

CONTRACT DOCUMENTS FOR
THREE VAULT MODIFICATION PROJECT

**145 WEST 7500 SOUTH VAULT
700 WEST WINCHESTER VAULT
6567 SOUTH 1300 WEST VAULT**

PROJECT #: 4112

JANUARY 2020

OWNER

Jordan Valley Water Conservancy District
8215 South 1300 West
West Jordan, Utah
(801) 565-4300

ENGINEER

Hansen, Allen & Luce, Inc
859 W. South Jordan Parkway
South Jordan, Utah 84095
(801) 566-5599



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NOTICE INVITING BIDS

PROJECT NAME: Three Vault Modification Project

DESCRIPTION OF WORK: Modifications to existing valve vaults at three separate locations. Modifications include removal of existing 30" gate valves and piping, installation of new 30" butterfly valves and piping, removal and installation of concrete vault lid, and additional vault improvements as indicated on the drawings.

DISTRICT WEB SITE AND PLANHOLDERS LIST

Prospective bidders must register at the District's web site (www.jvwcd.org) under "Engineering Projects". Prospective bidders are required to check the District's web site for any addenda prior to submitting a responsive bid. The District's web site will be used to publish updated information relative to the project, including a planholders list.

RECEIPT OF BIDS: Sealed bids will be received at the administration office of the Jordan Valley Water Conservancy District, Owner of the Work, located at 8215 South 1300 West, West Jordan, Utah 84088, until **2:00 pm, on Thursday, January 23, 2020**, for construction of the "Three Vault Modification Project".

OBTAINING CONTRACT DOCUMENTS: The Contract Documents are entitled, "Three Vault Modification Project". All Contract Documents may be obtained, online at www.jvwcd.org under "Engineering Projects".

OPENING OF BIDS: The bids will be publicly opened and read at the time and location identified above.

SITES OF WORK:

145 West 7500 South, Midvale, Utah.
700 West Winchester, Murray, Utah.
6567 South 1300 West, Taylorsville, Utah.

PRE-BID MEETING: A **mandatory** pre-bid meeting will be held at **11:00am on Thursday, January 16, 2020** at the office of the Owner. All potential bidders are required to attend the pre-bid meeting or schedule a separate pre-bid meeting with the Owner by appointment.

COMPLETION OF WORK: All work shall be completed within 380 calendar days from the date of the Notice to Proceed. Work shall be sequenced and scheduled as listed Section 01 11 00 Summary of Work.

AWARD OF CONTRACT: An Award of Contract, if it were awarded, will be made within 60 calendar days of the opening of bids.

NOTICE TO PROCEED: A Notice to Proceed, if it were issued, will be made within 60 calendar days of the Notice of Award.

NOTICE INVITING BIDS

BID SECURITY: Each bid shall be accompanied by a certified or cashier's check, money order or bid bond in the amount of five percent of the total bid price payable to the Jordan Valley Water Conservancy District as a guarantee that the bidder, if its bid is accepted, will promptly execute the contract, provide evidence of worker's compensation insurance, and furnish a satisfactory faithful performance bond in the amount of 100 percent of the total bid price and a payment bond in the amount of 100 percent of the total bid price.

ADDRESS AND MARKING OF BID: The envelope enclosing the bid shall be sealed and addressed to the Jordan Valley Water Conservancy District and delivered or mailed to 8215 South 1300 West, West Jordan, Utah 84088. The envelope shall be plainly marked in the upper left-hand corner with the name and address of the bidder and shall bear the words "Bid for," followed by the title of the Contract Documents for the work and the date and hour of opening of bids. The certified or cashier's check, money order, or bidder's bond shall be enclosed in the same envelope with the bid.

PROJECT ADMINISTRATION: All questions relative to this project prior to the opening of bids shall be directed to the Engineer for the project. It shall be understood, however, that no interpretations of the specifications will be made by telephone, nor will any "or equal" products be considered for approval prior to award of contract.

ENGINEER

Hansen, Allen & Luce, Inc
859 W. South Jordan Parkway
South Jordan, Utah 84095
(801) 566-5599
Contact: Vern Conder, P.E.
Email: vconder@hansenallenluce.com

OWNER'S RIGHTS RESERVED: The Owner reserves the right to reject any or all bids, to waive any informality in a bid, and to make awards in the interest of the Owner.

OWNER

Jordan Valley Water Conservancy District
8215 South 1300 West
West Jordan, Utah 84088
(801) 565-4300
Project Manager: Kevin Rubow, P.E.
Email: kevinr@jvwcd.org

JORDAN VALLEY WATER CONSERVANCY DISTRICT

INSTRUCTIONS TO BIDDERS

FORM OF BID: The bid shall be made on the bidding schedule(s) bound herein. The bid shall be enclosed in a sealed envelope bearing the name of the bidder and name of the project. In the event there is more than one bidding schedule, the bidder may bid on any individual schedule or on any combination of schedules.

DELIVERY OF BID: The bid shall be delivered by the time and to the place stipulated in the Notice Inviting Bids. It is the bidder's sole responsibility to see that his bid is received in proper time.

WITHDRAWAL OF BIDS: Bids shall be unconditionally accepted without alteration or correction, excepting that bidder may by means of written request, signed by the bidder or his properly authorized representative withdraw his bid. Such written request must be delivered to the place stipulated in the Notice Inviting Bids for receipt of bids prior to the scheduled closing time for receipt of bids.

OPENING OF BIDS: The bids will be publicly opened and read at the time and place stipulated in the Notice Inviting Bids.

MODIFICATIONS AND ALTERNATIVE BIDS: Unauthorized conditions, limitations, or provisions attached to a bid may render it non-responsive and may cause its rejection. The completed bid forms shall be without interlineations, alterations, or erasures. Alternative bids will not be considered unless called for. Oral, telegraphic, or telephonic bids or modifications will not be considered.

DISCREPANCIES IN BIDS: In the event there is more than one bid item in a bidding schedule, the bidder shall furnish a price for all bid items in the schedule; failure to do so may render the bid non-responsive and subject to rejection. In the event there are unit price bid items in a bidding schedule and the "amount" indicated for a unit price bid item does not equal the product of the unit price and quantity, the unit price shall govern and the "amount" will be corrected accordingly, and the Contractor shall be bound by said Correction. In the event there is more than one bid item in a bidding schedule and the total indicated for the schedule does not agree with the sum of the prices bid on the individual items, the prices bid on the individual items shall govern and the total for the schedule will be corrected accordingly, and the Contractor shall be bound by said correction.

INSTRUCTIONS TO BIDDERS

BID SECURITY: Each bid shall be accompanied by a certified or cashier's check or approved bid bond in the amount stated in the Notice Inviting Bids. Said check or bond shall be made payable to the Owner and shall be given as a guarantee that the bidder, if awarded the work, will enter into a contract within 10 calendar days after receipt of the contract from the Owner, and will furnish the necessary insurance certificates, Payment Bond, and Performance Bond; each of said bonds to be in the amount stated in the Notice Inviting Bids. In case the apparent low bidder refuses or fails to enter into such contract or fails to provide the required insurance and insurance certificates, the check or bid bond, as the case may be, shall be forfeited to the Owner. If the bidder elects to furnish a bid bond as his bid guarantee, he shall use the bid bond bound herein, or one conforming substantially to it in form.

BIDDER'S EXAMINATION OF CONTRACT DOCUMENTS AND SITE

It is the responsibility of each Bidder before submitting a Bid to:

1. Examine Contract Documents thoroughly.
2. Visit the site to become familiar with local conditions that may affect cost, progress, performance, or furnishing of the work.
3. Consider federal, state and local laws and regulations that may affect cost, progress, and performance of furnishing of the work.
4. Study and carefully correlate the Bidder's observations with the Contract Documents.
5. Notify the Engineer of all conflicts, errors, or discrepancies in the Contract Documents.

Reference is made to the Supplemental General Conditions for identification of:

1. Those reports of exploration and tests of subsurface conditions at the site, which have been utilized by the Engineer in the preparation of the Contract Documents.
2. Those drawings of physical conditions in or relating to existing surface and subsurface conditions (except underground utilities as defined in Article 1 of the General Conditions) which are at or contiguous to the site and which were utilized by the Engineer in the preparation of the Contract Documents. Copies of such reports and drawings are available for inspection at the office of the Owner.

INSTRUCTIONS TO BIDDERS

Information and data reflected in the Contract Documents with respect to underground facilities at/or contiguous to the site are based upon information and data furnished to the Owner and the Engineer by the owners of such underground facilities or others, and the Owner does not assume any responsibility for the accuracy or completeness thereof including any damages whatsoever that may be incurred by the Bidder or the Contractor through his reliance thereon unless it is expressly provided otherwise in the Supplemental General Conditions and/or the Technical Specifications.

Before submitting a bid, the bidder shall conduct such examination, investigations, studies and tests as are necessary to satisfy himself as to: the nature and location of the physical conditions (surface, subsurface and underground facilities), the general and local conditions particularly those bearing upon transportation, disposal, handling and storage of materials, availability of labor, availability of utilities, local weather conditions, the character of equipment and facilities required preliminary to and during the prosecution of the work; any and all other conditions that may in any way affect the cost, progress, performance or furnishing of materials in accordance with the Contract Documents. All such examination, investigation, studies, tests and the like shall be at the Bidder's expense.

Upon reasonable request in advance, the Owner shall provide each Bidder access to the site to conduct such explorations, examination, investigation and tests as each Bidder may determine necessary for the submission of a Bid. The Bidder shall fill all holes, clean and restore the site to its former condition upon the completion of such activities.

The submission of a bid hereunder shall be considered prima facie evidence that the Bidder has made such examination as is set forth in the above paragraph and is knowledgeable as to the location and site conditions surrounding the work and the conditions to be encountered in performing the work and as to the requirements, conditions and terms of the Contract and Contract Documents.

The Owner assumes no responsibility for any understanding or representations made by any of its officers or agents during or prior to the execution of this Contract, for information contained in any reports, subsurface studies, or other information which may be made available for the Contractor's information and which are not included as Contract Documents, for any understanding or representations by the Owner or by others which are not expressly stated in the Contract Documents which liability is not expressly assumed by the Owner or its representatives or Engineer in the Contract Documents. Such information shall be deemed to be for the information of the Contractor and the Contractor shall have the obligation of evaluating any such information as to its accuracy and effect the Owner will not be liable or responsible for any such information or any conclusions that may be drawn there from by the Contractor.

INSTRUCTIONS TO BIDDERS

The lands upon which the work is to be performed, right-of-ways and easements for access thereto together with other lands designated for use by the Contractor in performing the work are identified in the Contract Documents. All additional lands and access thereto that are required for temporary construction facilities or storage of materials and equipment are to be provided by the Contractor. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by the Owner unless otherwise provided in the Contract Documents.

The submission of a Bid shall constitute an incontrovertible representation by the Bidder that the Bidder has complied with every requirement of this Article, and that without exception the Bid is premised upon performing and furnishing the work required by the Contract Documents in compliance with such means, methods, techniques, sequences, or procedures of construction as may be indicated in or required by the Contract Documents; and that such means, methods, techniques, sequences or procedures described in the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing the work.

QUANTITIES OF WORK

The quantities of work or material stated in the Bid Schedule are supplied only to give an indication of the general scope of the work; the Owner does not expressly or by implication agree that the actual amount of work or material will correspond therewith. The Owner reserves the right after award of the Contract to increase or decrease the quantities of any unit price item of the work by an amount up to and including 25 percent of the quantity of any bid item, or to omit portions of such work as may be deemed necessary or expedient by the Engineer or Owner, without a change in the unit price. Such right to revise and omit shall include the right to delete any bid item in its entirety, or to add additional bid items in quantities up to and including an aggregate total amount not to exceed 25 percent of the total amount of the Contract.

The Bidders nor the ultimate Contractor on the Project shall at any time after the submittal of a bid make or have any claim for damages or anticipated profits or loss of profit or otherwise because of any difference between the quantities of work actually done and material furnished and those stated in said unit price items of the Bid.

INSTRUCTIONS TO BIDDERS

COMPETENCY OF BIDDERS: In selecting the lowest responsible Bidder, consideration will be given to the general competency of the Bidder for the performance of the work covered by the Bid. To this end, each bid shall be supported by a statement of the bidder's experience as of recent date on the form entitled "Information Required of Bidder," bound herein. No bid for the work will be accepted from a contractor who does not hold an active Contractor's license in good standing applicable to the type of work bid upon at the time of opening bids.

After an award of the contract no substitution of the Project Manager or Project Superintendent will be allowed without the written approval by the Owner.

DISQUALIFICATION OF BIDDERS: More than one bid from an individual, firm partnership, corporation, or association under the same or different names will not be considered. Reasonable grounds for believing that any bidder is interested in more than one bid for the work contemplated will cause the rejection of all bids in which such bidder is interested. If there is reason for believing that collusion exists among the bidders, all bids will be rejected.

RETURN OF BID GUARANTEE: Within 10 calendar days after award of the contract, the Owner will return the bid guarantees accompanying such of the bids as are not considered in making the award. All other bid guarantees will be held until a Notice to Proceed has been issued and accepted. They will then be returned to the respective bidders whose bids they accompany.

AWARD OF CONTRACT: Award of the Contract, if it be awarded, will be based primarily on the lowest overall cost to the Owner, and will be made to a responsive and responsible bidder whose bid complies with all the requirements prescribed. Any such award will be made by written notice and within 60 calendar days after opening of the bids, unless a different waiting period is expressly allowed in the Notice Inviting Bids. Unless otherwise indicated, an award will not be made for less than all the bid items in an individual bidding schedule. In the event the entire work is contained in more than one bidding schedule, the Owner may award schedules individually or in combination. In the case of two bidding schedules which are alternate to each other, only one of such alternate schedules will be awarded.

INSTRUCTIONS TO BIDDERS

EXECUTION OF CONTRACT: The Bidder to whom the award is made shall secure all insurance and shall furnish all certificates and bonds required by the specifications within ten calendar days after receipt of the Notice of Award from the Owner. The Bidder to whom the award is made shall execute a written contract with the Owner on the form of agreement provided within ten calendar days after receipt of the Agreement from the Owner. Failure or refusal to enter into a contract as herein provided or to conform to any of the stipulated requirements in connection therewith shall be just cause for annulment of the award and forfeiture of the bid guarantee. If the successful bidder refuses or fails to execute the contract, the Owner may award the contract to the second lowest responsible bidder, or reject all bids and re-advertise the project for rebidding. If the second lowest responsible bidder refuses or fails to execute the contract, the Owner may award the contract to the third lowest responsible bidder. On the failure or refusal of such second or third lowest bidder to execute the contract, each such bidder's guarantees shall be likewise forfeited to the Owner.

ISSUANCE OF NOTICE TO PROCEED: The Owner intends to execute the Agreement and issue the Notice to Proceed specifying the Project start date within ten calendar days after its receipt of the executed Agreement, Purchase Order Assignment(s), (if applicable), bonds and insurance certificates from the successful bidder. If the Contract Time is expressed as a specific completion date in the Notice Inviting Bids and paragraph 3.1 of the Agreement rather than a specific number of successive days following the start date identified in the Notice to Proceed, then any delay by the Owner beyond the ten days in issuing the Notice to Proceed shall extend the completion date by the number of days of the delay.

LICENSES: Contractor must be licensed as a business qualified to do business within the state of Utah prior to issuance of a Notice of Award. Contractor must hold a current contractor's license with classifications appropriate to the work being contracted.

STATE REGISTRY: The Contractor shall register the project, if awarded, on the State of Utah Construction Registry prior to the commencement of the work.

BID

BID TO: JORDAN VALLEY WATER CONSERVANCY DISTRICT

The undersigned Bidder hereby proposes to furnish all plant machinery, labor, services, materials, equipment, tools, supplies, transportation, utilities, and all other items and facilities necessary to perform all work required under the Bidding Schedule of the Owner's Contract Documents entitled "Three Vault Modification Project" drawings and all addenda issued by said Owner prior to opening of the bids.

Addenda are only delivered by e-mail and through the internet.

The undersigned bidder acknowledges receipt of the following addenda:

| <u>No.</u> | <u>Date Received</u> | <u>No.</u> | <u>Date Received</u> |
|------------|----------------------|------------|----------------------|
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

Bidder agrees that, within 10 calendar days after receipt of Notice of Award from Owner, he will execute the Agreement in the required form, of which the Notice Inviting Bids, Instructions to Bidders, Bid, Information Required of Bidder, Technical Specifications, Drawings, and all addenda issued by Owner prior to the opening of bids, are a part, and will secure the required insurance and bonds and furnish the required insurance certificates; and that upon failure to do so within said time, then the bid guarantee furnished by Bidder shall be forfeited to Owner as liquidated damages for such failure; provided, that if Bidder shall execute the Agreement, secure the required insurance and bonds, and furnish the required insurance certificates within said time, his check, if furnished, shall be returned to him within five days thereafter, and the bid bond, if furnished, shall become void. It is further understood that this bid may not be withdrawn for a period of 45 days after the date set for the opening thereof, unless otherwise required by law.

Bidder hereby certifies he has registered and participates in the Status Verification System (E-Verify).

Dated: _____ Bidder: _____

By: _____
(Signature)

Title: _____

Bidder further agrees to complete all work required within the time stipulated in the Contract Documents, and to accept in full payment therefore the price(s) named in the above-mentioned Bidding Schedule(s).

BID

Bid Item #1: VAULT MODIFICATION at 6567 SOUTH 1300 WEST

| ITEM | DESCRIPTION | QTY | UNIT | UNIT COST | TOTAL AMOUNT |
|--|---|-----|------|-----------|--------------|
| 1 | Mobilization/Demobilization | 1 | LS | | \$ |
| 2 | Testing Agency Services | 1 | LS | | \$ |
| 3 | Removal of existing Piping and Valves | 1 | LS | | \$ |
| 4 | Furnish and install new Piping and Valves | 1 | LS | | \$ |
| 5 | Commissioning of Pipelines | 1 | LS | | \$ |
| 6 | Road Repair | 1 | LS | | \$ |
| 7 | Installing a new precast vault lid | 1 | LS | | \$ |
| 8 | Site Improvements | 1 | LS | | \$ |
| 9 | Traffic Control | 1 | LS | | \$ |
| 10 | High Pressure Gas Line stabilization | 1 | LS | | \$ |
| TOTAL OF SCHEDULE OF VALUES for BID ITEM #1 | | | | \$ | |

Bid Item #2: VAULT MODIFICATION at 145 WEST 7500 SOUTH

| ITEM | DESCRIPTION | QTY | UNIT | UNIT COST | TOTAL AMOUNT |
|------|---|-----|------|-----------|--------------|
| 1 | Mobilization/Demobilization | 1 | LS | | \$ |
| 2 | Testing Agency Services | 1 | LS | | \$ |
| 3 | Removal of existing Piping and Valves | 1 | LS | | \$ |
| 4 | Furnish and install new Piping and Valves | 1 | LS | | \$ |
| 5 | Commissioning of Pipelines | 1 | LS | | \$ |
| 6 | Road Repair | 1 | LS | | \$ |

BID

| ITEM | DESCRIPTION | QTY | UNIT | UNIT COST | TOTAL AMOUNT |
|--|---|------------|-------------|------------------|---------------------|
| 7 | Site Improvements | 1 | LS | | \$ |
| 8 | Installing a new precast vault lid | 1 | LS | | \$ |
| 9 | Traffic Control | 1 | LS | | \$ |
| 10 | Electrical Complete with SCADA Connections and Conduits | 1 | LS | | \$ |
| 11 | HVAC Improvements | 1 | LS | | \$ |
| 12 | Sump Pump | 1 | LS | | \$ |
| TOTAL OF SCHEDULE OF VALUES for BID ITEM #2 | | | | \$ | |

Bid Item #3: VAULT MODIFICATION at 700 WEST WINCHESTER

| ITEM | DESCRIPTION | QTY | UNIT | UNIT COST | TOTAL AMOUNT |
|--|---|------------|-------------|------------------|---------------------|
| 1 | Mobilization/Demobilization | 1 | LS | | \$ |
| 2 | Testing Agency Services | 1 | LS | | \$ |
| 3 | Removal of existing Piping and Valves | 1 | LS | | \$ |
| 4 | Furnish and install new Piping and Valves | 1 | LS | | \$ |
| 5 | Commissioning of Pipelines | 1 | LS | | \$ |
| 6 | Road Repair | 1 | LS | | \$ |
| 7 | Site Improvements | 1 | LS | | \$ |
| 8 | Installing a new precast vault lid | 1 | LS | | \$ |
| 9 | Traffic Control | 1 | LS | | \$ |
| TOTAL OF SCHEDULE OF VALUES for BID ITEM #3 | | | | \$ | |

BID

Bid Item #4: ADDITIVE ALTERNATE BID ITEMS

| Item | Description | QTY | UNIT | Unit Cost | Total Cost |
|--------------------------------------|--|------------|-------------|------------------|-------------------|
| 1 | New 33 x 30 Reducer Supplied | 2 | EA | \$ | \$ |
| 2 | New 33 x 30 Reducer Supplied and Installed | 2 | EA | \$ | \$ |
| TOTAL AMOUNT for BID ITEM #4: | | | | \$ | |

BID SCHEDULE

| Item | Description | Total Cost |
|-------------------------|------------------------------------|-------------------|
| #1 | Modifications at 6567 S. 1300 W. | \$ |
| #2 | Modifications at 175 W. 7500 S. | \$ |
| #3 | Modifications at 700 W. Winchester | \$ |
| #4 | Additive Alternate Bid Items | \$ |
| TOTAL BID AMOUNT | | \$ |

Total Bid Amount including all system features shown or specified to make all project components complete and operable for the Three Vault Modification Project in words:

_____ Dollars

and _____ Cents.

BID BOND

KNOW ALL MEN BY THESE PRESENTS,

That _____
as Principal, and _____
as Surety, are held and firmly bound unto the Jordan Valley Water Conservancy District
(hereinafter called "Owner") in the sum of _____
dollars, (not less than five percent of the total amount of the bid) for the payment of which
sum, will and truly to be made, we bind ourselves, our heirs, executors, administrators,
successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has submitted a bid to Owner to perform all work required under the
bidding Schedule of the Owner's Contract Documents entitled "Three Vault Modification
Project", (hereafter called the "Project").

NOW THEREFORE, if Principal is awarded Contract by Owner for the Construction of the
Project and, within the time and in the manner required under the heading "Instructions to
Bidders" enters into the written contract entitled "Agreement" bound with said Contract
Documents, furnishes the required certificates of insurance, and furnishes the required
Performance Bond and Payment Bond within 10 calendar days after receipt of such
contract from Owner, then this obligation shall be null and void, otherwise it shall remain in
full force and effect. In the event suit is brought upon this bond by Owner and judgment is
recovered, Surety shall pay all costs incurred by Owner in such suit, including a reasonable
attorney's fee to be fixed by the court.

SIGNED AND SEALED, this ___day of _____, 20__.

By: _____ By: _____

President

Its: _____ Its: _____

(SEAL)

(SEAL)

INFORMATION REQUIRED OF BIDDER

The Bidder shall furnish the following information. Failure to comply with this requirement may render the Bid non-responsive and subject to rejection. Additional sheets shall be attached as required.

1. Contractor's name: _____
2. Contractor's address: _____

Contractor's Primary Contact: _____
Email address of Contractor's primary contact: _____
Contractor's telephone number: _____

3. **Contractor must be qualified and licensed to do business in Utah.**

Utah Department of Commerce Information

Business Entity Number: _____

Delinquent Date: _____

4. **Contractor must hold a current contractor's license, classification E100.**

Contractor's Utah License Number: _____

Expiration Date: _____

Primary Classification: _____

Supplemental Classification held, if any: _____

5. **Key Personnel Qualifications and Experience**

List key personnel here and provide detailed information in Attachments A and B. More than one Project Manager and/or Project Superintendent may be proposed. Only personnel approved by the Owner will be allowed in the key positions.

Project Manager A: _____

Project Manager (Alternate 1): _____

Project Manager (Alternate 2): _____

Project Manager shall have:

- At least five (5) years construction experience
- Two (2) projects that included underground utility vault work and pressurized welded steel pipe with a diameter of at least 24-inches.
- One (1) project that included pipeline construction within the public right-of-way which included traffic control.

INFORMATION REQUIRED OF BIDDER

Project Superintendent A: _____

Project Superintendent (Alternate 1): _____

Project Superintendent (Alternate 2): _____

Project Superintendent shall have:

- At least five (5) years construction experience
- Two (2) projects that included underground utility vault work and pressurized welded steel pipe with a diameter of at least 24-inches.
- One (1) project that included pipeline construction within the public right-of-way which included traffic control.

6. Previous Contractor Project Experience

Past project experience shall be provided for each requirement. The Owner shall be entitled to contact each and every reference listed by the contractor. The Contractor, by submitting a bid, expressly agrees that any information concerning the CONTRACTORS in possession of said entities and references may be made available to the owner.

Provide the information identified in Attachment C for each project which meets the minimum requirements listed below:

Requirements:

Contracting firm shall have successfully completed:

- Three (3) projects that included 24-inch diameter pressurized pipeline or larger with underground utility vault work.
- Two (2) of the projects shall have included welded steel pipeline construction.
- One (1) project that included pipeline construction within the public right-of-way which included traffic control.

Note: One project may satisfy multiple requirements.

INFORMATION REQUIRED OF BIDDER

7. Number of years as a contractor in construction work of this type:

8. Name and title of officers of Contractor's firm:

9. Number of persons employed full-time by the firm: _____

10. Name of person who inspected site of proposed work for your firm:

Name: _____

Date of Inspection: _____

11. Surety company who will provide the required bonds on this contract:

Agent's Name: _____

Telephone: _____

12. Workers Compensation Insurance Policy #: _____

INFORMATION REQUIRED OF BIDDER

ATTACHMENT A

(Copy as necessary – provide experience that meets the requirements listed above)

Project Manager Data Sheet

Name: _____

Years experienced as Project Manager: _____

Years of prior experience: _____ Positions: _____

Qualifying Project #1 (WSP with utility vault work): _____

Project Summary: _____

Year Completed: _____

Total Cost: _____

Owner: _____

Owner Contact Person: _____ Telephone: _____

Qualifying Project #2 (WSP with utility vault work): _____

Project Summary: _____

Year Completed: _____

Total Cost: _____

Owner: _____

Owner Contact Person: _____ Telephone: _____

Qualifying Project #3 (ROW): _____

Project Summary: _____

Year Completed: _____

Total Cost: _____

Owner: _____

Owner Contact Person: _____ Telephone: _____

INFORMATION REQUIRED OF BIDDER

ATTACHMENT B

(Copy as necessary – provide experience that meets the requirements listed above)

Superintendent Data Sheet

Name: _____

Years experienced as Project Manager: _____

Years of prior experience: _____ Positions: _____

Qualifying Project #1 (WSP with utility vault work): _____

Project Summary: _____

Year Completed: _____

Total Cost: _____

Owner: _____

Owner Contact Person: _____ Telephone: _____

Qualifying Project #2 (WSP with utility vault work): _____

Project Summary: _____

Year Completed: _____

Total Cost: _____

Owner: _____

Owner Contact Person: _____ Telephone: _____

Qualifying Project #3 (ROW): _____

Project Summary: _____

Year Completed: _____

Total Cost: _____

Owner: _____

Owner Contact Person: _____ Telephone: _____

INFORMATION REQUIRED OF BIDDER

ATTACHMENT C

(Provide experience that meets the requirements listed above)

Contracting Firm Data Sheet

Name: _____

Qualifying Project #1 (pressurized pipeline with utility vault): _____

Project Summary: _____

Year Completed: _____

Total Cost: _____

Owner: _____

Owner Contact Person: _____ Telephone: _____

Qualifying Project #2 (WSP with utility vault work): _____

Project Summary: _____

Year Completed: _____

Total Cost: _____

Owner: _____

Owner Contact Person: _____ Telephone: _____

Qualifying Project #3 (WSP with utility vault work): _____

Project Summary: _____

Year Completed: _____

Total Cost: _____

Owner: _____

Owner Contact Person: _____ Telephone: _____

Qualifying Project #4 (ROW): _____

Project Summary: _____

Year Completed: _____

Total Cost: _____

Owner: _____

Owner Contact Person: _____ Telephone: _____

AGREEMENT

An Agreement made as of the _____ day of _____, by and between the Jordan Valley Water Conservancy District, a water conservancy district organized under the laws of the State of Utah ("OWNER"), and _____, a _____ corporation qualified to do business and doing business in the State of Utah ("CONTRACTOR").

TERMS:

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE I
WORK

CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents for the _____. The Work is generally described as follows:

Furnishing all labor, services, materials, equipment, and supplies except for such materials, equipment, and services as may be stipulated in the Contract Documents to be furnished by the OWNER; furnishing and removing all plant machinery, temporary structures, tools, supplies, transportation, utilities, and all other items, facilities and equipment, and to do everything required by this Agreement and the Contract Documents; accepting all responsibility for and paying for all loss and damage arising out of the nature of the Work aforesaid, or from the action of the elements, or from any unforeseen difficulties which may arise during the prosecution of the Work until its acceptance by OWNER, and for all risks of every description connected with the Work; also for all expenses resulting from the suspension or discontinuance of work, except as in the Contract Documents are expressly stipulated to be borne by OWNER.

ARTICLE II
ENGINEER

The Project has been designed by the OWNER. The OWNER will assume all duties and responsibilities and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

[ALTERNATE PARAGRAPH] The Project has been designed by _____, a _____ corporation qualified to do business and doing business in the State of Utah, who is hereinafter called "ENGINEER" and who is to act as OWNER's representative, assume all duties and responsibilities and have the rights and

authority assigned to ENGINEER in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE III CONTRACT TIME

- 3.1 The Work shall be complete, in accordance with paragraphs 14.08 and 14.09 of the General Conditions, on or before _____.
- 3.2 Liquidated Damages: OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that the OWNER will suffer financial loss if the Work is not completed within the time specified in paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any proof of loss, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay OWNER the amount specified in Article 14.07 of the General Conditions and in Article 18.01 of the Supplementary General Conditions for each day that expires after the time specified in paragraph 3.1 for final completion until the Work is substantially complete. And, after Substantial Completion if CONTRACTOR neglects, refuses or fails to complete the remaining Work within forty-five (45) days or any proper extension thereof granted by OWNER, CONTRACTOR shall pay OWNER the amount specified in Article 14.07 of the General Conditions and in Article 18.01 of the Supplemental General Conditions for each day that expires after the forty-five (45) days until readiness for final payment.

ARTICLE IV CONTRACT PRICE

All payments to Contractor shall be made in accordance with the Contract Documents. OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents in current funds those prices stated in the approved Bid Schedule as named in the Notice of Award.

ARTICLE V PAYMENT PROCEDURES

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

- 5.1 Progress Payments: OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment

as recommended by ENGINEER, on a monthly basis. All progress payments will be on the basis of the progress of the Work measured by the schedule of values established in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Conditions.

- 5.2 Final Payment: Upon final completion and acceptance of the Work in accordance with Article 14 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in Article 14.

ARTICLE VI INTEREST

All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of twelve percent (12%) per annum.

ARTICLE VII CONTRACTOR'S REPRESENTATION

In order to induce OWNER to enter into the Agreement, CONTRACTOR makes the following representations:

- 7.1 CONTRACTOR has familiarized itself with the nature and extent of the Contract Documents, Work, site, locality, and all local conditions and Laws and Regulations that in any manner may affect cost, progress, performance or furnishing of the Work.
- 7.2 CONTRACTOR has studied carefully all exploration reports and test of subsurface conditions and drawings of physical conditions which are identified in the Supplementary General Conditions, as provided in paragraph 4.02 of the General Conditions, and accepts the Technical Data contained in such reports and drawings upon which CONTRACTOR is entitled to rely.
- 7.3 CONTRACTOR has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, reports and studies (in addition to or to supplement those referred to in paragraph 7.2 above) which pertain to the subsurface or physical conditions at or contiguous to the site or otherwise may affect the cost, progress, performance or furnishing of the Work as CONTRACTOR considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of paragraph 4.02 of the General Conditions; and no additional examinations, investigations, explorations, tests, reports,

studies or similar information or data are or will be required by CONTRACTOR for such purposes.

- 7.4 CONTRACTOR has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities.
- 7.5 CONTRACTOR has correlated the results of all observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.
- 7.6 CONTRACTOR has given ENGINEER written notice of all conflicts, errors or discrepancies that he had discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

ARTICLE VIII CONTRACT DOCUMENTS

The Contract Documents for the _____, which comprise the entire agreement between OWNER and CONTRACTOR concerning the Work, consist of the following:

- 8.1 This Agreement;
- 8.2 Performance and Payment Bonds;
- 8.3 Notice of Award;
- 8.4 Notice to Proceed;
- 8.5 General Conditions;
- 8.6 Supplemental General Conditions;
- 8.7 Notice Inviting Bids;
- 8.8 Instructions to Bidders;
- 8.9 Information Required of Bidder;
- 8.10 Technical Specifications;
- 8.11 Drawings - Sheet Number One;
- 8.12 Addendum Number One; and,
- 8.13 CONTRACTOR's Bid, including all schedules and explanatory attachments; attached as Exhibit A.

The CONTRACTOR (1) acknowledges that he has received a copy of each document, specified above, (2) acknowledges that he has read and understands each document specified above and (3) agrees to every term, condition and contract obligation set forth in each document specified above.

There are no Contract Documents other than those listed above in this Article 8. The Contract Documents may only be amended, modified or supplemented as provided in paragraphs 3.03 of the General Conditions.

ARTICLE IX
FEDERAL REQUIREMENTS

The CONTRACTOR shall comply with federal regulations as stated in the Supplemental General Conditions, Article 21.

ARTICLE X
MISCELLANEOUS

- 10.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.
- 10.2 No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.
- 10.3 In the event any legal action or other proceeding is brought for the enforcement of this Agreement and/or the Contract Documents, or for damages, because of an alleged dispute, breach, default or misrepresentation in connection with any of the provisions thereof, the successful or prevailing party shall be entitled to recover reasonable attorneys= fees and other costs incurred in the action or proceeding, in addition to any other relief to which it may be entitled.
- 10.4 Any notice to be given hereunder shall be deemed given when sent by registered or certified mail, postage prepaid to the parties at their respective addresses stated below or at any other address when notice of such change of address has been given as provided in this Article 10.4.

“OWNER”:

JORDAN VALLEY WATER
CONSERVANCY DISTRICT
8215 SOUTH 1300 WEST
WEST JORDAN, UT 84088

By: _____
Richard P. Bay
Its Chief Executive Officer
and General Manager

“CONTRACTOR”:

Utah License No. _____

By: _____

Its: _____

EXHIBIT A
CONTRACTOR'S BID

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS,

That _____, as Contractor, and _____ as Surety, are held firmly bound unto the Jordan Valley Water Conservancy District hereinafter called "Owner," in the sum of \$_____ for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has been awarded and is about to enter into the annexed Agreement with Owner to perform all work required under the Bidding Schedule(s) of the Owner's Contract Documents entitled "Three Vault Modification Project".

NOW THEREFORE, if Contractor shall perform all the requirements of the Agreement required to be performed on his part, at the times and in the manner specified therein, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

PROVIDED, that any alterations in the work to be done or the materials to be furnished, or changes in the time of completion, which may be made pursuant to the terms of the Agreement, shall not in any way release Contractor or Surety thereunder, nor shall any extensions of the time granted under the provisions of the Agreement release either the Contractor or Surety, and notice of such alterations or extensions of the work, materials or time to complete made under the Agreement is hereby waived by Surety. This Bond is furnished in compliance and in accordance with 14-1-18, Utah Code Ann., as amended, and 63-56-38 Utah Code Ann., as amended.

SIGNED AND SEALED, this _____ day of _____, 20__.

By: _____

By: _____

Its: _____

Its: _____

(SEAL)

(SEAL)

(SEAL AND NOTARIAL ACKNOWLEDGMENT OF SURETY)

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS,

That _____ as Contractor, and _____ as Surety, are held firmly bound unto the Jordan Valley Water Conservancy District hereinafter called "Owner," in the sum of \$ _____ for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has been awarded and is about to enter into the annexed Agreement with Owner to perform all work required under the Bidding Schedule(s) of the Owner's Contract Documents entitled, "Three Vault Modification Project".

NOW THEREFORE, if said Contractor, or subcontractor, fails to pay for any materials, equipment, or other supplies, or for rental of same, used in connection with the performance of work contracted to be done, or for amounts due under applicable State law for any work or labor thereon, said Surety will pay for the same in an amount not exceeding the sum specified above, and, in the event suit is brought upon this bond, a reasonable attorney's fee to be fixed by the court. This bond shall inure to the benefit of any persons, companies, or corporations entitled to file claims under applicable State law.

PROVIDED, that any alterations in the work to be done or the materials to be furnished, or changes in the time of completion, which may be made pursuant to the terms of the Agreement, shall not in any way release Contractor or Surety thereunder, nor shall any extensions of time granted under the provisions of said contract release either Contractor or the Surety, and notice of such alterations or extensions of the work, materials or time to complete made under the Agreement is hereby waived by Surety. This bond is furnished in compliance and in accordance with 14-1-18 and 19 Utah Code Ann., as amended, and 63-56-38 Utah Code Ann., as amended.

SIGNED AND SEALED, this _____ day of _____, 20____.

By: _____

By: _____

Its: _____

Its: _____

(SEAL)

(SEAL)

(SEAL AND NOTARIAL ACKNOWLEDGMENT OF SURETY)

NOTICE OF AWARD

To:

Re: Three Vault Modification Project

You are hereby notified that the OWNER has accepted your bid for the above referenced project in the amount of \$_____.

Furnish the required Contractor's Performance Bond, Payment Bond and Certificates of Insurance within ten calendar days from the date of this notice to you. An acknowledged copy of this Notice of Award, together with all future correspondence regarding this project, shall be sent to the District's Project Manager: Kevin Rubow.

When the Agreement is provided, sign and return it within ten calendar days from receipt of the agreement.

Dated this ____ day of _____, 20__.

Alan E. Packard, PE
Assistant General Manager & Chief Engineer

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Award is hereby acknowledged by:

This ____ day of _____, 20__.

Signature: _____

Printed Name: _____

Title: _____

NOTICE TO PROCEED

To:

Re: Three Vault Modification Project

You are hereby notified to commence work in accordance with the Agreement dated **Month Day, 2020**, and you are to complete the work by **Month Day, 2020**.

An acknowledged copy of this Notice to Proceed should be returned to the Owner, Attention: Kevin Rubow, Staff Engineer.

Dated this _____ day of _____.

Shane K. Swensen, P.E.
Engineering Department Manager

ACCEPTANCE OF NOTICE

Receipt of the above Notice to Proceed is hereby acknowledged by:

This _____ day of _____, 20____.

Signature: _____

Printed Name: _____

Title: _____

JORDAN VALLEY WATER CONSERVANCY DISTRICT

PAYMENT APPLICATION AND CERTIFICATE No. ____ **DATE:** _____

SHEET ____ **OF** _____

PERIOD FROM _____ TO _____, 20__

PROJECT: Three Vault Modification Project

JVWCD PROJECT NO.: 4112

CONTRACTOR: _____

ADDRESS: _____

ENGINEER: JVWCD

1. ORIGINAL CONTRACT PRICE:..... \$ _____
2. NET CHANGE ORDERS APPROVED TO DATE: \$ _____
(Attach Summary Sheet)
3. REVISED CONTRACT AMOUNT: \$ _____
(Sum of Lines 1 & 2)
4. TOTAL VALUE OF WORK COMPLETED TO DATE \$ _____
(Attached Payment Breakdown)
5. PERCENT PROJECT COMPLETE: _____ %
(Divide Line 4 by 3 and multiply by 100)
6. LESS AMOUNT RETAINED (5%) \$ _____
7. MATERIALS ON HAND..... \$ _____
(95% of Value, Listing Attached)
8. SUBTOTAL (Sum of Lines 4, Line 6 and Line 7) \$ _____
9. LESS PREVIOUS PAYMENTS \$ _____
10. CURRENT PAYMENT DUE: \$ _____
(Line 8 & 9)

JORDAN VALLEY WATER CONSERVANCY DISTRICT

Payment Application and Certificate No _____

SHEET _____ OF _____

CONTRACTOR'S Certification:

The undersigned CONTRACTOR certifies that: (1) all previous progress payments received from OWNER on account of work done under the Contract referred to herein have been applied to discharge in full all obligations of CONTRACTOR incurred in connection with work covered by prior Applications for Payment numbered 1 through _____ inclusive; and, (2) title to all materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER at time of payment free and clear of all liens, claims, security interests and encumbrances (except such as covered by bond acceptable to OWNER).

Dated: _____ CONTRACTOR: _____

By: _____

Engineer's Recommendation:

This Application (with accompanying documentation) meets the requirements of the Contract Documents and payment of the amount due this application is recommended.

ENGINEER

Dated: _____
Project Representative

Dated: _____
Project Manager

JORDAN VALLEY WATER CONSERVANCY DISTRICT

CHANGE ORDER

Change Order No. _____

Date: _____

Page ___ of ___

PROJECT NAME: Three Vault Modification Project

PROJECT NUMBER: 4112

CONTRACTOR: _____

CONTRACT DATE: _____

The following changes are hereby made to the CONTRACT DOCUMENTS:

- 1)
- 2)
- 3)

Total Change to CONTRACT PRICE: \$

Original CONTRACT PRICE: \$

Current CONTRACT PRICE adjusted by previous CHANGE ORDER(S)..... \$

The new CONTRACT PRICE including this CHANGE ORDER will be \$

The CONTRACT TIME will be increased by _____ calendar days.

The date for Substantial Completion will be _____, 20__.

The Contractor agrees to furnish all labor and materials and perform all work as necessary to complete the change order items for the price named herein, which includes all supervision and miscellaneous costs. This change order constitutes full and mutual accord and satisfaction for all time and all costs related to this change. By acceptance of this change order the Contractor agrees that the change order represents an equitable adjustment to the Contract, and further agrees to waive all right to file a claim arising out of or as a result of this change. This document will become a supplement to the Contract, and all provisions will apply hereto, upon approval by the Owner.

JORDAN VALLEY WATER CONSERVANCY DISTRICT

**CONTRACTOR'S CERTIFICATE
OF
SUBSTANTIAL COMPLETION**

OWNER

TO: Jordan Valley Water Conservancy District
8215 South 1300 West
West Jordan, Utah 84088-0070

PROJECT: Three Vault Modification Project

ATTENTION: _____

FROM: _____
Firm or Corporation

This is to certify that I, _____ am an authorized official of
_____ working in the capacity of _____
_____ and have been properly authorized by said
firm or corporation to sign the following statements pertaining to the subject contract:

I know of my own personal knowledge, and do hereby certify, that the work of the contract described above has been substantially performed and all materials used and installed to date are in accordance with, and in conformity to, the contract drawings and specifications. A list of all incomplete work is attached.

The Contractor hereby releases the Owner and its agents from all claims of and liability to the Contractor for anything done or furnished for or relating to the work, as further provided in Article 14.08B of the General Conditions, except demands against the Owner for the remainder of progress payments retained to date, and unresolved written claims prior to this date.

The contract work is now substantially complete, ready for its intended use, and ready for your inspection. You are requested to issue a Certificate of Substantial Completion.

SIGNATURE: _____

DATE: _____

JORDAN VALLEY WATER CONSERVANCY DISTRICT

**CONTRACTOR'S CERTIFICATE
OF
FINAL COMPLETION**

OWNER

TO: Jordan Valley Water Conservancy District
8215 South 1300 West
West Jordan, Utah 84088-0070

PROJECT: Three Vault Modification Project

ATTENTION: Project Representative: _____

FROM: _____
Firm or Corporation

This is to certify that I, _____ am an authorized official of
_____ working in the capacity of _____
_____ and have been properly authorized
by said firm or corporation to sign the following statements pertaining to the subject
contract:

I know of my own personal knowledge, and do hereby certify, that the work of the contract described above has been performed and all materials used and installed to date are in accordance with, and in conformity to, the contract drawings and specifications.

The Contract work is now complete in all parts and requirements, excepting the attached list of minor deficiencies and the reasons for each being incomplete to date, for which exemption from final payment requirements is requested in conformance to Article 14.09A of the General Conditions of our Contract (if no exemptions requested, write "none") _____. The work is now ready for your final inspection. The following items required from the Contractor prior to application for final payment (such as O & M Manuals, guarantees, record drawings, etc.) are submitted herewith, if any:

JORDAN VALLEY WATER CONSERVANCY DISTRICT

I understand that neither the issuance by the Engineer of a Notice of Completion, nor the acceptance thereof by the Owner, shall operate as a bar or claim against the Contractor under the terms of the guarantee provisions of the Contract Documents.

SIGNATURE: _____

DATE: _____

JORDAN VALLEY WATER CONSERVANCY DISTRICT

CONSENT OF SURETY FOR FINAL PAYMENT

PROJECT NAME: Three Vault Modification Project

LOCATION: _____

TYPE OF CONTRACT: _____

AMOUNT OF CONTRACT: _____

In accordance with the provisions of the above-named contract between the Owner and the Contractor, the following named surety:

on the Payment Bond of the following named Contractor:

hereby approves of final payment to the Contractor, and further agrees that said final payment to the Contractor shall not relieve the Surety Company named herein of any of its obligations to the following named Owner (as set forth in said Surety company's bond):

IN WITNESS WHEREOF, the Surety Company has hereunto set its hand and seal this _____ day of _____, 20____.

(Name of Surety Company)

(Signature of Authorized Representative)

(Name of Authorized Representatives)

(Title)

JORDAN VALLEY WATER CONSERVANCY DISTRICT

AFFIDAVIT OF PAYMENT

To All Whom It May Concern:

WHEREAS, the undersigned has been employed by the Jordan Valley Water Conservancy District to furnish labor and materials under a contract dated _____ for the project entitled "Three Vault Modification Project", in the County of Salt Lake, State of Utah, of which Jordan Valley Water Conservancy District is the Owner.

NOW, THEREFORE, this _____ day of _____, 20__, the undersigned, as the Contractor for the above-named Contract pursuant to the Conditions of the Contract hereby certifies that, except as listed below, he has paid in full or has otherwise satisfied all obligations for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or his property might in any way be held responsible.

EXCEPTIONS: (If none, write "None". If required by the Owner, the Contractor shall furnish bond satisfactory to the Owner for each Exception.)

Contractor (Name of sole ownership,
corporation or partnership)

(affix corporate seal here)

(Signature of Authorized Representative)

Title: _____

GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents the following terms have the meanings indicated:

Addenda - Written or graphic instruments issued prior to the opening of Bids which make additions, deletions, or revisions to the Contract Documents.

Agreement - The written contract between the OWNER and the CONTRACTOR for the performance of the WORK pursuant to the Contract Documents. Documents incorporated into the contract by reference become part of the contract and of the Agreement.

Application for Payment - The form furnished by the ENGINEER and completed by the CONTRACTOR to request progress or final payment including supporting documentation to substantiate the amounts for which payment is requested.

Bonds - Performance, and Payment Bonds and other instruments which protect against loss due to inability or refusal of the CONTRACTOR to perform pursuant to the Contract Documents.

Change Order - A document recommended by the ENGINEER, which is signed by the CONTRACTOR and the OWNER and authorizes an addition, deletion, or revision in the WORK, or an adjustment in the Contract Price or the Contract Time, issued on or after the Effective Date of the Agreement.

Contract Documents - Information and Instructions, forms (including the Schedule of Prices and all required certificates and affidavits), Agreement, Performance Bond, Payment Bond, General Conditions, Supplemental General Conditions, Technical Specifications, Drawings and all Addenda and Change Orders executed pursuant to the provisions of the Contract Documents.

Contract Price - The total monies payable by the OWNER to the CONTRACTOR under the terms and conditions of the Contract Documents.

Contract Time - The number of successive Days stated in the Contract Documents for the completion of the WORK. The Contract Time begins to run on the date specified in the Notice to Proceed.

CONTRACTOR - The person, firm, or corporation with whom the OWNER has executed the Agreement.

Cost Proposal - The offer or proposal of the pipeline installation subcontractor to the CONTRACTOR to provide the work required under these Contract Documents.

Day - A calendar day of 24 hours measured from midnight to the next midnight.

Defective Work - Work that: is unsatisfactory, faulty, or deficient; does not conform to the Contract Documents; does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents; has been damaged prior to the ENGINEERS's recommendation of final payment.

Drawings - The drawings, plans, maps, profiles, diagrams, and other graphic representations which show the character, location, nature, extent, and scope of the WORK.

Effective date of the Agreement - The date indicated in the Agreement on which it was executed, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

ENGINEER - The person, firm, or corporation named as such in the Contract Documents.

Field Order - A written order issued by the ENGINEER which may or may not involve a change in the WORK.

Laws and Regulations; Laws or Regulations - Laws, rules, regulations, ordinances, codes, and/or orders promulgated by a lawfully constituted body authorized to issue such Laws and Regulations.

Notice of Award - The OWNER's written notice to the apparent successful Bidder stating that upon compliance with the conditions precedent enumerated therein by the apparent successful Bidder within the time specified, the OWNER will enter into the Agreement.

Notice to Proceed - The OWNER's written notice to the CONTRACTOR authorizing the CONTRACTOR to proceed with the work and establishing the date of commencement of the Contract Time.

OWNER - The Jordan Valley Water Conservancy District.

Partial Utilization - Placing a portion of the WORK in service for the purpose for which it is intended (or a related purpose) before reaching Substantial Completion of the WORK.

Project - A unit of total construction of which the WORK to be provided under the Contract Documents, may be the whole, or a part thereof.

Project Representative - The authorized representative of the ENGINEER who is assigned to the site or any part thereof.

Proposer - Any person, firm or corporation submitting a proposal for the work.

Schedule of Prices - The offer or proposal of the CONTRACTOR setting forth the price or prices for the work to be performed.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the CONTRACTOR to illustrate some portion of WORK and all illustrations, brochures, standard schedules, performance charts, instruction, and diagrams to illustrate material or equipment for some portion of the WORK.

Specifications - (Same definition as for Technical Specifications hereinafter).

Subcontractor - An individual, firm, or corporation having a direct contract with the CONTRACTOR or with any other Subcontractor for the performance of a part of the WORK at the site.

Substantial Completion - That state of construction when the WORK has progressed to the point where, in the opinion of the ENGINEER as evidenced by the Certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the WORK can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to any work refer to substantial completion thereof.

Supplementary General Conditions - The part of the Contract Documents which make additions, deletions, or revisions to these General Conditions.

Supplier - A manufacturer, fabricator, supplier, distributor, materialman, or vendor.

Technical Data - The factual information contained in reports describing physical conditions, including exploration method, plans, logs, laboratory test methods and factual data. Technical Data does not include conclusions, interpretations, interpolations, extrapolations or opinions contained in reports or reached by the CONTRACTOR.

Technical Specifications - Those portions of the Contact Documents consisting of the written technical descriptions of products and execution of the WORK.

Underground Utilities - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments and any encasements containing such facilities which have been installed under ground to furnish any of the following services or

materials: water, sewage and drainage removal, electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, traffic, or other control systems.

WORK - The entire construction required to be furnished under the Contract Documents. WORK is the result of performing services, furnishing labor and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

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ARTICLE 2 - PRELIMINARY MATTERS

2.01 DELIVERY OF BONDS/INSURANCE CERTIFICATES

- A. The CONTRACTOR shall deliver to the OWNER the Agreement, Bonds, Insurance Policies and Certificates required by the Contract Documents within ten (10) days after receiving the Notice of Award from the OWNER.

2.02 COPIES OF DOCUMENTS

- A. The OWNER shall furnish the CONTRACTOR 5 copies of the Contract Documents, together with 5 sets of full-scale Drawings. Additional quantities of the Contract Documents will be furnished at reproduction cost.

2.03 STARTING THE PROJECT

- A. The CONTRACTOR shall begin construction of the WORK within 10 days after the commencement date stated in the Notice to Proceed, but shall not commence construction prior to the commencement date.

2.04 BEFORE STARTING CONSTRUCTION

- A. Before undertaking each part of the WORK, the CONTRACTOR shall carefully study and compare the Contract Documents to check and verify pertinent figures and dimensions shown thereon with all applicable field measurements. The CONTRACTOR shall promptly report in writing to the ENGINEER any conflict, error, or discrepancy which the CONTRACTOR may discover and shall obtain a written interpretation or clarification from the ENGINEER before proceeding with any work affected thereby.
- B. The CONTRACTOR shall submit to the ENGINEER for review those documents called for in each section of the Technical Specifications.

2.05 PRECONSTRUCTION CONFERENCE

- A. The CONTRACTOR shall attend a preconstruction conference with the OWNER, the ENGINEER and others as appropriate to discuss the construction of the WORK in accordance with the Contract Documents.

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2.06 FINALIZING SCHEDULES

- A. At least 7 days before the CONTRACTOR's submittal of its first Application for Payment, the CONTRACTOR, the ENGINEER, and others as appropriate will meet to finalize the schedules submitted in accordance with the Technical Specifications.

GENERAL CONDITIONS

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 INTENT

- A. The Contract Documents comprise the entire agreement between OWNER and CONTRACTOR concerning the WORK. The Contract Documents are complementary, what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the place of the Project.
- B. It is the intent of the Contract Documents to describe the WORK, functionally complete, to be constructed in accordance with the Contract Documents. All work, materials, or equipment that may be reasonably inferred from the Contract Documents as being required to produce the completed work shall be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe work, materials, or equipment such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals, or codes or any technical society, organization, or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual, or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of the OWNER, the CONTRACTOR, or the ENGINEER or any of their consultants, agents, or employees from those set forth in the Contract Documents.
- C. If, during the performance of the WORK, the CONTRACTOR finds a conflict, error or discrepancy in the Contract Documents, the CONTRACTOR shall immediately report it to the ENGINEER in writing and before proceeding with the work affected thereby. The ENGINEER shall then make a written interpretation, clarification, or correction from the ENGINEER.

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3.02 ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS

- A. In resolving conflicts resulting from conflicts, errors, or discrepancies in any of the Contract Documents, the order of precedence shall be as follows:
1. Change Orders
 2. Agreement
 3. Addenda
 4. Contractor's Bid (Bid Form)
 5. Supplemental General Conditions
 6. Notice Inviting Bids
 7. Instructions to Bidders
 8. General Conditions
 9. Technical Specifications
 10. Referenced Standard Specifications
 11. Drawings
- B. With reference to the Drawings the order of precedence is as follows:
1. Figures govern over scaled dimensions
 2. Detail drawings govern over general drawings
 3. Addenda/change order drawings govern over general drawings
 4. Contract Drawings govern over standard drawings

3.03 AMENDING AND SUPPLEMENTING CONTRACT DOCUMENTS

- A. The Contract Documents may be amended by a Change Order (pursuant to Article 10) to provide for additions, deletions or revisions in the WORK or to modify terms and conditions.

GENERAL CONDITIONS

3.04 REUSE OF DOCUMENTS

- A. Neither the CONTRACTOR, Subcontractor, Supplier, nor any other person or organization performing any of the WORK under a contract with the OWNER shall have or acquire any title to or ownership rights in any of the Drawings, Technical Specifications, or other documents used on the WORK, and they shall not reuse any of them on the extensions of the Project or any other project without written consent.

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ARTICLE 4 - AVAILABILITY OF LANDS; PHYSICAL CONDITIONS: REFERENCE POINTS

4.01 AVAILABILITY OF LANDS

- A. The OWNER shall furnish the lands, rights-of-way and easements upon which the WORK is to be performed and for access thereto, together with other lands designated for the use of the CONTRACTOR in the Contract Documents. Easements for permanent structures or permanent changes in existing major facilities will be obtained and paid for by the OWNER, unless otherwise provided in the Contract Documents. Nothing contained in the Contract Documents shall be interpreted as giving the CONTRACTOR exclusive occupancy of the lands or rights-of-way provided. The CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment. The CONTRACTOR shall not enter upon nor use any property not under the control of the OWNER until a written temporary construction easement agreement has been executed by the CONTRACTOR and the property owner, and a copy of the easement furnished to the ENGINEER prior to its use. Neither the OWNER nor the ENGINEER shall be liable for any claims or damages resulting from the CONTRACTOR's unauthorized trespass or use of any properties.

4.02 PHYSICAL CONDITIONS - SUBSURFACE AND EXISTING STRUCTURES

- A. Explorations and Reports: The paragraph entitled "Physical Conditions" of the Supplementary General Conditions identifies exploration reports and subsurface conditions tests at the site that have been utilized by the ENGINEER in the preparation of the Contract Documents. The CONTRACTOR may rely upon the accuracy of the Technical Data contained in these reports. The CONTRACTOR is responsible for the interpretation, extrapolation or interpolation of all technical as well as nontechnical data and its reliance on the completeness, opinions and interpretation of the reports.
- B. Existing Structures: The paragraph entitled "Physical Conditions" of the Supplementary General Conditions identifies the drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Utilities referred to in Paragraph 4.04 herein) which are at or contiguous to the site that have been utilized by the ENGINEER in the preparation of the Contract Documents. The CONTRACTOR is responsible for the interpretation, extrapolation or interpolation of all technical as well as nontechnical data and its reliance on the completeness, opinions and interpretation of the reports.

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4.03 DIFFERING SITE CONDITIONS

- A. The CONTRACTOR shall notify the ENGINEER upon encountering any of the following unforeseen conditions, hereinafter called "differing site conditions," during the prosecution of the WORK. The CONTRACTOR's notice to the ENGINEER shall be in writing and delivered before the differing site conditions are disturbed, but in no event later than 14 days after their discovery.
1. Subsurface or latent physical conditions at the site of the WORK differing materially from those indicated, described, or delineated in the Contract Documents including those reports and documents discussed in Paragraph 4.02; and
 2. Physical conditions at the site of the WORK of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents including those reports and documents discussed in Paragraph 4.02.
- B. The ENGINEER will review the alleged differing site conditions, determine the necessity of obtaining additional explorations or tests with respect to verifying their existence and extent and advise the OWNER in writing of the ENGINEER's findings and conclusions.
- C. If the OWNER concludes that because of newly discovered conditions a change in the Contract Documents is required, a Change Order will be issued as provided in Article 10 to reflect and document the consequences of the differing site conditions.
- D. In each such case, an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, or any combination thereof, will be allowable to the extent that they are attributable to the differing site conditions. If the OWNER and the CONTRACTOR are unable to agree as to the amount or length of the Change Order, a claim may be made as provided in Articles 11 and 12.
- E. The CONTRACTOR's failure to give written notice of differing site conditions within 14 days of their discovery and before they are disturbed shall constitute a waiver of all claims in connection therewith, whether direct or consequential in nature.

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4.04 PHYSICAL CONDITIONS - UNDERGROUND UTILITIES

- A. Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing Underground Utilities at or contiguous to the site are based on information and data furnished to the OWNER or the ENGINEER by the owners of Underground Utilities or by others. Unless it is expressly provided in the Supplementary General Conditions and/or the Section entitled "Protection and Restoration of Existing Facilities" of the Technical Specifications, the OWNER and the ENGINEER shall not be responsible for the accuracy or completeness of any Underground Utilities information or data. The CONTRACTOR's responsibility relating to underground utilities are: review and check all information and data, locate all Underground Utilities shown or indicated in the Contract Documents, coordinate the WORK with the owners of Underground Utilities during construction, the safeguard and protect the of Underground Utilities, and repair any damage to Underground Utilities resulting from the WORK. The cost of all these activities will be considered as having been included in the Contact Price.
- B. Not Shown or Indicated: If an Underground Utility not shown or indicated in the Contract Documents is uncovered or revealed at or contiguous to the site and which the CONTRACTOR could not reasonably have been expected to be aware of, the CONTRACTOR shall give written notice to the OWNER of that utility and the ENGINEER, specifying the location of the utility in question.

4.05 REFERENCE POINTS

- A. The ENGINEER will provide one bench mark, near or on the site of the WORK, and will provide two points near or on the site to establish a base line for use by the ENGINEER for alignment control. Unless otherwise specified in the Technical Specifications, the CONTRACTOR shall furnish all other lines, grades, and bench marks required for proper execution of the WORK.
- B. The CONTRACTOR shall preserve all bench marks, stakes, and other survey marks. In case of their removal or destruction by its own employees or by its subcontractor's employees, the CONTRACTOR shall be responsible for the accurate replacement of reference points by professionally qualified personnel at no additional cost to the OWNER.

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ARTICLE 5 - BONDS AND INSURANCE

5.01 PERFORMANCE AND OTHER BONDS

- A. The CONTRACTOR shall furnish Performance and Payment Bonds, each in the amount set forth in the Supplementary General Conditions as security for the faithful performance and payment of all the CONTRACTOR's obligations under the Contract Documents. All insurance companies, sureties, and bond companies shall have an AM Best rating of A- or better, with a Financial Size Category of XII or better. Sureties shall also be listed on the Department of the Treasury's Circular 570, with an acceptable underwriting limitation limit. The Performance Bond shall remain in effect at least until one year after the date of Notice of Completion, except as otherwise provided by Law or Regulation or by the Contract Documents. After the ENGINEER issues the Notice of Completion, the amount of the Performance Bond may be reduced to 10 percent of the Contract Price, or \$1,000, whichever is greater. The CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary General Conditions.

- B. If the surety on any Bond furnished by the CONTRACTOR is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the WORK is located, the CONTRACTOR shall within 7 days after written approval by the OWNER of a substitute Bond and Surety substitute the approved Bond and Surety.

5.02 INSURANCE

- A. The CONTRACTOR shall purchase and maintain the insurance required under this paragraph. All insurance companies, sureties, and bond companies shall have an AM Best rating of A- or better, with a Financial Size Category of XII or better. Sureties shall also be listed on the Department of the Treasury's Circular 570, with an acceptable underwriting limitation limit. This insurance shall include the specific coverages set out herein and be written for not less than the limits of liability and coverages provided in the Supplementary General Conditions, or required by law, whichever is greater. The CONTRACTOR's liabilities under the Agreement shall not be deemed limited in any way to the insurance coverage required.

- B. The CONTRACTOR shall furnish the OWNER and ENGINEER with certificates indicating the type, amount, class of operations covered, effective dates and expiration dates of all policies. All insurance policies purchased and maintained (or the certificates or other evidence thereof) shall contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 30 days' prior written

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notice has been given to the OWNER by certified mail. All insurance shall remain in effect until the ENGINEER issues the Notice of Completion and at all times thereafter when the CONTRACTOR may be correcting, removing, or replacing defective work in accordance with Paragraph 13.06 or completing punch list items required by the Notice of Completion. In addition, the insurance required herein (except for Worker's Compensation and Employer's Liability) shall name the OWNER, the ENGINEER, and their officers, agents, and employees as "additional insured" under the policies.

1. Workers' Compensation and Employer's Liability: This insurance shall protect the CONTRACTOR against all claims under applicable state workers' compensation laws. The CONTRACTOR shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workers' compensation law. This policy shall include an "all states" endorsement. The CONTRACTOR shall require each subcontractor similarly to provide Workers' Compensation Insurance for all of the latter's employees to be engaged in the WORK unless its employees are covered by the protection afforded by the CONTRACTOR's Workers' Compensation Insurance. In the event a class of employees is not protected under the Workers' Compensation Statute, the CONTRACTOR or Subcontractor, as the case may be, shall provide adequate employer's liability insurance for the protection of its employees not protected under the statute.
2. Comprehensive General Liability: This insurance shall be written in comprehensive form and shall protect the CONTRACTOR against all claims arising from injuries to persons other than its employees and damage to property of the OWNER or others arising out of any act or omission of the CONTRACTOR or its agents, employees or subcontractors. The policy shall include the following endorsements: (1) Protective Liability endorsement to insure the contractual liability assumed by the CONTRACTOR under the indemnification provisions in these General Conditions; (2) Broad Form Property Damage endorsement; (3) Personal Injury endorsement to cover personal injury liability for intangible harm. The Comprehensive General Liability coverage shall contain no exclusion relative to blasting, explosion, collapse of building, or damage to underground structures.
3. Comprehensive Automobile Liability: This insurance shall be written in comprehensive form. The policy shall protect the CONTRACTOR against all claims for injuries to employees, members of the public and

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damage to property of others arising from the use of CONTRACTOR's motor vehicles, whether they are owned, non-owned, or hired, and whether used or operated on or off the site. The motor vehicle insurance required under this paragraph shall include: (a) motor vehicle liability coverage; (b) personal injury protection coverage and benefits; and (c) uninsured motor vehicle coverage.

4. Subcontractor's Insurance: The CONTRACTOR shall require each of its subcontractors to procure and to maintain Comprehensive General Liability Insurance and Comprehensive Automobile Liability Insurance of the type and in the amounts specified in the Supplementary General Conditions or insure the activities of its subcontractors in the CONTRACTOR's own policy, in like amount.
5. Builder's Risk: This insurance shall be of the "all risk" type, shall be written in completed value form, and shall protect the CONTRACTOR, the OWNER, and the ENGINEER against damage to buildings, structures, materials and equipment. The amount of this insurance shall not be less than the insurable value of the WORK at completion. Builder's risk insurance shall provide for losses to be payable to the CONTRACTOR, the OWNER, and the ENGINEER as their interests may appear. The policy shall contain a provision that in the event of payment for any loss under the coverage provided, the insurance company shall have no rights of recovery against the CONTRACTOR, the OWNER, and the ENGINEER. The Builder's Risk policy shall insure against all risks of direct physical loss or damage to property from any external cause including flood and earthquake. Allowable exclusions, if any, shall be as specified in the Supplementary General Conditions.

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ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 SUPERVISION AND SUPERINTENDENCE

- A. The CONTRACTOR shall supervise and direct the WORK competently and efficiently, devoting the attention and applying the skills and expertise necessary to perform the WORK in accordance with the Contract Documents. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incidental thereto. The CONTRACTOR shall be responsible to see that the finished WORK complies accurately with the Contract Documents.
- B. The CONTRACTOR shall employ the Superintendent named in "Information Required of Bidder" on the work site at all times during the progress of the WORK. The superintendent shall not be replaced without the OWNER's written consent. The superintendent will be the CONTRACTOR's representative at the site and shall have authority to act on behalf of the CONTRACTOR. All communications given to the superintendent shall be as binding as if given to the CONTRACTOR. The CONTRACTOR shall issue all its communications to the OWNER through the ENGINEER.
- C. The CONTRACTOR's superintendent shall be present at the site of the WORK at all times while work is in progress. Failure to observe this requirement shall be considered suspension of the WORK by the CONTRACTOR until the superintendent is again present at the site.

6.02 LABOR, MATERIALS, AND EQUIPMENT

- A. The CONTRACTOR shall provide skilled, competent and suitably qualified personnel to survey and lay out the WORK and perform construction as required by the Contract Documents. When required in writing by the OWNER or ENGINEER, the CONTRACTOR or any subcontractor shall discharge any person who is, in the opinion of the OWNER or ENGINEER, incompetent, disorderly, or otherwise unsatisfactory and shall not again employ the discharged person on the WORK without the consent of the OWNER or ENGINEER. The CONTRACTOR shall at all times maintain good discipline and order at the site.
- B. Except in connection with the safety or protection of persons the WORK, or property at the site or adjacent thereto, all work at the site shall be performed during regular working hours, and the CONTRACTOR will not permit overtime work or the performance of work on Saturday, Sunday or any legal holiday without the OWNER's written consent given after prior written notice

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to the ENGINEER. Except as otherwise provided in this Paragraph, the CONTRACTOR shall receive no additional compensation for overtime work, i.e., work in excess of 8 hours in any one calendar day or 40 hours in any one calendar week, even though such overtime work may be required under emergency conditions and may be ordered by the ENGINEER in writing. Additional compensation will be paid the CONTRACTOR for overtime work in the event extra work is ordered by the ENGINEER and the Change Order specifically authorizes the use of overtime work, but only to the extent that the CONTRACTOR pays overtime wages on a regular basis being paid by for overtime work of a similar nature in the same locality.

- C. All costs of inspection and testing performed during overtime work approved solely for the convenience of the CONTRACTOR shall be borne by the CONTRACTOR. The OWNER shall have the authority to deduct the costs of all inspection and testing from any partial payments otherwise due to the CONTRACTOR.
- D. Unless otherwise specified in the Contract Documents, the CONTRACTOR shall furnish, erect, maintain and remove the construction plant, and temporary works and assume full responsibility for all materials, equipment, labor, transportation, construction equipment, machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities and all other facilities and incidentals necessary for the furnishing, performance testing, start-up and completion of the WORK.
- E. All materials and equipment incorporated into the WORK shall be of new and good quality, except as otherwise provided in the Contract Documents. If required by the ENGINEER, the CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. The CONTRACTOR shall apply, install, connect, erect, use, clean, and condition all material and equipment in accordance with the instructions of the manufacturer and Supplier except as otherwise provided in the Contract Documents.

6.03 ADJUSTING PROGRESS SCHEDULE

- A. The CONTRACTOR shall submit any adjustments in the progress schedule to the ENGINEER for acceptance in accordance with the provisions for "Contractor Submittals" in the Technical Specifications.

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6.04 SUBSTITUTES OR "OR-EQUAL" ITEMS

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to ENGINEER for review under the circumstances described below:
1. "Or-Equal" Items: If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this paragraph 6.04.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment ENGINEER determines that: (i) it is a least equal in quality, durability, appearance, strength, and design characteristics; (ii) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;
 - b. CONTRACTOR certifies that: (i) there is no increase in cost to the OWNER; and (ii) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Document.
 2. Substitute Items
 - a. If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under paragraph 6.04.A.1, it will be considered a proposed substitute item.
 - b. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or

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equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR.

- c. The procedure for review by ENGINEER will be as set forth in paragraph 6.04.A.2.d, as supplemented in the Technical Specifications and as ENGINEER may decide is appropriate under the circumstances.
 - d. CONTRACTOR shall first make written application to ENGINEER for review of a proposed substitute item of material or equipment that CONTRACTOR seeks to furnish or use. The application shall certify that the proposed substitute item will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified, and be suited to the same use as that specified. The application will state the extent, if any, to which the use of the proposed substitute item will prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not use of the proposed substitute item will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute item, and whether or not incorporation or use of the substitute item is subject to payment of any license fee or royalty. All variations of the proposed substitute item from that specified will be identified in the application, and available engineering, sales, maintenance, repair, and replacement services will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change, all of which will be considered by ENGINEER in evaluating the proposed substitute item. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute item.
- B. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in

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ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in subparagraph 6.04.A.2.

- C. Engineer's Evaluation: ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.04.A and 6.04.B. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized until ENGINEER's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." ENGINEER will advise CONTRACTOR in writing of any negative determination.
- D. Special Guarantee: OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.
- E. ENGINEER's Cost Reimbursement: ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in evaluating substitute proposed or submitted by CONTRACTOR pursuant to paragraphs 6.04.A.2 and 6.04.B and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER approves a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluation each such proposed substitute.
- F. CONTRACTOR's EXPENSE: CONTRACTOR shall provide all data in support of any proposed substitute or "or-equal" at CONTRACTOR's expense.

6.05 CONCERNING SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- A. The CONTRACTOR shall be responsible to the OWNER and the ENGINEER for the acts and omissions of its subcontractors and their employees to the same extent as the CONTRACTOR is responsible for the acts and omissions of its own employees. Nothing contained in this paragraph shall create any contractual relationship between any subcontractor and the OWNER or the ENGINEER nor relieve the CONTRACTOR of any liability or obligation under the Agreement.

6.06 PERMITS

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- A. Unless otherwise provided in the Supplementary General Conditions, the CONTRACTOR shall obtain and pay for all construction permits and licenses from the agencies having jurisdiction, including furnishing the insurance and bonds required by such agencies. The costs incurred by the CONTRACTOR in compliance with this paragraph shall not be made the basis for claims for additional compensation. The OWNER shall assist the CONTRACTOR, when necessary, in obtaining such permits and licenses. The CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the WORK, which are applicable at the time of opening of Bids, including all utility connection charges for utilities required by the WORK.

- B. The CONTRACTOR shall pay all license fees and royalties and assume all costs when any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others when issued in the construction of the WORK or incorporated into the WORK. If a particular invention, design, process, product, or device is specified in the Contract Documents for incorporation into or use in the construction of the WORK and if to the actual knowledge of the OWNER or the ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of these rights shall be disclosed by the OWNER in the Contract Documents. The CONTRACTOR shall indemnify, defend and hold harmless the OWNER and the ENGINEER and anyone directly or indirectly employed by either of them from and against all claims, damages, losses, and expenses (including attorneys' fees and court costs) arising out of any infringement of patent rights or copyrights incident to the use in the performance of the WORK or resulting from the incorporation in the WORK of any invention, design, process, product, or device not specified in the Contract Documents.

6.07 LAWS AND REGULATIONS

- A. The CONTRACTOR shall observe and comply with all federal, state, and local laws, ordinances, codes, orders, and regulations which in any manner affect those engaged or employed on the WORK, the materials used in the WORK, or the conduct of the WORK. If any discrepancy or inconsistency should be discovered in the Contract Documents in relation to any law, ordinance, code, order, or regulations, the CONTRACTOR shall report the same in writing to the ENGINEER. The CONTRACTOR shall indemnify, defend and hold harmless the OWNER, the ENGINEER and their officers, agents, and employees against all claims and from violation of any law, ordinance, code, order, or regulation, whether by CONTRACTOR or by its employees or subcontractors. Any particular law or regulation specified or

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referred to elsewhere in the Contract Documents shall not in any way limit the obligation of the CONTRACTOR to comply with all other provisions of federal, state, and local laws and regulations. Where an individual State act on occupational safety and health standards has been approved by Federal authority, then the provision of said State act shall control.

6.08 EQUAL OPPORTUNITY

- A. The Contractor agrees to abide by: the provisions of Title VII of the Civil Rights Act of 1964 (42USC § § 2000e et seq.), which prohibits discrimination against any employee or applicant for employment on the basis of race, religion, color, or national origin; Executive Order No. 11246, as amended, which prohibits discrimination on the basis of sex; 45 CFR 90, which prohibits discrimination on the basis of age; Section 504 of the Rehabilitation Act of 1973, (42 USC § 794), which prohibits discrimination on the basis of handicap; Utah Executive Order dated June 30, 1989, which prohibits sexual harassment in the workplace; and the Americans with Disabilities Act (42 USC § § 12111 et seq.), which prohibits discrimination against qualified employees and applicants with a disability.

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6.09 TAXES

- A. The CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by the CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the WORK.

6.10 USE OF PREMISES

- A. The CONTRACTOR shall confine construction equipment, stored materials and equipment, and other operations of workers to (1) the Project site, (2) the land and areas identified for the CONTRACTOR's use in the Contract Documents, and (3) other lands whose use is acquired by Laws and Regulations, rights-of-way, permits, and easements. The CONTRACTOR shall be fully responsible to the owner and occupant of such lands for any damage to the lands or areas contiguous thereto, resulting from the performance of the WORK or otherwise. Should any claim be made against the OWNER or the ENGINEER by owner or occupant of lands because of the performance of the WORK, the CONTRACTOR shall promptly settle the claim by agreement, or resolve the claim through litigation. The CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify, defend, and hold the OWNER and the ENGINEER harmless from and against all claims, damages, losses, and expenses (including, but not limited to, fees of engineers, architects, attorneys, and other professionals and court costs) arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any owner or occupant of land against the OWNER or the ENGINEER to the extent the claim is based or arises out of the CONTRACTOR's performance of the WORK.

6.11 SAFETY AND PROTECTION

- A. The CONTRACTOR shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the WORK. The CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
 - 1. All employees on the WORK and other persons and organizations who may be affected thereby.
 - 2. All the WORK and materials and equipment to be incorporated therein, whether in storage on or off the site; and

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3. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.
- B. The CONTRACTOR shall comply with all applicable Laws and Regulations (whether referred to herein or not) of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss and shall erect and maintain all necessary safeguards for such safety and protection. The CONTRACTOR shall notify owners of adjacent property and utilities when prosecution of the WORK may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Unless the CONTRACTOR otherwise designates in writing a different individual as the responsible individual, the CONTRACTOR's superintendent shall be CONTRACTOR's representative at the site whose duty shall be the prevention of accidents.

6.12 SHOP DRAWINGS AND SAMPLES

- A. After checking and verifying all field measurements and after complying with the applicable procedures specified in the Technical Specifications, the CONTRACTOR shall submit all shop drawings to the ENGINEER for review and approval in accordance with the approved schedule for shop drawings submittals specified in the Technical Specifications.
- B. The CONTRACTOR shall also submit to the ENGINEER for review and approval all samples in accordance with the approved schedule of sample submittals specified in the Technical Specifications.
- C. Before submitting shop drawings or samples, the CONTRACTOR shall determine and verify all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto and review or coordinate each shop drawing or sample with other shop drawings and samples and with the requirements of the WORK and the Contract Documents.

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6.13 CONTINUING THE WORK

- A. The CONTRACTOR shall carry on the WORK and adhere to the progress schedule during all disputes or disagreements with the OWNER. No work shall be delayed or postponed pending resolution of any dispute or disagreement, except as the CONTRACTOR and the OWNER may otherwise mutually agree in writing.

6.14 INDEMNIFICATION

- A. To the fullest extent permitted by Laws and Regulations, the CONTRACTOR shall indemnify, defend, and hold harmless the OWNER, the ENGINEER, and their officers, agents, and employees, against and from all claims and liability arising under or by reason of the Agreement or any performance of the WORK, but not from the sole negligence or willful misconduct of the OWNER and/or the ENGINEER. Such indemnification by the CONTRACTOR shall include but not be limited to the following:
 - 1. Liability or claims resulting directly or indirectly from the negligence or carelessness of the CONTRACTOR or its agents in the performance of the WORK, or in guarding or maintaining the same, or from any improper materials, implements, or appliances used in its construction, or by or on account of any act or omission of the CONTRACTOR or its agents;
 - 2. Liability or claims arising directly or indirectly from or based on the violation of any law, ordinance, regulation, order, or decree, whether by the CONTRACTOR or its agents;
 - 3. Liability or claims arising directly or indirectly from the use or manufacture by the CONTRACTOR, its agents, or the OWNER in the performance of this Agreement of any copyrighted or uncopied composition, secret process, patented or unpatented invention, article, or appliance, unless otherwise specifically stipulated in this Agreement.
 - 4. Liability or claims arising directly or indirectly from the breach of any warranties, whether express or implied, made to the OWNER or any other parties by the CONTRACTOR or its agents;
 - 5. Liabilities or claims arising directly or indirectly from the willful misconduct of the CONTRACTOR or its agents; and,

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6. Liabilities or claims arising directly or indirectly from any breach of the obligations assumed herein by the CONTRACTOR.
 - B. The CONTRACTOR shall reimburse the OWNER, and the ENGINEER for all costs and expense, (including but not limited to fees and charges of engineers, architects, attorneys, and other professional and court costs) incurred by the OWNER, and the ENGINEER in enforcing the provisions of this Paragraph.
 - C. The indemnification obligation under this Paragraph shall not be limited in any way by any limitation of the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR or any such subcontractor or other person or organization under workers' compensation acts, disability benefit acts, or other employee benefit acts.

6.15 CONTRACTOR'S DAILY REPORTS

- A. The CONTRACTOR shall complete a daily report indicating manpower, major equipment, subcontractors, weather conditions, etc., involved in the performance of the WORK. The daily report shall be completed on forms prepared by the CONTRACTOR and acceptable to the ENGINEER, and shall be submitted to the ENGINEER at the conclusion of each work day.

6.16 ASSIGNMENT OF CONTRACT

- A. The CONTRACTOR shall not assign, sublet, sell, transfer, or otherwise dispose of the Agreement or any portion thereof, or its right, title, or interest therein, or obligations thereunder, without the written consent of the OWNER except as imposed by law. If the CONTRACTOR violates this provision, the Agreement may be terminated at the option of the OWNER. In such event, the OWNER shall be relieved of all liability and obligations to the CONTRACTOR and to its assignee or transferee, growing out of such termination.

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ARTICLE 7 - OTHER WORK

7.01 RELATED WORK

- A. The OWNER may perform other work related to the Project at the site by the OWNER's own forces, have other work performed by utility owners, or let other direct contracts for the performance of the other work which may contain General Conditions similar to these. If the fact that such other work is to be performed was not noted in the Contract Documents, written notice thereof will be given to the CONTRACTOR prior to commencing any other work.
- B. The CONTRACTOR shall afford each utility owner and other contractor who is a party to a direct contract (or the OWNER, if the OWNER is performing the additional work with the OWNER's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of the other work. The CONTRACTOR shall properly connect and coordinate the WORK with the other work. The CONTRACTOR shall do all cutting, fitting, and patching of the WORK that may be required to make its several parts come together properly and integrate with the other work. The CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and shall only cut or alter their work with the written consent of the ENGINEER and the others whose work will be affected.
- C. If the proper execution or results of any part of the CONTRACTOR's work depends upon the integration of work with the completion of other work by any other contractor or utility owner (or the OWNER), the CONTRACTOR shall inspect and report to the ENGINEER in writing all delays, defects, or deficiencies in the other work that renders it unavailable or unsuitable for proper integration with the CONTRACTOR's work. Except for the results or effects of latent or nonapparent defects and deficiencies in the other work, the CONTRACTOR's failure to report will constitute an acceptance of the other work as fit and proper for integration with the CONTRACTOR's work and as a waiver of any claim for additional time or compensation associated with the integration of the CONTRACTOR's work with the other work.

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7.02 COORDINATION

- A. If the OWNER contracts with others for the performance of other work on the Project at the site, a coordinator will be identified to the extent that the coordinator can be identified at this time, in the Supplementary General Conditions and delegated the authority and responsibility for coordination of the activities among the various contractors. The specific matters over which the coordinator has authority and the extent of the coordinator's authority and responsibility will be itemized in the Supplementary General Conditions or in a notice to the CONTRACTOR at such time as the identity of the coordinator is determined.

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ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 COMMUNICATIONS

- A. The OWNER shall issue all its communications to the CONTRACTOR through the ENGINEER.

8.02 PAYMENTS

- A. The OWNER shall make payments to the CONTRACTOR as provided in Paragraphs 14.05 and 14.09.

8.03 LANDS, EASEMENTS, AND SURVEYS

- A. The OWNER's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. The OWNER shall identify and make available to the CONTRACTOR copies of exploration reports and subsurface conditions tests at the site and in existing structures which have been utilized by the ENGINEER in preparing the Drawings and Technical Specifications as set forth in Paragraph 4.02

8.04 CHANGE ORDERS

- A. The OWNER shall execute approved Change Orders for the conditions described in Paragraph 10.01D.

8.05 INSPECTIONS AND TESTS

- A. The OWNER's responsibility with respect to inspection, tests, and approvals is set forth in Paragraph 13.03B.

8.06 SUSPENSION OF WORK

- A. In connection with the OWNER's right to stop work or suspend work, see Paragraphs 13.04 and 15.01. Paragraphs 15.02 and 15.03 deal with the OWNER's right to terminate services of the CONTRACTOR under certain circumstances.

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ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.01 OWNER'S REPRESENTATIVE

- A. The ENGINEER will be the OWNER's representative during the construction period. The duties, responsibilities and the limitations of authority of the ENGINEER as the OWNER's representative during construction are set forth in a separate agreement with the OWNER and are summarized hereafter.

9.02 VISITS TO SITE

- A. The ENGINEER will make visits to the site during construction to observe and inspect the progress and quality of the WORK and to determine, in general if the WORK is proceeding in accordance with the Contract Documents.

9.03 PROJECT REPRESENTATION

- A. The ENGINEER will furnish a Project Representative to observe and inspect the performance of the WORK. The Project Representative and/or other authorized agents of the Engineer shall serve as the chief Owner/Engineer contact(s) with the Contractor during the construction phase. All submittals shall be delivered to and communications between the Engineer and the Contractor shall be handled by the Project Representative and/or other authorized agents. The Project Representative shall be the chief authorized representative of the Owner and the Engineer at the site of the work in all on-site relations with the Contractor.

9.04 CLARIFICATIONS AND INTERPRETATIONS

- A. The ENGINEER will issue with reasonable promptness written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as the ENGINEER may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

9.05 AUTHORIZED VARIATIONS IN WORK

- A. The ENGINEER may authorize minor variation in the WORK as described in the Contract Documents when such variations do not involve an adjustment in the Contract Price or the Contract Time and are consistent with the overall intent of the Contract Documents. These variations shall be accomplished by issuing a Field Order. The issuance of a Field Order requires the CONTRACTOR to perform the work described in the order promptly. If the

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CONTRACTOR believes that a Field Order justifies an increase in the Contract Price or an extension of the Contract Time and parties are unable to agree as the amount or extent thereof, the CONTRACTOR may make a claim therefor as provided in Article 11 or 12.

9.06 REJECTION OF DEFECTIVE WORK

- A. The ENGINEER is authorized to reject work which the ENGINEER believes to be defective and require special inspection or testing of the WORK as provided in Paragraph 13.03G, whether or not the WORK is fabricated, installed, or completed.

9.07 CONTRACTOR SUBMITTALS, CHANGE ORDERS, AND PAYMENTS

- A. The ENGINEER will review for approval all Contractor submittals, including shop drawings, samples, substitutes, and "or equal" items, etc., in accordance with the procedures set forth in the Technical Specifications.
- B. In connection with the ENGINEER's responsibilities as to Change Orders, see Articles 10, 11, and 12.
- C. In connection with the ENGINEER's responsibilities with respect to Applications for Payment, see Article 14.

9.08 DECISIONS ON DISPUTES

- A. All claims, disputes, and other matters concerning the acceptability of the WORK, the interpretation of the requirements of the Contract Documents pertaining to the performance of the WORK, and claims for changes in the Contract Price or Contract Time under Articles 11 and 12 will be referred to the ENGINEER in writing with a request for formal decision in accordance with this paragraph. The ENGINEER will render a decision in writing within 30 days of receipt of the request. Written notice of each claim, dispute, or other matter will be delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 30 days) after the occurrence of the event. Written supporting data will be submitted to the ENGINEER with the written claim unless the ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim.
- B. When reviewing the claim or dispute, the ENGINEER will not show partiality to the OWNER or the CONTRACTOR and will incur no liability in connection with any interpretation or decision rendered in good faith. The ENGINEER's rendering of a decision with respect to any claim, dispute, or other matter (except any which have been waived by the making or acceptance of final

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payment as provided in Paragraph 14.12) shall be a condition precedent to the OWNER's or the CONTRACTOR's exercise of their rights or remedies under the Contract Documents or by Law or Regulations with respect to the claim, dispute, or other matter.

9.09 LIMITATION ON ENGINEER'S RESPONSIBILITIES

- A. Neither the ENGINEER's authority to act pursuant to its agreement with the OWNER, nor the description of that authority under this Article 9, nor any other description of the ENGINEER's responsibility in the Contract Documents, nor any decision made by the ENGINEER in good faith either to exercise or not exercise its authority, shall give rise to any duty or responsibility on the part of the ENGINEER to the CONTRACTOR, any Subcontractor, any Supplier, any surety or any other person or organization performing any part of the WORK.
- B. Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as reviewed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review, or judgement of the ENGINEER as to the WORK, it is intended that such requirement, direction, review, or judgment will be solely to evaluate the WORK for compliance with the Contract Documents, unless there is a specific statement indicating otherwise. The use of any such term or adjective shall not be effective to assign to the ENGINEER any duty or authority to supervise or direct the performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of its agreement with the OWNER.
- C. The ENGINEER will not be responsible for the CONTRACTOR's means, methods, techniques, sequences, or procedures of construction not specified in the Contract Documents or the safety precautions and programs incident thereto.
- D. The ENGINEER will not be responsible for the acts or omissions of the CONTRACTOR nor of any subcontractor, supplier, or any other person or organization performing any of the WORK to the extent that such acts or omissions are not reasonably discoverable considering the level of observation and inspection required by the ENGINEER's agreement with the OWNER.

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ARTICLE 10 - CHANGES IN THE WORK

10.01 GENERAL

- A. Without invalidating the Agreement and without notice to any surety, the OWNER may at any time or from time to time, order additions, deletions, or revisions in the WORK; these will be authorized by a written Field Order and/or a Change Order issued by the ENGINEER. Upon receipt of any of these documents, the CONTRACTOR shall promptly proceed with the work involved pursuant to the applicable conditions of the Contract Documents.
- B. If the OWNER and the CONTRACTOR are unable to agree upon the increase or decrease in the Contract Price or an extension or shortening of the Contract Time, if any, that should be allowed as a result of a Field Order, a claim may be made therefor as provided in Articles 11 or 12.
- C. The CONTRACTOR shall not be entitled to an increase in the Contract Price nor an extension of the Contract Time with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented by Change Order, except in the case of an emergency and except in the case of uncovering work provided in the Paragraph 13.03G.
- D. The OWNER and the CONTRACTOR shall execute appropriate Change Orders covering:
 - 1. Changes in the WORK which are ordered by the OWNER pursuant to Paragraph 10.01A;
 - 2. Changes required because of acceptance of defective work under Paragraph 13.06;
 - 3. Changes in the Contract Price or Contract Time which are agreed to by the parties; or
 - 4. Any other changes agreed to by the parties.
- E. If the provisions of any Bond require notice of any change to be given to a surety, the giving of these notices will be the CONTRACTOR's responsibility. The CONTRACTOR shall provide for the amount of each applicable Bond to be adjusted accordingly.

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10.02 ALLOWABLE QUANTITY VARIATIONS

- A. Whenever a unit price and quantity have been established for a bid item in the Contract Documents, the quantity stated may be increased or decreased to a maximum of 25 percent with no change in the unit price. An adjustment in the quantity in excess of 25 percent will be sufficient to justify a change in the unit price. Changes in the quantity of all bid items established in the Contract Documents, regardless of whether the changes are more or less than 25 percent and at the unit price established in the Contract Documents or adjusted otherwise, shall be documented by Change Orders.

- B. In the event a part of the WORK is to be entirely eliminated and no lump sum or unit price is named in the Contract Documents to cover the eliminated work, the price of the eliminated work shall be agreed upon in writing by the OWNER and the CONTRACTOR. If the OWNER and the CONTRACTOR fail to agree upon the price of the eliminated work, the price shall be determined in accordance with the provisions of Article 11.

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ARTICLE 11 - CHANGE OF CONTRACT PRICE

11.01 GENERAL

- A. The Contract Price constitutes the total compensation payable to the CONTRACTOR for performing the WORK. Except as directed by Change Orders, all duties, responsibilities, and obligations assigned to or undertaken by the CONTRACTOR shall be at its expense without change in the Contract Price.

- B. The Contract Price may only be changed by a Change Order. Any claim for an increase in the Contract Price shall be based on written notice delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 30 days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered with the claim, unless the ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim, and shall be accompanied by the CONTRACTOR's written statement that the amount claimed covers all known amounts (direct, indirect, and consequential) to which the CONTRACTOR is entitled as a result of the occurrence of the event. If the OWNER and the CONTRACTOR cannot otherwise agree on the amount involved, all claims for adjustment in the Contract Price shall be determined by the ENGINEER in accordance with Paragraph 9.08A. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this Paragraph 11.01B.

- C. The value of any work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:
 - 1. Where the work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved.
 - 2. By mutual acceptance of a lump sum, which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.
 - 3. On the basis of the cost of work (determined as provided in Paragraphs 11.02 and 11.03) plus a CONTRACTOR's fee for overhead and profit (determined as provided in Paragraph 11.04).

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11.02 COST OF WORK (BASED ON TIME AND MATERIALS)

- A. General: The term "cost of work" means the sum of all costs necessarily incurred and paid by the CONTRACTOR for labor, materials, and equipment in the proper performance of work. Except as otherwise may be agreed to in writing by the OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project.
- B. Labor: The cost of labor used in performing work by the CONTRACTOR, a subcontractor, or other forces will be the sum of the following:
1. The actual wages paid plus any employer payments to, or on behalf of workers for fringe benefits including health and welfare, pension, vacation, and similar purposes. The cost of labor may include the rates paid to foremen when determined by the ENGINEER that the services of foremen do not constitute a part of the overhead allowance.
 2. All payments imposed by state and federal laws including, but not limited to, compensation insurance, and social security payments.
 3. The amount paid for subsistence and travel required by collective bargaining agreements, or in accordance with the regular practice of the employer.

At the beginning of the extra work and as later requested by the ENGINEER, the CONTRACTOR shall furnish the ENGINEER proof of labor compensation rates being paid.

- C. Materials: The cost of materials used in performing work will be the cost to the purchaser, whether CONTRACTOR or subcontractor, from the supplier thereof, except as the following are applicable:
1. Trade discounts available to the purchase shall be credited to the OWNER notwithstanding the fact that such discounts may not have been taken by the CONTRACTOR.
 2. For materials secured by other than a direct purchase and direct billing to the purchaser, the cost shall be deemed to be the price paid to the actual supplier as determined by the ENGINEER. Markup except for actual costs incurred in the handling of such materials will not be allowed.

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3. Payment for materials from sources owned wholly or in part by the purchaser shall not exceed the price paid by the purchaser for similar materials from these sources on extra work items or current wholesale price for the materials delivered to the work site, whichever is lower.
 4. If in the opinion of the ENGINEER the cost of material is excessive, or the CONTRACTOR does not furnish satisfactory evidence of the cost of the material, then the cost shall be deemed to be the lowest current wholesale price for the quantity concerned, delivered to the work site less trade discount. The OWNER reserves the right to furnish materials for the extra work and no claim shall be made by the CONTRACTOR for costs and profit on such materials.
- D. Equipment: The CONTRACTOR will be paid for the use of equipment at the rental rate listed for the equipment specified in the Supplementary General Conditions. The rental rate will be used to compute payments for equipment whether the equipment is under the CONTRACTOR's control through direct ownership, leasing, renting, or another method of acquisition. The rental rate to be applied for use of each item of equipment shall be the rate resulting in the least total cost to the Owner for the total period of use. If it is deemed necessary by the CONTRACTOR to use equipment not listed in the Supplementary General Conditions an equitable rental rate for the equipment will be established by the ENGINEER. The CONTRACTOR may furnish cost data which might assist the ENGINEER in the establishing the rental rate.
1. All equipment shall, in the opinion of the ENGINEER, be in good working condition and suitable for the purpose for which the equipment is to be used.
 2. Before construction equipment is used on the extra work, the CONTRACTOR shall plainly stencil or stamp an identifying number thereon at a conspicuous location, and shall furnish to the ENGINEER, in duplicate, a description of the equipment and its identifying number.
 3. Unless otherwise specified, manufacturers' ratings and manufacturer approved modifications shall be used to classify equipment for the determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer.
 4. Individual pieces of equipment or tools having a replacement value of \$100 or less, whether or not consumed by use, shall be considered to be small tools and no payment will be made therefore.

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5. Rental time will not be allowed while equipment is inoperative due to breakdowns.
- E. Equipment on the Work: The rental time to be paid for equipment used on the WORK shall be the time the equipment is in productive operation on the extra work being performed and, in addition, shall include the time required to move the equipment to the location of the extra work and return it to the original location or to another location that requires no more moving time than that required to return it to its original location. Moving time will not be paid if the equipment is used on other than the extra work, even though located at the site of the extra work. Loading and transporting costs will be allowed, in lieu of moving time, when the equipment is moved by means other than its own power. However, no payment will be made for loading and transporting costs when the equipment is used on other than the extra work even though located at the site of the extra work. The following shall be used in computing the rental time of equipment on the WORK.
1. When hourly rates are listed, any part of an hour less than 30 minutes of operation shall be considered to be 1/2-hour of operation, and any part of an hour in excess of 30 minutes will be considered one hour of operation.
 2. When daily rates are listed, any part of a day less than 4 hours operation shall be considered to be 1/2-day of operation. When owner-operated equipment is used to perform extra work to be paid for on a time and materials basis, the CONTRACTOR will be paid for the equipment and operator, as set forth in Paragraph (3), (4), and (5), following.
 3. Payment for the equipment will be made in accordance with the provisions in Paragraph 11.02D, herein.
 4. Payment for the cost of labor and subsistence or travel allowance will be made at the rates paid by the CONTRACTOR to other workers operating similar equipment already on the WORK, or in the absence of such labor, established by collective bargaining agreements for the type of workmen and location of the extra work, whether or not the operator is actually covered by such an agreement. A labor surcharge will be added to the cost of labor described herein in accordance with the provisions of Paragraph 11.02B, herein, which surcharge shall constitute full compensation for payments imposed by state and federal laws and all payments made to on behalf of workers other than actual wages.

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5. To the direct cost of equipment rental and labor, computed as provided herein, will be added the allowances for equipment rental and labor as provided in Paragraph 11.04, herein.

11.03 SPECIAL SERVICES

- A. Special work or services are defined as that work characterized by extraordinary complexity, sophistication, or innovation or a combination of the foregoing attributes which are unique to the construction industry. The following may be considered by the ENGINEER in making estimates for payment for special services:
 1. When the ENGINEER and the CONTRACTOR, by agreement, determine that a special service or work is required which cannot be performed by the forces of the CONTRACTOR or those of any of its subcontractors, the special service or work may be performed by an entity especially skilled in the work to be performed. After validation of invoices and termination of market values by the ENGINEER, invoices for special services or work based upon the current fair market value thereof may be accepted without complete itemization of labor, material, and equipment rental cost.
 2. When the CONTRACTOR is required to perform work necessitating special fabrication or machining process in a fabrication or a machine shop facility away from the job site, the charges for that portion of the work performed at the off-site facility may by agreement, be accepted as a special service and accordingly, the invoices from the work may be accepted without detailed itemization.
 3. All invoices for special services will be adjusted by deducting all trade discounts offered or available, whether the discounts were taken or not. In lieu of the allowances for overhead and profit specified in Paragraph 11.04, herein, an allowance of 5 percent will be added to invoices for special services.
- B. All work performed hereunder shall be subject to all of the provisions of the Contract Documents and the CONTRACTOR's sureties shall be bound with reference hereto as under the original Agreement. Copies of all amendments to surety bonds or supplemental surety bonds shall be submitted to the OWNER for review prior to the performance of any work hereunder.

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11.04 CONTRACTOR'S FEE

- A. WORK ordered on the basis of time and materials will be paid for at the actual necessary cost as determined by the ENGINEER, plus allowances for overhead and profit. For extra work involving a combination of increases and decreases in the WORK the actual necessary cost will be the arithmetic sum of the additive and deductive costs. The allowance for overhead and profit shall include full compensation for superintendence, bond and insurance premiums, taxes, office expenses, and all other items of expense or cost not included in the cost of labor, materials, or equipment provided for under Paragraphs 11.02B, C, and D, herein including extended overhead and home office overhead. The allowance for overhead and profit will be made in accordance with the following schedule:

ACTUAL NECESSARY COST OVERHEAD AND PROFIT ALLOWANCE

| | |
|-----------------|------------|
| Labor | 10 percent |
| Materials | 10 percent |
| Equipment | 10 percent |

- B. It is understood that labor, materials, and equipment may be furnished by the CONTRACTOR or by the subcontractor, the allowance specified herein shall be applied to the labor, materials, and equipment costs of the subcontractor, to which the CONTRACTOR may add 5 percent of the subcontractor's total cost for the extra work. Regardless of the number of hierarchical tiers of subcontractors, the 5 percent increase above the subcontractor's total cost which includes the allowances for overhead and profit specified herein may be applied one time only for each separate work transaction.

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ARTICLE 12 - CHANGE OF CONTRACT TIME

12.01 GENERAL

- A. The Contract Time may only be changed by a Change Order. Any claim for an extension of the Contract time shall be based on written notice delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 30 days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within 30 days after such occurrence (unless the ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the adjustment claimed is the entire adjustment to which the CONTRACTOR has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Time shall be determined by the ENGINEER in accordance with Paragraph 9.08 if the OWNER and the CONTRACTOR cannot otherwise agree. No claim for an adjustment in the Contract Time will be valid if not submitted in accordance with the requirements of this Paragraph 12.01A.

- B. The Contract Time will be extended in an amount equal to time lost if the CONTRACTOR makes a claim as provided in Paragraph 12.01A and the ENGINEER determines that the delay was caused by events beyond the control of the CONTRACTOR. Examples of events beyond the control of the CONTRACTOR include acts or neglect by the OWNER or others performing additional work as contemplated by Article 7, or by acts of God or of the public enemy, fire, floods, epidemics, quarantine restrictions, strikes, labor disputes, sabotage, or freight embargoes.

- C. All time limits stated in the Contract Documents are of the essence.

- D. None of the aforesaid time extensions shall entitle the CONTRACTOR to any adjustment in the Contract Price or any damages for delay. Furthermore, the CONTRACTOR hereby indemnifies and holds harmless the OWNER and ENGINEER, their officers, agents and employees from and against all claims, damages, losses and expenses (including lost property and attorney's fees) arising out of or resulting from the temporary suspension of work whether for the OWNER's convenience as defined in Article 15.01 (a) or for whatever other reasons including the stoppage of work by the ENGINEER for the CONTRACTOR's failure to comply with any order issued by the ENGINEER.

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12.02 EXTENSIONS OF THE TIME FOR DELAY DUE TO INCLEMENT WEATHER

- A. "Inclement weather" is any weather condition or conditions resulting immediately therefrom, causing the CONTRACTOR to suspend construction operations or preventing the CONTRACTOR from proceeding with at least 75 percent of the normal labor and equipment force engaged on the WORK.
- B. Should the CONTRACTOR prepare to begin work at the regular starting time at the beginning of any regular work shift on any day on which inclement weather, or its effects on the condition of the WORK prevents work from beginning at the usual starting time and the crew is dismissed as a result thereof, the CONTRACTOR will not be charged for a working day whether or not conditions change thereafter during the day and the major portion of the day could be considered to be suitable for construction operations.
- C. The CONTRACTOR shall base its construction schedule upon the inclusion of the number of days of inclement weather specified in the paragraph entitled "Inclement weather delays" of the Supplementary General Conditions. No extension of the Contract Time due to inclement weather will be considered until after the stated number of days of inclement weather has been reached. However, no reduction in Contract Time will be made if the number of inclement weather days is not reached.

12.03 EXTENSIONS OF TIME FOR OTHER DELAYS

- A. If the CONTRACTOR is delayed in completion of the WORK beyond the time named in the Contract Documents for the completion of the WORK, by acts of God or of the public enemy, fire, floods, epidemics, quarantine restrictions, strikes, labor disputes, industry-wide shortage of raw materials, sabotage or freight embargoes, the CONTRACTOR shall be entitled to an adjustment in the Contract Time. No such adjustment will be made unless the CONTRACTOR shall notify the ENGINEER in writing of the causes of delay within 15 calendar days from the beginning of any such delay. The ENGINEER shall ascertain the facts and the extent of the delay. No adjustment in time shall be made for delays resulting from noncompliance with the Contract, accidents, failure on the part of the CONTRACTOR to carry out the provisions of the Contract including failure to provide materials, equipment or workmanship meeting the requirements of the Contract Documents; the occurrence of such events shall not relieve the CONTRACTOR from the necessity of maintaining the required progress.
- B. In the event that Contract completion is delayed beyond the Contract Time named in the Specifications by reason of shortages of raw materials required for CONTRACTOR-furnished items, the CONTRACTOR shall be entitled to

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an adjustment in the Contract Time in like manner as if the WORK had been suspended for the convenience and benefit of the OWNER; provided, however, that the CONTRACTOR shall furnish documentation acceptable to the OWNER and ENGINEER that he placed or attempted to place firm orders with suppliers at a reasonable time in advance of the required date of delivery of the items in question, that such shortages shall have developed following the date such orders were placed or attempts made to place same, that said shortages are general throughout the affected industry, that said shortages are shortages of raw materials required to manufacture CONTRACTOR-furnished items and not simply failure of CONTRACTOR's suppliers to manufacture, assemble or ship items on time, and that the CONTRACTOR shall, to the degree possible, have made revisions in the sequence of his operations, within the terms of the Contract, to offset the expected delay. The CONTRACTOR shall notify the ENGINEER, in writing, concerning the cause of delay, within 15 calendar days of the beginning of such delay. The validity of any claim by the CONTRACTOR to an adjustment in the Contract Time shall be determined by the OWNER acting through the ENGINEER, and his findings thereon shall be based on the ENGINEER's knowledge and observations of the events involved and documentation submitted by the CONTRACTOR, showing all applicable facts relative to the foregoing provisions. Only the physical shortage of raw materials will be considered under these provisions as a cause for adjustment of time and no consideration will be given to any claim that items could not be obtained at a reasonable, practical, or economical cost or price, unless it is shown to the satisfaction of the OWNER that such items could have been obtained only at exorbitant prices entirely out of line with current rates taking into account the quantities involved and the usual practices in obtaining such quantities.

- C. If the CONTRACTOR is delayed in completion of the WORK by reason of changes made under the provisions of Article 10 or changed conditions as provided under Article 4.03, or by failure of the OWNER to acquire or clear right-of-way as provided under Article 15.01, or by any act of the ENGINEER or of the OWNER, not contemplated by the Contract, an adjustment in the Contract time will be made by the OWNER in like manner as if the WORK had been suspended for the convenience and benefit of the OWNER, except, that if the WORK is increased as a result of changes, the OWNER, at his sole discretion, may grant an adjustment in the number of calendar days for completion of the Contract. In the event of such delay, the CONTRACTOR shall notify the ENGINEER in writing of the causes of delay within 15 calendar days from the beginning of any such delay.

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ARTICLE 13 - WARRANTY AND GUARANTEE; TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

13.01 WARRANTY, GUARANTEE AND MAINTENANCE PERIOD

- A. The CONTRACTOR warrants and guarantees to the OWNER and the ENGINEER that all work, equipment, materials and workmanship are in accordance with the Contract Documents and are not defective. Prompt notice of defects discovered by the OWNER or ENGINEER shall be given to the CONTRACTOR. All defective work, whether or not in place, may be rejected, corrected, or accepted as provided in this Article 13.

- B. If within one (1) year after the date of Final Completion, as set by the Engineer's Notice of Completion, or a longer period of time prescribed by Laws or Regulations or by the terms of any applicable special guarantee or specific provisions of the Contract Documents, any work is found to be defective, the OWNER shall notify the CONTRACTOR in writing and the CONTRACTOR shall promptly, without cost to the OWNER and in accordance with the OWNER's written notification, either correct the defective work, or, if it has been rejected by the OWNER, remove it from the site and replace it with non-defective work. In the event the CONTRACTOR does not promptly comply with the notification, or in an emergency where delay would cause serious risk of loss or damage, the OWNER may have the defective work corrected or rejected work removed and replaced. All direct, indirect, and consequential costs of the removal and replacement including but not limited to fees and charges of engineers, architects, attorneys and other professionals will be paid by the CONTRACTOR. This paragraph shall not be construed to limit nor diminish the CONTRACTOR's absolute guarantee to complete the WORK in accordance with the Contract Documents.

13.02 ACCESS TO WORK

- A. The ENGINEER, other representatives of the OWNER, testing agencies, and governmental agencies with jurisdictional interests shall have access to the work at reasonable times for their observation, inspections, and testing. The CONTRACTOR shall provide proper and safe conditions for their access.

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13.03 TESTS AND INSPECTIONS

- A. The CONTRACTOR shall give the ENGINEER timely notice of readiness of the WORK for all required inspections, tests, or approvals.
- B. If Laws or Regulations of any public body other than the OWNER, with jurisdiction over the WORK require any work to be specifically inspected, tested, or approved, the CONTRACTOR shall pay all costs in connection therewith. The CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with the OWNER's or the ENGINEER's acceptance of a Supplier of materials or equipment proposed as a substitution or-equal to be incorporated in the WORK and of materials or equipment submitted for review prior to the CONTRACTOR's purchase for incorporation in the WORK. The cost of all inspections, tests, and approvals with the exception of the above which are required by the Contract Documents shall be paid by the OWNER (unless otherwise specified).
- C. The ENGINEER will make, or have made, such inspections and test as the ENGINEER deems necessary to see that the WORK is being accomplished in accordance with the requirements of the Contract Documents. The Contractor without additional cost to the OWNER, shall provide the labor and equipment necessary to make the WORK available for inspections. Unless otherwise specified in the Supplementary General Conditions or the OWNER-ENGINEER Agreement, all other costs of inspection and testing will be borne by the OWNER. In the event the inspections or tests reveal non-compliance with the requirements of the Contract Documents, the CONTRACTOR shall bear the cost of corrective measures deemed necessary by the ENGINEER, as well as the cost of subsequent re-inspection and retesting. Neither observations by the ENGINEER nor inspections, tests, or approvals by others shall relieve the CONTRACTOR from the CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents.
- D. All inspections, tests, or approvals other than those required by Laws or Regulations of any public body having jurisdiction shall be performed by properly licensed organizations selected by the OWNER.

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- E. If any work (including the work of others) that is to be inspected, tested, or approved is covered without the ENGINEER's written authorization, it must, if requested by the ENGINEER, be uncovered for testing, inspection, and observation. The uncovering shall be at the CONTRACTOR's expense unless the CONTRACTOR timely notified the ENGINEER of the CONTRACTOR's intention to cover the same and the ENGINEER failed to act with reasonable promptness in response to the notice.
- F. In any work is covered contrary to the written request of the ENGINEER, it must, if requested by the ENGINEER, be uncovered for the ENGINEER's observation and replaced at the CONTRACTOR's expense.
- G. If the ENGINEER considers it necessary or advisable that covered work be observed, inspected or tested by the ENGINEER or others, the ENGINEER shall direct the CONTRACTOR to uncover, expose, or otherwise make available for observation, inspection, or testing that portion of the work in question. The CONTRACTOR shall comply with the ENGINEER's direction and furnish all necessary labor, material, and equipment. If found the work is defective, the CONTRACTOR shall bear all direct, indirect and consequential costs of uncovering, exposure, observation, inspection, and testing and of satisfactory reconstruction of the work, including but not limited to fees and charges for engineers, architects, attorneys, and other professionals. However, if the work is not defective, the CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both. The increase in Contract Time and Contract Price shall be the CONTRACTOR's actual time and costs directly attributable to uncovering and exposing the work. If the parties are unable to agree as to the amount or extent of the changes, the CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

13.04 OWNER MAY STOP THE WORK

- A. If the WORK is defective, or the CONTRACTOR fails to perform work in such a way that the completed WORK will conform to the Contract Documents, the OWNER may order the CONTRACTOR to stop the WORK, or any portion thereof, until the cause for the order has been eliminated. This right of the OWNER to stop the WORK shall not give rise to any duty on the part of the OWNER to exercise this right for the benefit of the CONTRACTOR or any other party.

13.05 CORRECTION OR REMOVAL OF DEFECTIVE WORK

- A. When directed by the ENGINEER, the CONTRACTOR shall promptly correct all defective work, whether or not fabricated, installed, or completed, or, if the

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work has been rejected by the ENGINEER, remove it from the site and replace it with non-defective work. The CONTRACTOR shall bear all direct, indirect and consequential costs of correction or removal, including but not limited to fees and charges of engineers, architects, attorneys, and other professionals made necessary thereby.

13.06 ACCEPTANCE OF DEFECTIVE WORK

- A. If, instead of requiring correction or removal and replacement of defective work, the OWNER prefers to accept the work, the OWNER may do so. The CONTRACTOR shall bear all direct, indirect, and consequential costs attributable to the OWNER's evaluation of and determination to accept the defective work. If any acceptance of defective work occurs prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the WORK, and the OWNER shall be entitled to an appropriate decrease in the Contract Price.

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ARTICLE 14 - PAYMENTS TO CONTRACTOR, LIQUIDATED DAMAGES AND COMPLETION

14.01 SCHEDULE OF VALUES (LUMP SUM PRICE BREAKDOWN)

- A. The schedule of values or lump sum price breakdown established as provided in the Technical Specifications shall serve as the basis for progress payments and will be incorporated into the form of Application for Payment included in the Contract Documents.

14.02 UNIT PRICE BID SCHEDULE

- A. Progress payments for unit price work will be based on the number of units completed.

14.03 APPLICATION FOR PROGRESS PAYMENT

- A. Unless otherwise prescribed by the Owner, on the 25th of each month, the CONTRACTOR shall submit to the ENGINEER for review and approval, an Application for Payment completed and signed by the CONTRACTOR covering the WORK completed as of the date of the Application and accompanied by such supporting documentation as required by the Contract Documents.
- B. The Application for Payment shall identify, as a sub-total, the amount of the CONTRACTOR's Total Earnings to Date, plus the Value of Materials at the Site which have not yet been incorporated in the WORK, and less a deductive adjustment for materials installed which were not previously incorporated in the WORK, but for which payment was allowed under the provisions of payment for Materials Stored at the Site but not yet incorporated in the WORK.
- C. The Net Payment Due to the CONTRACTOR shall be the above-mentioned sub-total, from which shall be deducted the retainage amount and the total amount of all previous payments made to the CONTRACTOR.
- D. The OWNER may withhold and retain 5% of each approved progress payment to the CONTRACTOR. The total retention proceeds withheld shall not exceed 5% of the total construction price. All retention proceeds shall be placed by the OWNER in an interest-bearing account. The interest accrued shall be for the benefit of the CONTRACTOR and its subcontractors, and it shall be paid after the WORK has been completed and accepted by the OWNER. CONTRACTOR shall ensure that any interest accrued on the

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retainage is distributed by the CONTRACTOR to its subcontractors on a pro rata basis.

- E. Any retention proceeds withheld, and any accrued interest, shall be released by the OWNER pursuant to an Application for Payment from the CONTRACTOR within 45 days from the later of:
1. the date the OWNER receives the final Application for Payment from the CONTRACTOR;
 2. the date that a certificate of occupancy or final acceptance notice is issued to:
 - (a) the Contractor who obtained the building permit from the building inspector or from a public agency;
 - (b) the OWNER; or
 - (c) the ENGINEER.
 3. the date the CONTRACTOR accepts final payment for the Work; or
 4. the date that a public agency or building inspector having authority to issue its own certificate of occupancy does not issue the certificate but permits partial or complete occupancy of a newly constructed or remodeled building; provided, however, that if only partial occupancy of a building is permitted, any retention proceeds withheld and retained, and any accrued interest, shall be partially released in direct proportion to the value of the part of the building occupied.

Each Application for Payment from the CONTRACTOR shall include documentation of lien releases or waivers.

- F. Notwithstanding any other provision in this Article to the contrary,
1. If the CONTRACTOR is in default or breach of the terms and conditions of the Contract Documents, the OWNER may withhold from payment to the CONTRACTOR for so long as reasonably necessary an amount necessary to cure the breach or default of the CONTRACTOR; or
 2. If the WORK or a portion of the WORK has been substantially completed, the OWNER may retain until completion up to twice the

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fair market value of the WORK of the CONTRACTOR that has not been completed:

- (a) in accordance with the Contract Documents; or
- (b) in the absence of applicable provisions in the Contract Documents to generally accepted craft standards.

- 3. If the OWNER refuses payment under subparagraphs (F)(i) or (ii), it shall describe in writing within 45 days of withholding such amounts what portion of the WORK was not completed according to the standards specified in the Contract Documents.

G. The CONTRACTOR shall distribute retention proceeds as outlined below:

- 1. Except as provided in Paragraph 14.03.G.2, below, if the CONTRACTOR receives retention proceeds, it shall pay each of its subcontractors from whom retention has been withheld each subcontractor's share of the retention received within ten days from the day that all or any portion of the retention proceeds is received from the OWNER.
- 2. Notwithstanding Paragraph 14.03.G.1, above, if a retention payment received by the CONTRACTOR is specifically designated for a particular subcontractor, payment of the retention shall be made to the designated subcontractor.

H. Except as otherwise provided in the Supplementary General Conditions, the value of materials stored at the site shall be valued at 95 percent of the value of the materials. This amount shall be based upon the value of all acceptable materials and equipment stored at the site or at another location agreed to in writing by the OWNER; provided, each individual item has a value of more than \$5,000 and will become a permanent part of the WORK. The Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that the CONTRACTOR has received the materials and equipment free and clear of all liens, charges, security interests, and encumbrances (which are hereinafter in these General Conditions referred to as "Liens") and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the OWNER's interest therein, all of which will be satisfactory to the OWNER.

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14.04 CONTRACTOR'S WARRANTY OF TITLE

- A. The CONTRACTOR warrants and guarantees that title to all work, materials, and equipment covered by an Application for Payment, whether incorporated in the WORK or not, will pass to the OWNER no later than the time of final payment free and clear of all liens.

14.05 REVIEW OF APPLICATIONS FOR PROGRESS PAYMENT

- A. The ENGINEER will, within 7 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to the OWNER, or return the Application to the CONTRACTOR indicating in writing the ENGINEER's reasons for refusing to recommend payment. In the later case, the CONTRACTOR may make the necessary corrections and resubmit the Application. Thirty days after presentation of the Application for Payment with the ENGINEER's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.05B) become due and when due will be paid by the OWNER to the CONTRACTOR.
- B. The OWNER may refuse to make payment of the full amount recommended by the ENGINEER to compensate for claims made by the OWNER on account of the CONTRACTOR's performance of the WORK or other items entitling the OWNER to a credit against the amount recommended, but the OWNER must give the CONTRACTOR written notice within 7 days (with a copy to the ENGINEER) stating the reasons for such action.

14.06 PARTIAL UTILIZATION

- A. The OWNER may utilize or place into service any item of equipment or other usable portion of the WORK at any time prior to completion of the WORK. The OWNER shall notify the CONTRACTOR in writing of its intent to exercise this right. The notice will identify the equipment or specific portion or portions of the WORK to be utilized or otherwise placed into service.
- B. It shall be understood by the CONTRACTOR that until such written notification is issued, all responsibility for care and maintenance of all items or portions of the WORK to be partially utilized shall be borne by the CONTRACTOR. Upon the issuance of a notice of partial utilization, the ENGINEER will deliver to the OWNER and the CONTRACTOR a written recommendation as to division of responsibilities between the OWNER and the CONTRACTOR with respect to security, operation, safety, maintenance,

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heat, utilities and insurance. Upon the OWNER's acceptance of these recommendations, the ENGINEER's aforesaid recommendation will be binding on the OWNER and the CONTRACTOR until final payment.

- C. The CONTRACTOR shall retain full responsibility for satisfactory completion of the WORK, regardless of whether a portion thereof has been partially utilized by the OWNER and the CONTRACTOR's one year correction period shall commence only after the date of Final Completion for the WORK.

14.07 LIQUIDATED DAMAGES

- A. The CONTRACTOR shall pay to the OWNER the amount specified in the Supplemental General Conditions, not as a penalty but as liquidated damages, if he fails to complete the WORK or specified parts of the WORK within the time or times agreed upon. The periods for which these damages shall be paid shall be the number of Days from the agreed date or Contract Time as contained in the Agreement, or from the date of termination of any extension of time approved by the OWNER, to the date or dates on which the ENGINEER certifies Substantial Completion of WORK or specified parts of the WORK as provided in Article 14.08, herein. The OWNER may deduct the amount of said damages from any monies due or to become due the CONTRACTOR. After Substantial Completion, if the CONTRACTOR fails to complete the remaining WORK within 45 days or any proper extension thereof granted by OWNER, CONTRACTOR shall pay OWNER the amount stated in the Supplemental General Conditions as liquidated damages for each day that expires after the 45 days until readiness for final payment.
- B. The said amount is fixed and agreed upon by and between the CONTRACTOR and the OWNER because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the OWNER would sustain; and said amount is agreed to be the amount of damages which the OWNER would sustain. Said damages are not in lieu of but in addition to other actual or consequential damages to which the OWNER may be entitled.
- C. All times specified in the Contract Documents are hereby declared to be of the essence.

14.08 SUBSTANTIAL COMPLETION

- A. When the CONTRACTOR considers the WORK ready for its intended use, and the CONTRACTOR has delivered to the ENGINEER all maintenance and operating instructions, schedules, guarantees, bonds, certificates of

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inspection, marked-up record documents and other documents, all as required by the Contract Documents, the CONTRACTOR may notify the OWNER and the ENGINEER in writing that the WORK is substantially complete and request that the ENGINEER prepare a Certificate of Substantial Completion. Within a reasonable time thereafter, the OWNER, the CONTRACTOR, and the ENGINEER shall make an inspection of the WORK to determine the status of completion. If the ENGINEER does not consider the WORK substantially complete, the ENGINEER will notify the OWNER and CONTRACTOR in writing giving the reasons therefor. If the ENGINEER considers the WORK substantially complete, the ENGINEER will prepare and deliver to the OWNER for its execution the Certificate of Substantial Completion signed by the ENGINEER and CONTRACTOR, which shall fix the date of Substantial Completion.

- B. The Certificate of Substantial Completion shall be a release by the CONTRACTOR of the OWNER and its agents from all claims and liability to the CONTRACTOR for anything done or furnished for, or relating to, the WORK or for any act or neglect of the OWNER or of any person relating to or affecting the WORK, to the date of Substantial Completion, except demands against the OWNER for the remainder of the amounts kept or retained from progress payments and excepting pending, unresolved claims filed in writing prior to the date of Substantial Completion. At the time of delivery of the Certificate of Substantial Completion, the ENGINEER will deliver to the OWNER and the CONTRACTOR, if applicable, a written recommendation as to division of responsibilities between the OWNER and the CONTRACTOR with respect to security, operation, safety, maintenance, heat, utilities and insurance. Upon the OWNER's acceptance of these recommendations, the ENGINEER's recommendation will be binding on the OWNER and the CONTRACTOR until final payment.
- C. The OWNER, upon written notice to the CONTRACTOR, shall have the right to exclude the CONTRACTOR from the WORK after the date of Substantial Completion, and complete all or portions of the WORK at the CONTRACTOR's expense.

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14.09 COMPLETION AND FINAL PAYMENT

- A. Upon written certification from the CONTRACTOR that the WORK is complete (if a Certificate of Substantial Completion has been issued this certification must occur within 45 days of that date), the ENGINEER will make a final inspection with the OWNER and the CONTRACTOR. If the OWNER and ENGINEER do not consider the WORK complete, the ENGINEER will notify the OWNER and the CONTRACTOR in writing of all particulars in which this inspection reveals that the WORK is incomplete or defective. The CONTRACTOR shall immediately take the measures necessary to remedy these deficiencies. If the ENGINEER and OWNER consider the WORK complete, the CONTRACTOR may proceed to file its application for final payment pursuant to this Article. At the request of the CONTRACTOR, the ENGINEER may recommend to the OWNER that certain minor deficiencies in the WORK that do not prevent the entire WORK from being used by the OWNER for its intended use, and the completion of which will be unavoidably delayed due to no fault of the CONTRACTOR, be exempted from being completed prerequisite to final payment. These outstanding items of pickup work, or "punch list items", shall be listed on the ENGINEER's Notice of Completion, together with the recommended time limits for their completion, and extended warranty requirements for those items and the value of such items.
- B. After the issuance of the Notice of Completion and after the CONTRACTOR has completed corrections that have not been exempted to the satisfaction of the ENGINEER and delivered to the ENGINEER all required additions and modifications to maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, marked-up record documents and other documents, all as required by the Contract Documents; and after the ENGINEER has indicated that the WORK is acceptable, the CONTRACTOR may make application for final payment following the procedure for progress payments. The final application for payment shall be accompanied by all documentation called for in the Contract Documents and other data and schedules as the OWNER or ENGINEER may reasonably require, including an affidavit of the CONTRACTOR that all labor, services, material, equipment and other indebtedness connected with the WORK for which the OWNER or his property might in any way be responsible, have been paid or otherwise satisfied, and a consent of the payment bond surety to final payment, all in forms approved by the OWNER.

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14.10 FINAL APPLICATION FOR PAYMENT

- A. If, on the basis of the ENGINEER's observation of the WORK during construction and final inspection, and the ENGINEER's review of the final application for payment and accompanying documentation, all as required by the Contract Documents, the ENGINEER is satisfied that the WORK has been completed and the CONTRACTOR has fulfilled all of his obligations under the Contract Documents, the ENGINEER will, within ten days after receipt of the final application for payment, indicate in writing his recommendation of payment and present the application to the OWNER for payment. Thereupon, the ENGINEER will give written notice to the OWNER and the CONTRACTOR that the WORK is acceptable by executing the ENGINEER's Notice of Completion. Otherwise, the ENGINEER will return the application to the CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case the CONTRACTOR shall make the necessary corrections and resubmit the application.
- B. Within 45 calendar days after the ENGINEER's filing of the Notice of Completion, the OWNER will make final payment including all deducted retainage (except as noted below) to the CONTRACTOR. The OWNER's remittance of final payment shall be the OWNER's acceptance of the WORK if formal acceptance of the WORK is not indicated otherwise. The final payment shall be that amount remaining after deducting all prior payments and all amounts to be kept or retained under the provisions of the Contract, including the following items:
1. Liquidated damages, as applicable.
 2. All amounts retained by the OWNER under Paragraph 14.03(F).

14.11 CONTRACTOR'S CONTINUING OBLIGATIONS

- A. The CONTRACTOR's obligation to perform and complete the WORK in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by the ENGINEER, nor the issuance of a Certificate of Substantial Completion or Notice of Completion, nor payment by the OWNER to the CONTRACTOR under the Contract Documents, nor any use or occupancy of the WORK or any part thereof by the OWNER, nor any act of acceptance by the OWNER nor any failure to do so, nor any review of a shop drawing or sample submittal, will constitute an acceptance of work or materials not in accordance with the Contract Documents or a release of the CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents.

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14.12 FINAL PAYMENT TERMINATES LIABILITY OF OWNER

- A. Final payment is defined as the last progress payment made to the CONTRACTOR for earned funds, less deductions listed in Paragraph 14.10B herein. The acceptance by the CONTRACTOR of the final payment referred to in Paragraph 14.10 herein, shall be a release of the OWNER and its agents from all claims of liability to the CONTRACTOR for anything done or furnished for, or relating to, the work or for any act or neglect of the OWNER or of any person relating to or affecting the work, except demands against the OWNER for the remainder, if any, of the amounts kept or retained under the provisions of Paragraph 14.10 herein; and excepting pending, unresolved claims filed prior to the date of the Certificate of Substantial Completion.

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ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 SUSPENSION OF WORK BY OWNER

- A. The OWNER acting through the ENGINEER may, by written notice to the Contractor, temporarily suspend the WORK, in whole or in part, for a period or periods of time, but not to exceed 90 days, for the convenience and benefit of the OWNER upon the occurrence of any one or more of the following: (1) unsuitable weather; (2) delay in delivery of OWNER- furnished equipment or materials, or such other conditions as are considered unfavorable for prosecution of the work; (3) Shortfall in construction funds; (4) Constraints imposed by public entities, public utilities, property owners or legal proceedings; (5) Failure or delay in acquisition of easements or right-of-way by the OWNER; or (6) Other conditions which, in the opinion of the OWNER, warrant a delay in the WORK. Suspended WORK shall be resumed by the CONTRACTOR within 10 calendar days of receipt from the ENGINEER of written notice to proceed. Whenever the OWNER temporarily suspends work for any conditions enumerated in this Article 15.01 A, the CONTRACTOR shall be entitled to an adjustment in the Contract Time as specified in Article 12.03 C.
- B. The suspension of work shall be effective upon receipt by the Contractor of the written order suspending the work and shall be terminated upon receipt by the Contractor of the written order terminating the suspension.
- C. The CONTRACTOR hereby indemnifies and holds harmless the OWNER and ENGINEER, their officers, agents and employees, from and against all claims, damages, losses and expenses, including lost profits and attorney's fees, arising out of or resulting from the temporary suspension of the WORK, whether for the OWNER's convenience described in this Article or for whatever other reasons, including the stoppage of work by the ENGINEER for the CONTRACTOR's failure to comply with any order issued by the ENGINEER.

15.02 TERMINATION OF AGREEMENT BY OWNER (CONTRACTOR DEFAULT)

- A. In the event of default by the CONTRACTOR, the OWNER may give written notice to the CONTRACTOR of OWNER's intent to terminate the Agreement. The notice shall state the event of default and the time allowed to remedy the default. It shall be considered a default by the CONTRACTOR whenever the CONTRACTOR shall: (1) declare bankruptcy, become insolvent, or assign its assets for the benefit of its creditors; (2) fail to provide materials or workmanship meeting the requirements of the Contract Documents; (3) disregard or violate provisions of the Contract Documents or ENGINEER's

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instructions, (4) fail to prosecute the WORK according to the approved progress schedule; or, (5) fail to provide a qualified superintendent, competent workmen, or materials or equipment meeting the requirements of the Contract Documents. If the CONTRACTOR fails to remedy the conditions constituting default within the time allowed, the OWNER may then issue a Notice of Termination.

- B. In the event the Agreement is terminated in accordance with Paragraph 15.02A, the OWNER may take possession of the WORK and may complete the WORK by whatever method or means the OWNER may select. The cost of completing the WORK shall be deducted from the balance which would have been due the CONTRACTOR had the Agreement not been terminated and the WORK completed in accordance with the Contract Documents. If such cost exceeds the balance which would have been due, the CONTRACTOR shall pay the excess amount to the OWNER. If such cost is less than the balance which would have been due, the CONTRACTOR shall have no claim to the difference.

15.03 TERMINATION OF AGREEMENT BY OWNER (FOR CONVENIENCE)

- A. The OWNER may terminate the Agreement at any time if it is found that reasons beyond the control of either the OWNER or CONTRACTOR make it impossible or against the OWNER's interests to complete the WORK. In such a case, the CONTRACTOR shall have no claims against the OWNER except: (1) for the value of the work, as determined by the engineer, performed by the Contractor up to the date the Agreement is terminated; and, (2) for the cost of materials and equipment on hand, in transit, or on definite commitment, as of the date the Agreement is terminated, which would be needed in the WORK and which meet the requirements of the Contract Documents. The value of work performed and the cost of materials and equipment delivered to the site, as mentioned above, shall be determined by the ENGINEER in accordance with the procedure prescribed from making the final application for payment and final payment under Paragraphs 14.09 and 14.10.

15.04 TERMINATION OF AGREEMENT BY CONTRACTOR

- A. The CONTRACTOR may terminate the Agreement upon 10 days written notice to the OWNER, whenever: (1) the WORK has been suspended under the provisions of Paragraph 15.01, for more than 90 consecutive days through no fault or negligence of the CONTRACTOR, and notice to resume work or to terminate the agreement has not been received from the OWNER within this time period; or, (2) the OWNER should fail to pay the

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CONTRACTOR any monies due him in accordance with the terms or the Contract Documents and within 60 days after presentation to the OWNER by the CONTRACTOR of a request therefor, unless within said 10-day period the OWNER shall have remedied the condition upon which the payment delay was based. In the event of such termination, the CONTRACTOR shall have no claims against the OWNER except for those claims specifically enumerated in Paragraph 15.03, and as determined in Accordance with the requirements of that paragraph.

GENERAL CONDITIONS

ARTICLE 16 - MISCELLANEOUS

16.01 GIVING NOTICE

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

16.02 TITLE TO MATERIALS FOUND ON THE WORK

- A. The OWNER reserves the right to retain title to all soils, stone, sand, gravel, and other materials developed and obtained from excavations and other operations connected with the WORK. Unless otherwise specified in the Contract Documents, neither the CONTRACTOR nor any subcontractor shall have any right, title, or interest in or to any such materials. The CONTRACTOR will be permitted to use in the WORK, without charge, any such materials which meet the requirements of the Contract Documents.

16.03 RIGHT TO AUDIT

- A. If the CONTRACTOR submits a claim to the OWNER for additional compensation, the OWNER shall have the right, as a condition to considering the claim, and as a basis for evaluation of the claim, and until the claim has been settled, to audit the CONTRACTOR's books. This right shall include the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to discover and verify all direct and indirect costs of whatever nature claimed to have been incurred or anticipated to be incurred and for which the claim has been submitted. The right to audit shall include the right to inspect the CONTRACTOR's plants, or such parts thereof, as may be or have been engaged in the performance of the WORK. The CONTRACTOR further agrees that the right to audit encompasses all subcontracts and is binding upon subcontractors. The right to examine and inspect herein provided for shall be exercisable through such representatives as the OWNER deems desirable during the CONTRACTOR's normal business hours at the office of the CONTRACTOR. The CONTRACTOR shall make available to the OWNER for auditing, all relevant accounting records and documents, and other financial data, and upon request, shall submit true copies of requested records to the OWNER.

16.04 ASBESTOS

- A. If the CONTRACTOR during the course of work observes the existence of asbestos in any structure or building, the CONTRACTOR shall promptly notify the OWNER and the ENGINEER. The OWNER shall consult with the ENGINEER regarding removal or encapsulation of the asbestos material and the CONTRACTOR shall not perform any work pertinent to the asbestos material prior to receipt or special instruction from the OWNER through the ENGINEER.

SUPPLEMENTAL GENERAL CONDITIONS

ARTICLE 17- GENERAL

17.01 GENERAL

1. These Supplemental General Conditions amend or supplement the General Conditions of the Contract and any other provisions of the Contract Documents as indicated herein. All provisions which are not so amended or supplemented remain in full force and effect.
2. The terms used in these Supplemental General Conditions which are defined in the General Conditions of the Contract have the meanings assigned to them in the General Conditions of the Contract herein.

17.02 SUPPLEMENTAL DEFINITIONS

1. ENGINEER

The "Engineer" is

Hansen, Allen & Luce, Inc
859 W. South Jordan Parkway
South Jordan, Utah 84095
(801) 566-5599

17.03 TESTING COSTS

1. Paragraph 13.03 of the General Conditions is amended as follows: the CONTRACTOR shall pay all testing costs. The Owner reserves the right to have additional tests performed by a testing organization selected by the OWNER and at the OWNER's expense.

SUPPLEMENTAL GENERAL CONDITIONS

ARTICLE 18 - AMOUNTS OF LIQUIDATED DAMAGES, BONDS AND INSURANCE

18.01 AMOUNT OF LIQUIDATED DAMAGES

- A. As provided in Article 14.07 of the General Conditions, the Contractor shall pay to the Owner as liquidated damages the amount of \$1,000 for each calendar day's delay beyond the Contract Time for substantial completion. The Contractor shall pay to the Owner as liquidated damages the amount of \$200 for each calendar day's delay beyond 45 calendar days from the date of substantial Completion until the Engineer issues the Notice of Final Completion.

18.02 PERFORMANCE AND OTHER BOND AMOUNTS

- A. The CONTRACTOR shall furnish a satisfactory Performance Bond in the amount of 100 percent of the Contract Price and a satisfactory Payment Bond in the amount of 100 percent of the Contract Price.

18.03 INSURANCE AMOUNTS

The limits of liability for the insurance required by Paragraph 5.02 of the General Conditions shall provide for not less than the following amounts or greater where required by Laws and Regulations:

- A. Workers' Compensation under Paragraph 5.02B.1 of the General Conditions:

- 1. State: Utah Statutory

- B. Comprehensive General Liability: (under Paragraph 5.02B.2 of the General Conditions):

- 1. Bodily Injury (including completed operations and products liability):

| | |
|---------------------|------------------|
| <u>\$ 500,000</u> | Each Occurrence |
| <u>\$ 1,000,000</u> | Annual Aggregate |

Property Damage:

| | |
|-------------------------------|--------------------|
| <u>\$ 500,000</u> | Each Occurrence |
| <u>\$ 1,000,000</u> | Annual Aggregate |
| or a combined single limit of | <u>\$1,000,000</u> |

SUPPLEMENTAL GENERAL CONDITIONS

2. Property Damage liability insurance including, Explosion, Collapse and Underground coverages, where applicable.

3. Personal Injury, with employment exclusion deleted

\$ 1,000,000

Annual Aggregate

C. Comprehensive Automobile Liability: (Under Paragraph 5.02B.3 of the General Conditions:)

1. Bodily Injury

\$ 500,000

Each Person

\$ 1,000,000

Each Occurrence

2. Property Damage:

\$ 500,000

Each Occurrence

or combined single limit of

\$1,000,000

D. Builders Risk: Not required.

SUPPLEMENTAL GENERAL CONDITIONS

ARTICLE 19 - PHYSICAL CONDITIONS AND WEATHER DELAYS

19.01 INCLEMENT WEATHER DELAYS

- A. The Contractor's construction schedule shall be based upon the inclusion of at least five (5) day(s) of inclement weather delays. Reference Article 12, paragraph 12.02 of the General Conditions for additional requirements.

SUPPLEMENTAL GENERAL CONDITIONS

ARTICLE 20 - SUBCONTRACT LIMITATIONS

20.01 SUBCONTRACT LIMITATIONS

- A. In addition to the provisions of Paragraph 6.05 of the General Conditions, the CONTRACTOR shall perform not less than 20 percent of the WORK with its own forces (i.e., without subcontracting). The 20 percent requirement shall be understood to refer to the WORK, the value of which totals not less than 20 percent of the Contract Price.

ARTICLE 21 - MISCELLANEOUS

21.01 PATENTS AND COPYRIGHTS

The Contractor shall indemnify and save harmless the Owner, the Engineer, and their officers, agents, and employees, against all claims or liability arising from the use of any patented or copyrighted design, device, material, or process by the Contractor or any of his subcontractors in the performance of the work.

SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.1 GENERAL

- A. The work to be performed under this project shall consist of furnishing all labor, materials, and equipment necessary or required to complete the work in all respects as shown on the Drawings and as herein specified. All work, materials, and services not expressly shown or called for in the Contract Documents which may be necessary to complete the construction of the work in good faith shall be performed, furnished, and installed by CONTRACTOR as though originally so specified or shown, at no increase in cost to OWNER.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The work comprises modifications to three JWWCD Vaults piping and valves. Modifications to the valve vault piping include: removal of the existing piping and valves; installation and replacement of the piping and valves and other equipment as identified on the drawings; asphalt and concrete road replacement and other surface improvements including curb, gutter and sidewalk; HVAC, electrical and SCADA modifications (only at 145W 7500 S) and all other associated work shown on the drawings.

1.3 SEQUENCE AND SCHEDULE OF WORK

- A. Work shall be sequenced and scheduled in the following order and during the specified time:
1. 6567 South 1300 West – during the month of December 2020
 2. 145 West 7500 South – during the month of January 2021
 3. 700 West Winchester – during the month of February 2021
- B. Work will be required to be completed during period shown above. The water at each site will be shut off for a period of three weeks during the time and turned back on during the last week for testing and backfilling.
1. Owner Shutdowns may not completely turn off the water. Contractor shall anticipate some of the valves may leak and prepare for pumping and/or removal of bypass water.
 2. Surface improvements shall be completed during the month of March 2021, weather permitting.
 - a. Temporary asphalt shall be installed during the cold weather and replace in the spring.

1.4 CONTRACT METHOD

- A. The work hereunder will be constructed under a single lump sum contract for modifications to each of the valve vaults and an each price for additive alternates.

1.5 CONTRACTOR USE OF PROJECT SITE

- A. CONTRACTOR's use of the project site shall be limited to its construction operations, including on-site storage of materials and on-site construction of facilities.

1.6 PROJECT SECURITY

- A. CONTRACTOR shall make all necessary provisions to protect the project and CONTRACTOR's facilities from fire, theft, and vandalism, and the public from unnecessary exposure to injury.

1.7 CHANGES IN THE WORK

- A. It is mutually understood that it is inherent in the nature of public works construction that some changes in the plans and specifications may be necessary during the course of construction to adjust them to unforeseen field conditions, and that it is of the essence of the Contract to recognize a normal and expected margin of change. ENGINEER shall have the right to make such changes, from time to time, in the plans, in the character of the work, and in the scope of the project as may be necessary or desirable to ensure the completion of the work in the most satisfactory manner without invalidating the Contract.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

- END OF SECTION -

SECTION 01 14 19
CONTRACTOR'S USE OF PREMISES

PART 1 GENERAL

1.1 PROJECT LOCATION

- A. The work covered by this contract will be performed at the locations shown on the drawings.

1.2 ACCESS TO THE SITE

- A. Access to the sites shall be from public right-of-ways.
- B. CONTRACTOR shall take necessary steps to protect the rights and property of private property owners.

1.3 WORKING HOURS

- A. Contractor shall abide by all local ordinances or laws regarding work between 9:00 PM and 7:00 AM and shall obtain written variances from the regulating entities if needed or required. Contractor shall also abide by all conditions issued by OWNER.

1.4 MEASUREMENT AND PAYMENT

- A. Contractors Use of Premises shall not be measured or paid as a separate item but shall be included as part of the item to which it relates.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

- END OF SECTION –

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SECTION 01 22 00
MEASUREMENT AND PAYMENT

PART 1 GENERAL

- A. All work completed under this contract shall be in accordance with the Drawings and Specifications and will be measured by ENGINEER/OWNER. The quantities appearing on the Bid Schedule or Schedule of Values are approximate only, and are prepared for the comparison of bids. Payment to CONTRACTOR on bid items with unit prices other than "Lump Sum" will be made for actual quantities of work performed and accepted, or material furnished in accordance with the Contract. The scheduled quantities of work to be done and materials to be furnished may be increased or decreased in accordance with the General Conditions.
- B. The term "Lump Sum" when used as an item of payment will mean complete payment for the work described in the contract. When a complete structure, portion of work, or unit is specified "Lump Sum" as the unit of measurement, the unit will include fittings, accessories, and all work necessary to complete the work as shown on the Drawings and as specified.
- C. When the accepted quantities of work vary from the quantities in the bid schedule, CONTRACTOR shall accept as payment in full, so far as contract items are concerned, payment at the original contract unit prices for the work done. OWNER reserves the right to add to or delete from quantities listed in the bid schedule in order to match the total bid with the budgeted money available.

1.2 BID SCHEDULE

A. BID ITEM NO. 1 - "VAULT MODIFICATION at 6567 SOUTH 1300 WEST"

- 1. **METHOD OF MEASUREMENT** This Bid Item shall not be measured, but shall be paid for on a lump sum basis for the modified piping, connections, including all of the work shown and specified on the Drawings and these Specifications for the Project.
- 2. **BASIS OF PAYMENT** Payment shall be made at the contract lump sum bid price. Payment shall be considered complete compensation for all labor, equipment, tools, and materials, mobilization/demobilization, traffic control, permits, removal of the existing piping, furnishing and installing new piping with associated valves and fittings, new 6" vents and vent covers, 2" air release line, 3/4" sample line, ladder, disinfection and commissioning; material testing; backfilling; installing a new precast vault lid, surface improvements including temporary and permanent asphalt, curb and gutter, and sidewalk; implementation of requirements and coordination with Dominion Gas Company, and all other items as shown and/or specified in these documents.

B. BID ITEM NO. 2 - "VAULT MODIFICATION at 145 WEST 7500 SOUTH"

- 1. **METHOD OF MEASUREMENT** This Bid Item shall not be measured, but shall be paid for on a lump sum basis for the modified piping, connections, electrical work, including all of the work shown and specified on the Drawings and these Specifications for the Project.
- 2. **BASIS OF PAYMENT** Payment shall be made at the contract lump sum bid price. Payment shall be considered complete compensation for all labor, equipment, tools,

and materials, mobilization/demobilization, traffic control, permits, removal of the existing piping, furnishing and installing new piping with associated valves and fittings, new 6" vents and vent covers, 2" air release lines, sump pump and sump pump piping, HVAC, electrical and SCADA, disinfection and commissioning; testing all new mechanical and electrical systems; material testing; backfilling, installing a new precast vault lid, new ring and cover, surface improvements including temporary and permanent asphalt, curb and gutter, and sidewalk; and all other items as shown and/or specified in these documents.

C. BID ITEM NO. 3 - "VAULT MODIFICATION at 700 WEST WINCHESTER"

1. **METHOD OF MEASUREMENT** This Bid Item shall not be measured, but shall be paid for on a lump sum basis for the modified piping, connections, electrical work, including all of the work shown and specified on the Drawings and these Specifications for the Project.
2. **BASIS OF PAYMENT** Payment shall be made at the contract lump sum bid price. Payment shall be considered complete compensation for all labor, equipment, tools, and materials, mobilization/demobilization, traffic control, permits, removal of the existing piping, furnishing and installing new piping with associated valves and fittings, new 6" vents and vent covers, 2" air release line, ladder, disinfection and commissioning; material testing, backfilling; installing a new precast vault lid, surface improvements including concrete roadway repair, curb and gutter, and sidewalk; and all other items as shown and/or specified in these documents.

1.3 ADDITIVE ALTERNATES

A. BID ITEM 1 – NEW 33 X 30 REDUCER SUPPLIED

1. **METHOD OF MEASUREMENT** This Bid Item shall be measured for each new 33 x 30 steel reducer supplied, painted and delivered to the site.
2. **BASIS OF PAYMENT** Payment shall be made at the contract unit bid price for each new 33 x 30 reducer supplied, painted and delivered to the site.

B. BID ITEM 2 – NEW 33 X 30 REDUCER SUPPLIED AND INSTALLED

1. **METHOD OF MEASUREMENT** This Bid Item shall be measured for each new 33 x 30 steel reducer supplied, painted, delivered to the site, and installed on the existing pipe.
2. **BASIS OF PAYMENT** Payment shall be made at the contract unit bid price for each new 33 x 30 reducer supplied, painted, delivered to the site, and installed on the existing pipe. Costs shall also include increased costs for excavation, backfilling, and surface improvements for the extra distance of the reducer.

- END OF SECTION -

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
- B. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.
- C. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
- D. Midvale City (at 145 West 7500 South), Murray City (at 700 West Winchester), Taylorsville (at 6567 South 1300 East), OWNER (Jordan Valley Water Conservancy District), and/or utility owners may be working within the project area while this contract is in progress. If so, CONTRACTOR shall schedule his work in conjunction with these other organizations to minimize mutual interference.
- E. Water service to these areas can't be interrupted for an extended period of time. If water service is to be interrupted on any other pipeline, CONTRACTOR shall provide a minimum notice of 24 hours to each home or business affected. A copy of CONTRACTOR'S notification letter shall be reviewed and approved by OWNER prior to distribution. Where practicable, shutdowns shall be during the night time hours.
- F. If required to work in City Streets or Utah Department of Transportation (UDOT) right-of-way, CONTRACTOR shall notify UDOT or City 72 hours prior to work being performed therein. Work within the City Streets or UDOT right-of-way shall be in accordance with their required permit and any license agreement with OWNER. CONTRACTOR shall obtain and comply with all required permits.
- G. Coordination with Adjacent Property Owner
 - 1. Once each week hand deliver or mail a written "**Construction Status Update Notice**" to all residents, businesses, schools and property owners adjacent to and affected by the Work. Notice shall be on CONTRACTOR's company letterhead paper and be secured to doorknob should occupants not be home. Obtain ENGINEER's review of notice prior to distribution. As a minimum the notice shall contain the following:
 - a. name and phone number of CONTRACTOR's representative for the project
 - b. work anticipated for the next 7 days including work locations and work by subcontractors and utility companies
 - c. rough estimate of construction schedule through end of project
 - d. anticipated driveway approach closures
 - e. anticipated water, sewer or power outages
 - f. anticipated vehicular traffic impacts, rerouting or lane closures
 - g. anticipated pedestrian impacts and sidewalk closures

- h. changes to public transportation bus routes
 - i. any other construction or work items which will impact or restrict the normal use of streets and amenities
2. Failure to comply with this contract provision is considered grounds for project suspension per Article 15.1 of the General Conditions (APWA Document 00 70 00).

1.2 FIELD ENGINEERING

- A. CONTRACTOR shall provide all survey and construction staking as necessary to complete the required work according to the contract documents. Construction staking and surveying shall be performed by a registered Land Surveyor in the State of Utah.
- B. Locate and protect survey control and reference points. Promptly notify Engineer of discrepancies discovered.
- C. Control datum for survey is that shown on Drawings.
- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- F. CONTRACTOR shall be responsible to coordinate with all property owners to determine the location of existing sewer and water service laterals.
- G. All service laterals shall be verified and indicated on the "Record Drawings" supplied by the CONTRACTOR to the ENGINEER.

1.3 PRECONSTRUCTION MEETING

- A. Prior to the commencement of work at the site, a preconstruction conference will be held at a mutually agreed time and place which shall be attended by CONTRACTOR's Project Manager, its superintendent, and its subcontractors as appropriate. Other attendees will be:
 - 1. ENGINEER and the Resident Project Representative (RPR)
 - 2. Representatives of OWNER
 - 3. Governmental representatives as appropriate
 - 4. Others as requested by CONTRACTOR, OWNER, or ENGINEER.
- B. Unless previously submitted to ENGINEER, CONTRACTOR shall bring to the conference one copy of each of the following:
 - 1. Progress schedule
 - 2. Procurement schedule of major equipment and materials and items requiring long lead time
 - 3. Shop Drawings/Sample/Substitute or "Or Equal" submittal schedule.
- C. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda may include the following:

1. CONTRACTOR's tentative schedules
 2. Transmittal, review, and distribution of CONTRACTOR's submittals
 3. Processing applications for payment
 4. Maintaining record documents
 5. Critical work sequencing
 6. Field decisions and Change Orders
 7. Use of project site, office and storage areas, security, housekeeping, and OWNER's needs
 8. Major equipment deliveries and priorities
 9. CONTRACTOR's assignments for safety and first aid
- D. ENGINEER will preside at the preconstruction conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.
- E. The CONTRACTOR should plan on the conference taking no less than 2 hours.

1.4 PROGRESS MEETINGS

- A. CONTRACTOR shall schedule and hold regular on-site progress meetings at least weekly and at other times as required by ENGINEER or as required by progress of the work. CONTRACTOR, ENGINEER, and all subcontractors active on the site shall be represented at each meeting. CONTRACTOR may at its discretion request attendance by representatives of its suppliers, manufacturers', and other subcontractors.
- B. ENGINEER shall preside at the meetings and provide for keeping and distribution of the minutes. The purpose of the meetings will be to review the progress of the work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.
- C. At each construction progress meeting a progress report shall be presented by the CONTRACTOR containing an updated Progress Schedule. Where the delayed completion date of a project phase is noted, the CONTRACTOR shall describe the anticipated delays or problems and outline the action plan being taken to resolve the issues.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

- END OF SECTION -

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SECTION 01 31 00
PROGRESS SCHEDULES

PART 1 GENERAL

1.1 SUBMITTALS

A. Informational Submittals:

1. Detailed Overall Progress Schedule:
 - a. Submit Progress Schedule within 14 days after Effective Date of the Agreement.
 - b. Submit an Updated Progress Schedule each month.
 - c. Provide written 2-week look ahead schedule at each progress meeting broken down in daily increments.

1.2 PROGRESS SCHEDULE

A. In addition to basic requirements outlined in General Conditions, show a detailed schedule, beginning with Notice to Proceed through Final Completion.

B. Show activities including, but not limited to the following:

1. Notice to Proceed.
2. Submittal Approval for Long Lead
3. Mobilization and Equipment Set Up
4. Construction Activities
5. Delivery of Equipment
6. Electrical System
7. Mechanical Systems
8. Commissioning, & Startup
9. Demobilization and site clean-up
10. Intermediate and Work Completion Milestones

C. Update the Overall Progress Schedule monthly; as part of progress payment process. Failure to do so may result in the Owner withholding all or part of the monthly progress payment until the Progress Schedule is updated in a manner acceptable to Owner/Engineer.

1.3 PROGRESS OF THE WORK

A. Updated Progress Schedule shall reflect:

1. Progress of Work to within 5 working days prior to submission
2. Approved changes in Work scope and activities modified since submission.
3. Delays in Submittals or resubmittals, deliveries, or Work
4. Adjusted or modified sequences of Work
5. Other identifiable changes
6. Revised projections of progress and completion
7. Report of changed logic

1.4 ADJUSTMENT OF CONTRACT TIMES

- A. Reference General Conditions.
- B. Evaluation and reconciliation of Adjustments of Contract Times shall be based on the Updated Progress Schedule at the time of proposed adjustment or claimed delay.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL PROCEDURES

- A. Within 21 days after Notice to Proceed, submit a complete list of anticipated submittals, including Specifications and Drawing references for each.
- B. Wherever submittals are required by the Contract Documents, Shop Drawings, and data shall be transmitted in an electronic format to ENGINEER with a submittal transmittal form which is acceptable to ENGINEER.
- C. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix, i.e. Submittal 1, Submittal 1.A, etc.
- D. Identify Project, Contractor, subcontractor and/or supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
- E. CONTRACTOR shall review submittals prior to submission to ENGINEER. Apply Contractor's stamp, signed and dated, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents. Identify any deviations from the Contract Documents on the submittal transmittal form.
- F. Schedule submittals to expedite Project, and deliver to ENGINEER at their business address. Coordinate submission of related items.
- G. Submittals shall be submitted sufficiently in advance to allow ENGINEER not less than ten regular working days for examining the drawings. These drawings shall be accurate, distinct, and complete and shall contain all required information, including satisfactory identification of items and unit assemblies in relation to the contract drawings and/or specifications.
- H. Identify variations from Contract Documents and product or system limitations which may adversely affect successful performance of completed Work.
- I. If a submittal is returned to CONTRACTOR marked "APPROVED", or similar notification, formal revision and resubmission will not be required.
- J. If a submittal is returned marked "APPROVED – MAKE CORRECTIONS NOTED", or similar notification, CONTRACTOR shall make the corrections on the submittal, however, formal revision and resubmission will not be required.
- K. Resubmittals
 - 1. If a Submittal is returned marked "AMEND AND RESUBMIT", or similar notification, CONTRACTOR shall revise the submittal and resubmit an electronic copy.
 - 2. Identify changes made since the previous submission.

L. Rejected Submittals

1. If a submittal is returned marked "REJECTED – RESUBMIT", or similar notification, it shall mean either that the proposed material or product does not satisfy the specification, the submittal is so incomplete that it cannot be reviewed, or is a substitution request not submitted in accordance with Section 01 60 00 – Product Requirements.
2. CONTRACTOR shall prepare a new submittal or submit a substitution request according to Section 01 60 00 – Product Requirements and shall submit an electronic copy.

M. Instruct parties to promptly report inability to comply with requirements.

N. Submittals not requested will not be recognized or processed.

O. Unless noted otherwise, corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as changes to the contract requirements.

P. Fabrication or purchase of an item may only commence after ENGINEER has reviewed the pertinent submittals and returned copies to CONTRACTOR marked either "APPROVED" or "APPROVED – MAKE CORRECTIONS NOTED".

Q. ENGINEER's review of CONTRACTOR submittals shall not relieve CONTRACTOR of the entire responsibility for the corrections of details and dimensions. CONTRACTOR shall assume all responsibility and risk for any misfits due to any errors in CONTRACTOR submittals. CONTRACTOR shall be responsible for dimensions and quantities, coordinating with all trades, the design of adequate connections and details, and satisfactory and safe performance of the work.

1.2 CONSTRUCTION PROGRESS SCHEDULES

A. Submit construction progress schedule in accordance with Section 01 31 00 – Progress Schedule.

1.3 PRODUCT DATA

A. Product Data: Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 78 50 -Project Closeout.

1.4 SHOP DRAWINGS

A. Shop Drawings: Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

- B. Fabrication of an item may be commenced only after ENGINEER has reviewed the pertinent submittals and returned copies to CONTRACTOR marked either "APPROVED", or "APPROVED - MAKE CORRECTIONS NOTED". Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis of claims for extra work.
- C. When required by individual specification sections, provide shop drawings signed and sealed by professional engineer responsible for designing components shown on shop drawings.
 - 1. Include signed and sealed calculations to support design.
 - 2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
 - 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Project Closeout.

1.5 SAMPLES

- A. Whenever indicated in the specifications or requested by ENGINEER, CONTRACTOR shall submit at least 1 sample of each item or material to ENGINEER for acceptance at no additional cost to OWNER.
- B. Samples, as required herein, shall be submitted for acceptance prior to ordering such material for delivery to the jobsite, and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delay in the Work.
- C. Unless otherwise specified, all colors and textures of specified items will be selected by ENGINEER from the manufacturer's standard colors and standard materials, products, or equipment lines.

1.6 CERTIFICATES

- A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or Contractor to ENGINEER, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to ENGINEER.

1.7 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to ENGINEER

for delivery to Owner in quantities specified for Product Data.

- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.8 MANUFACTURER'S FIELD REPORTS

- A. When required in individual sections, have manufacturer or Supplier provide qualified representative to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment as applicable and to make written report of observations and recommendations to ENGINEER.

1.9 OPERATIONS AND MAINTENANCE MANUAL SUBMITTAL

- A. CONTRACTOR shall furnish ENGINEER one copy of the Operations and Maintenance Manuals in PDF electronic format. A Table of Contents shall be provided which indicates all equipment and suppliers in the Operations and Maintenance Manuals.
- B. CONTRACTOR shall include in the Operations and Maintenance manuals full details for care and maintenance for all visible surfaces as well as the following for each item of mechanical, electrical, and instrumentation equipment (except for equipment furnished by OWNER):
 1. Complete operating instructions, including location of controls, special tools or other equipment required, related instrumentation, and other equipment needed for operation.
 2. Preventative maintenance procedures and schedules
 3. A description of proper maintenance activities
 4. Complete parts lists, by generic title, identification number, and catalog number, complete with exploded views of each assembly.
 5. Disassembly and reassembly instruction
 6. Name and location of nearest supplier and spare parts warehouse
 7. Name and location of manufacturer
 8. Recommended troubleshooting and start-up procedures
 9. Prints of the record drawings, including diagrams and schematics, as required under the electrical and instrumentation portions of these specifications.
- C. All Operations and Maintenance manuals shall be submitted in final form to ENGINEER not later than the 75 percent of construction completion date. All discrepancies found by ENGINEER in the Operations and Maintenance manuals shall be corrected by CONTRACTOR prior to final acceptance of the project.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

- END OF SECTION -

SECTION 01 42 13
ABBREVIATIONS

PART 1 GENERAL

1.1 DESCRIPTION

- A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these specifications, the following acronyms or abbreviations which may appear in these specifications shall have the meanings indicated herein.

1.2 ABBREVIATIONS AND ACRONYMS

| | |
|--------|---|
| AAR | Association of American Railroads |
| AASHTO | American Association of the State Highway and Transportation Officials |
| ACI | American Concrete Institute |
| AGA | American Gas Association |
| AGC | American General Contractors |
| AHA | American Hardboard Association |
| AI | The Asphalt Institute |
| AIA | American Institute of Architects |
| AISC | American Institute of Steel Construction |
| AISI | American Iron and Steel Institute |
| ANSI | American Nation Standards Institute, Inc. |
| APA | American Plywood Association |
| API | American Petroleum Institute |
| APWA | American Public Works Association |
| ASCE | American Society of Civil Engineers |
| ASHRAE | American Society of Heating, Refrigerating, and Air-Conditioning Engineers |
| ASME | American Society of Mechanical Engineers |
| ASOC | American Society of Quality Control |
| ASSE | American Society of Sanitary Engineers |
| ASTM | American Society for Testing and Materials |
| AWS | American Welding Society |
| AWWA | American Water Works Association |
| AWPB | American Wood Preservers Bureau |
| BBC | Basic Building Code, Building Officials and Code Administrators International |
| CEMA | Conveyors Equipment Manufacturer's Association |
| CGA | Compressed Gas Association |
| CLFMI | Chain Link Fence Manufacturer's Institute |
| CMA | Concrete Masonry Association |
| CRSI | Concrete Reinforcing Steel Institute |
| DIPRA | Ductile Iron Pipe Research Association |
| DOC | Department of Commerce |
| DWQ | Department of Water Quality |
| DWR | Drinking Water Regulations |
| ECTC | Erosion Control Technology Council |

| | |
|--------|--|
| EIA | Electronic Industries Association |
| EPA | Environmental Protection Agency |
| ETC | Electrical Test Laboratories |
| FEMA | Federal Emergency Management Agency |
| FHWA | Federal Highway Administration |
| FM | Factory Mutual System |
| HI | Hydraulic Institute |
| IBC | International Building Code |
| ICBO | International Conference of Building Officials |
| ICC | International Code Council |
| ICC-ES | International Code Council Evaluation Service |
| IEEE | Institute of Electrical and Electronics Engineers |
| IES | Illuminating Engineering Society |
| IFC | International Fire Code |
| IMC | International Mechanical Code |
| IME | Institute of Makers of Explosives |
| IPC | International Plumbing Code |
| ISA | Instrument Society of America |
| ISO | International Organization of Standardization |
| ITE | Institute of Traffic Engineers |
| LPI | Lightning Protection Institute |
| LRQA | Lloyd's Register Quality Assurance |
| MBMA | Metal Building Manufacturer's Association |
| MSS | Manufacturers Standardization Society |
| NAAMM | National Association of Architectural Metal Manufacturers |
| NACE | National Association of Corrosion Engineers |
| NBS | National Bureau of Standards |
| NEC | National Electrical Code |
| NEMA | National Electrical Manufacturer's Association |
| NFPA | National Fire Protection Association |
| NFPA | National Forest Products Association |
| NISO | National Information Standards Organization |
| NSF | National Sanitation Foundation |
| OSHA | Occupational Safety and Health Administration |
| PCA | Portland Cement Association |
| PCI | Precast/Prestressed Concrete Institute |
| RCRA | Resource Conservation and Recovery Act |
| RMA | Rubber Manufacturers Association |
| RWMA | Resistance Welder Manufacturer's Association |
| SAE | Society of Automotive Engineers |
| SSPC | Society for Protective Coating (formerly Steel Structure Painting Council) |
| SSPWC | Standard Specification for Public Works Construction |
| TPI | Truss Plate Institute |
| UDOT | Utah Department of Transportation |
| UBC | Uniform Building Code |
| UL | Underwriters Laboratories, Inc. |
| UPRR | Union Pacific Railroad |
| WCRSI | Western Concrete Reinforcing Steel Institute |
| WI | Woodwork Institute |
| WRI | Wire Reinforcements Institute, Inc. |
| WWPA | Western Wood Products Association |

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

- END OF SECTION -

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SECTION 01 42 19
REFERENCE STANDARDS

PART 1 GENERAL

1.1 QUALITY ASSURANCE

A.TITLES OF SECTIONS AND PARAGRAPHS. Captions accompanying Specifications sections and paragraphs are for convenience of reference only, and do not form a part of the Specification.

B.APPLICABLE PUBLICATIONS. Whenever in these specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards or requirements of the respective issuing agencies which have been published as of the date that the work is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the drawings shall be waived because of any provision of, or omission from, said standards or requirements.

C.SPECIALISTS, ASSIGNMENTS. In certain instances, specifications test requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements and shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the work; also, they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with CONTRACTOR.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A.Without limiting the generality of other requirements of the specifications, all work specified herein shall conform to or exceed the requirements of all applicable codes and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of these Specifications nor the applicable codes.

B.Reference herein to "Building Code" or "Uniform Building Code" shall mean the International Building Code of the International Code Council. The latest edition of the code as approved and used by the local agency as of the date of award, as adopted by the agency having jurisdiction, shall apply to the work herein, including all addenda, modifications, amendments, or other lawful changes thereto.

C.In case of conflict between codes, reference standards, drawings and the other Contract Document, the most stringent requirements shall govern. All conflicts shall be brought to the attention of ENGINEER for clarification and directions prior to ordering or providing any materials or labor. CONTRACTOR shall bid the most stringent requirements.

D.APPLICABLE STANDARD SPECIFICATIONS. CONTRACTOR shall construct the work specified herein in accordance with the requirements of the Contract Documents and the

referenced portions of those referenced codes, standards, and specifications listed herein; except, that wherever references to "Standard Specifications" are made, the provisions therein for measurement and payment shall not apply.

E.References in the Contract Documents to "Standard Specifications" shall mean the Contract Documents including all current supplements, addenda, and revisions thereof.

F.References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

G.References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including changes and amendments thereto.

H.UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY. Wells, tanks, pumping stations and culinary water pipelines shall conform to the requirements of Utah Administrative Code Rule R 309. Water and sewer pipeline installation shall conform to the requirements of Utah Administrative Code Rule R 317-3-2.9 "Protection of Water Supplies" for horizontal and vertical separation.

I.UTAH DEPARTMENT OF TRANSPORTATION (UDOT) REQUIREMENTS. CONTRACTOR's work on UDOT property or right-of-way shall conform to UDOT's latest edition of Standard Specifications For Road and Bridge Construction.

J.U.S. ARMY CORPS OF ENGINEERS (COE) REQUIREMENTS. CONTRACTOR's work shall conform to C.O.E. Specifications in accordance with Section 404 of the Clean Water Act for excavation in wetlands.

K.Reference herein to APWA shall mean the latest edition of the "Manual of Standard Specifications" and "Manual of Standard Plans" as prepared by the American Public Works Association and the Associated General Contractors of America.

L.All provisions of the Manual of Standard Specifications, Latest Edition and Manual of Standard Plans, Latest Edition both published by the Utah Chapter of the American Public Works Association are hereby made a part of the Contract Documents by reference. The publications may be purchased separately from the Utah Technology Transfer Center, Utah State University, 4111 Old Main Hill, Logan, UT 84322-4111. Any conflicts, between the technical specifications, drawings, and other provisions or documents contained in the Contract Form or Contract Documents versus provisions contained in the Manual of Standard Specifications, Latest Edition and Manual of Standard Plans, Latest Edition published by the Utah Chapter of the American Public Works Association, shall be resolved in favor of the most stringent of the criteria and conditions as determined by ENGINEER.

M.All provisions of JVVCD standards, and City standards for the various municipalities in which this project is located (i.e. Midvale City, Murray City, and Taylorsville City) are hereby made a part of the Contract Documents by reference. Any conflicts, between the technical specifications, drawings, and other provisions or documents contained in the Contract Form or Contract Documents versus provisions contained in JVVCD standards, or City standards, shall be resolved in favor of the most stringent of the criteria and conditions as determined by ENGINEER.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

- END OF SECTION -

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SECTION 01 45 00
QUALITY CONTROL AND MATERIALS TESTING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section outlines responsibilities for controlling quality of materials, products and workmanship.

1.2 MATERIALS

- A. All materials incorporated in the project shall be new and shall fully comply with the specifications. Unless otherwise clearly provided in the specifications, all workmanship, equipment, materials, and articles incorporated in the work covered by the contract are to be of the best available grade of their respective kinds. Whenever, in the specifications, any material, article, device, product, fixture, form, type of construction, or process indicated or specified by patent or proprietary name, by name of manufacturer, or by catalog number, such specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the material or process desired and shall be deemed to be followed by the words "or approved equal" and CONTRACTOR may in such case, upon receiving the ENGINEER's approval, purchase and use any item, type, or process which shall be substantially equal in every respect to that indicated or specified.
- B. Materials and equipment may be used in the Work based upon receipt of a Supplier's certificate of compliance. Certificate must be in possession of CONTRACTOR and reviewed by ENGINEER prior to use.
- C. Quality Assurance Testing by the OWNER and/or ENGINEER shall not relieve CONTRACTOR of responsibility to furnish materials and work in full compliance with Contract Documents.

1.3 MANUFACTURER'S INSTRUCTIONS

- A. Should instructions conflict with Contract Documents, request clarification before proceeding.
- B. When required in individual sections, submit manufacturer's instructions in the quantity required for product data, delivery, handling, storage, assembly, installation, start-up, adjusting, balancing, and finishing, as appropriate.

1.4 WORKMANSHIP

- A. Maintain performance control and supervision over Subcontractors, Suppliers, manufacturers, products, services, workmanship, and site conditions, to produce work in accordance with Contract Documents.
- B. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- C. Provide suitable qualified personnel to produce specified quality.

- D. Ensure finishes match approved samples.

1.5 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.6 TESTING AND INSPECTION SERVICES

- A. Testing agency and testing for quality control and material testing shall be furnished by CONTRACTOR as part of the project. Results of testing shall be reported to CONTRACTOR and ENGINEER on site. Reports of the testing shall be transmitted directly to the ENGINEER.
- B. Materials to be supplied under this contract will be tested and/or inspected either at their place of origin or at the site of the work by the testing agency. CONTRACTOR shall give ENGINEER written notification well in advance of actual readiness of materials to be tested and/or inspected at point of origin so ENGINEER may witness testing by the testing agency. Satisfactory tests and inspections at the point of origin shall not be construed as a final acceptance of the material nor shall it preclude retesting or reinspection at the site of the work.
- C. CONTRACTOR shall furnish such samples of materials as are requested by the ENGINEER, without charge. No material shall be used until reports from the testing agency have been reviewed and accepted by the ENGINEER. See Section 01 33 00, Submittal Procedures.

1.7 UNSATISFACTORY CONDITIONS

- A. Examine areas and conditions under which materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

1.8 AUTHORITY AND DUTIES OF PROJECT REPRESENTATIVE

- A. Refer to Section 00 80 00 "Supplementary Conditions" sub-section SC 9.3 "Project Representation".

1.9 QUALITY CONTROL TESTING

- A. ENGINEER's failure to detect any defective Work or materials does not prevent later rejection when such defect is discovered, nor does it obligate ENGINEER for acceptance.
- B. CONTRACTOR shall provide 24-hours minimum notice to ENGINEER for all testing required by these specifications so that ENGINEER may coordinate or be present during testing.

1.10 TESTING ACCEPTANCE AND FREQUENCY

- A. Minimum Quality Control Testing Frequency: As defined in Table 01 45 00-1, the CONTRACTOR shall be responsible to ensure that all testing is performed at the frequencies shown. CONTRACTOR shall uncover any work at no cost to OWNER to allow the testing agency to perform required testing at the frequency shown.
- B. Acceptance of Defective Work: As defined in Article 13.08 of the General Conditions.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of correct characteristics, and in correct locations.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

TABLE 01 45 00-1: QUALITY CONTROL TESTING FREQUENCY

| SYSTEM or MATERIAL | TESTS | MINIMUM REQUIRED FREQUENCY |
|--|------------------------------------|--|
| PORTLAND CEMENT CONCRETE | | |
| Section 03 30 00 Cast-in-Place Concrete | Slump | 1 test every day of placement (if less than 100 cubic yards in a day), 1 test for every 100 cubic yards, or 1 test for each 3,000 square feet of surface area for slabs and more frequently if batching appears inconsistent. Conduct with strength tests. |
| | Entrained air | 1 test with slump test. |
| | Ambient and concrete temperatures | 1 test with slump test. |
| | Water cement ratio. | To be verified and provided with batch tickets. |
| | Compressive strength | 1 set of 4 cylinders every 100 c.y. or part thereof per day. |
| SUBGRADE AND BACKFILL MATERIALS | | |
| Section 31 23 15 Excavation and Backfill for Buried Pipelines | Field Density | 1 test per 200 linear feet per 1.5 feet of backfill thickness placed. |
| | Laboratory | 1 test for each material type which includes proctor, classification and gradation. |
| Section 31 23 23 Excavation and Backfill for Structures | Field Density | 1 test per 200 linear feet per 8 inches of backfill thickness placed. |
| | Laboratory | 1 test for each material type which includes proctor, classification and gradation. |
| Section 32 11 23 Road Base - Untreated Base Course | Field Density | Base course subgrade: 1 test per 2,000 square feet of area. Base course: 1 test per 2,000 square feet of area. |
| | Laboratory | Base course: 1 test for each material type which includes proctor, classification and gradation. |
| ASPHALT | | |
| Section 32 12 16 Hot-Mix Asphalt Concrete Paving | Mix Design | <u>Marshall Test Method</u> : 1 test initially per each type of material and each change in target, and for each day of production thereafter. <u>Specific Gravity</u> : 1 per each Marshall Test <u>Extraction</u> : 1 test per each Marshall Test |
| | Field Density | <u>Bituminous surfaces</u> : 1 test per 2,000 square feet placed or part thereof. |
| | Asphalt Thickness and Core Density | <u>Bituminous surfaces</u> : 1 test sample every 300 linear feet of completed roadway. |

| SYSTEM or MATERIAL | TESTS | MINIMUM REQUIRED FREQUENCY |
|---|-------------|----------------------------|
| STEEL PIPE | | |
| Section 33 92 10 Steel Pipe, Specials, and Fittings | Field Welds | Weld tests for piping. |
| <p>NOTES:</p> <ol style="list-style-type: none"> 1 Additional tests shall be conducted when variations occur due to the contractor's operations, weather conditions, site conditions, etc. 2 Classification, moisture content, Atterberg limits and specific gravity tests shall be conducted for each compaction test if applicable. 3 Tests can substitute for same tests required under "Aggregates" (from bins or source), although gradations will be required when blending aggregates. 4 Aggregate moisture tests are to be conducted in conjunction with concrete strength tests for water/cement calculations. | | |

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SECTION 01 45 23
TESTING AGENCY SERVICES

1.1 GENERAL

1.2 SUMMARY

- A. CONTRACTOR shall be responsible for providing Construction Quality Control Testing of all soils, concrete, asphalt, etc. as required by the various sections of these specifications. This section includes the following:
1. Use of independent testing agency
 2. Control testing report submittal requirements
 3. Responsibilities of testing agency

1.3 RELATED WORK

- A. Related work specified in other sections:
1. Section 01 22 00 Measurement and Payment
 2. Section 01 33 00 Submittal Procedures
 3. Section 01 45 00 Quality Control and Materials Testing

1.4 REFERENCES

- A. Work covered by this Specification shall meet or exceed the provisions of the latest editions of the following Codes and Standards in effect at the time of award of the Contract. The publication is referred to in the text by basic designation only.
- B. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
1. ASTM D 3740: Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
 2. ASTM D 4561 Standard Practice for Quality Control Systems for Organizations Producing and Applying Bituminous Paving Materials
 3. ASTM E 329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

1.5 DEFINITIONS

- A. Independent Testing Agency: A testing agency NOT owned by CONTRACTOR, and an agency that does not have any preferential affiliation or association with CONTRACTOR, or any of CONTRACTOR's Subcontractors and Suppliers other than entering into a contract with CONTRACTOR to perform the duties defined in these Specifications.
- B. Professional Engineer: An engineer who complies with Utah licensing law and is acceptable to the authority having jurisdiction.

1.6 QUALITY ASSURANCE

- A. CONTRACTOR shall employ and pay for services of an independent testing agency which complies with ASTM D 3740, ASTM D 4561, and ASTM E 329 to test materials for contract compliance.
- B. Concrete Technician: Approved by ENGINEER or ACI certified.
- C. Person charged with engineering managerial responsibility.
- D. Professional engineer on staff to review services.
- E. Level of certification of technicians.

1.7 CONTRACTOR SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures
- B. If CONTRACTOR is employing and paying for an independent testing agency, prior to start of Work, submit testing agency's name, address, telephone number and the following:
 - 1. Person charged with engineering managerial responsibility
 - 2. Professional engineer on staff to review services
 - 3. Level of certification of technicians

1.8 TESTING AGENCY SUBMITTALS

- A. Field Test Report: Submit report no later than the end of the current day.
- B. Laboratory Test Report: Submit original report within 48 hours after test results are determined.
- C. Final Summary Report: Submit prior to final payment
- D. On all reports include:
 - 1. Project title, number and date of the report
 - 2. Date, time and location of test
 - 3. Name and address of material Supplier
 - 4. Identification of product being tested and type of test performed
 - 5. Identify whether test is initial test or retest
 - 6. Results of testing and interpretation of results
 - 7. Name of technician who performed the testing

1.9 RESPONSIBILITIES OF TESTING AGENCY

- A. Calibrate testing equipment at least annually with devices with an accuracy traceable to either National Bureau of Standards or acceptable values of natural physical constraints.
- B. Provide sufficient personnel at site and cooperate with CONTRACTOR, ENGINEER and OWNER's Representative in performance of testing service.

- C. Secure samples using procedures specified in the applicable testing code.
- D. Perform testing of products in accordance with applicable sections of the Contract Documents.
- E. Immediately report any compliance or noncompliance of materials and mixes to CONTRACTOR, ENGINEER, and OWNER's Representative.
- F. When an out-of-tolerance condition exists, perform additional inspections and testing until the specified tolerance is attained, and identify retesting on test reports.

1.10 LIMITS ON TESTING AGENCY AUTHORITY

- A. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Agency may not suspend Work.
- C. Agency has no authority to accept Work for OWNER.

1.11 MEASUREMENT AND PAYMENT

- A. Testing agency services shall be not be measured or paid as a separate item but shall be included as part of the work for which it relates.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

- END OF SECTION -

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SECTION 01 50 00

TEMPORARY CONSTRUCTION UTILITIES AND ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section covers temporary utilities, including electricity, lighting, telephone service, water, and sanitary facilities; temporary controls, including barriers, protection of work, and water control; and construction facilities, including parking, progress cleaning, and temporary buildings.

1.2 TEMPORARY UTILITIES

- A. Temporary Electricity: CONTRACTOR shall provide, maintain, and pay for all power required by CONTRACTOR, including electrical service to any CONTRACTORS field office.
- B. Temporary Lighting: CONTRACTOR shall provide all temporary lighting required for execution of his work and for employee and public safety. As a minimum, lighting levels during working hours shall meet the requirements of OSHA Subsection 1926.56 illumination.
- C. Temporary Heating and Cooling
1. Provide heating and cooling devices as needed to maintain specified conditions for construction operations.
- D. Temporary Ventilation
1. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. Telephone Service: CONTRACTOR shall provide, maintain and pay for telephone services and to the field office (if required), at time of project mobilization.
- F. Temporary Water Service
1. CONTRACTOR shall provide for all his workers on the project, adequate and reasonably convenient uncontaminated drinking water supply. All facilities shall comply with the regulations of the local and State Departments of Health.
 2. CONTRACTOR shall be responsible to arrange for water, both potable and non-potable water.
 3. When water is taken from a city water system or any other potable water supply source for construction purposes, suitable precautions shall be taken to prevent cross connections and contamination of water supply.
- G. Temporary Sanitary Facilities: CONTRACTOR shall provide and maintain sanitary facilities for his employees and his subcontractors' employees that will comply with the regulations of the local and State Departments of Health.

1.3 TEMPORARY CONTROLS

- A. Barriers: Provide barriers as necessary to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
- B. Project Security
 - 1. CONTRACTOR shall make all necessary provisions to protect the project and CONTRACTOR's facilities from fire, theft, and vandalism, and the public from unnecessary exposure to injury.
 - 2. Entry Control:
 - a. Restrict entrance of persons and vehicles into Project site.
 - b. Allow entrance only to authorized persons.
- C. Dust Control: Execute Work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into the atmosphere. Give all unpaved streets, roads, detours, or haul roads used in the construction area an approved dust-preventive treatment or periodically water to prevent dust. Applicable environmental regulations for dust prevention shall be strictly enforced. **If required, CONTRACTOR shall submit a Fugitive Dust Control Plan to the Division of Air Quality, which meets all state requirements (R307-309). CONTRACTOR shall comply with all of the state requirements in R307-309**
- D. Pest Control: Provide methods, means, and facilities to prevent rodents, pests and insects from damaging the Work.
- E. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. All chemicals used during construction or furnished for project operation whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instruction of the manufacturer.
- F. Protection of Work: CONTRACTOR shall protect installed work and provide special protection where specified in individual specifications sections. CONTRACTOR shall provide temporary and removable protection for installed products, and shall control activity in immediate work area to minimize damage.
- G. Open Burning: No open burning of waste materials will be allowed.
- H. Explosives and Blasting: The use of explosives on the work will not be permitted.
- I. Noise Abatement: In inhabited areas, particularly residential, operations shall be performed in a manner to minimize unnecessary noise generation.
- J. Storm and Ground Water
 - 1. CONTRACTOR shall provide and maintain at all times during construction, ample means and devices with which to promptly remove and properly dispose of all water

- entering the excavation or other parts of the work, whether the water be from surface or underground water sources.
2. In excavation, fill, and grading operations, care shall be taken to disturb the pre-existing drainage pattern as little as possible. Particular care shall be taken not to direct drainage water into private property or into streets or drainage ways inadequate for the increased flow.
 3. CONTRACTOR shall maintain effective means to minimize the quantity of sediments leaving the work area either by storm water or CONTRACTOR's own dewatering operations. CONTRACTOR shall be responsible for obtaining required permits and complying with all City, State, and Federal storm water management regulations and requirements, including preparing and implementing a Storm Water Pollution Prevention Plan (SWPPP) for Construction Activities. If required, CONTRACTOR shall submit a copy of the Notice of Intent and the SWPPP to the OWNER for review and approval.

1.4 CONSTRUCTION FACILITIES

A. VEHICULAR ACCESS

1. Construct temporary access roads from public thoroughfares to serve construction area, of width and load bearing capacity to accommodate unimpeded traffic for construction purposes.
2. Extend and relocate vehicular access as Work progress requires, provide detours as necessary for unimpeded traffic flow.
3. Location of temporary access roads and detours shall be approved by Engineer.
4. Provide unimpeded access for emergency vehicles.
5. Provide and maintain access to fire hydrants and control valves free of obstructions.
6. Provide means of removing mud from vehicle wheels before entering streets.
7. When possible, use existing on-site roads for construction traffic.

- B. Parking: CONTRACTOR shall provide temporary parking areas to accommodate use of construction personnel. Parking shall be located in an area approved by the ENGINEER.

C. Progress Cleaning

1. CONTRACTOR shall maintain areas free of waste materials, debris, and rubbish. Maintain the site in a clean and orderly condition. Upon completion of work, repair all damage caused by equipment and leave the project site free of rubbish or excess materials of any kind.
2. Thoroughly clean all spilled dirt, gravel, or other foreign materials caused by the construction operations from all streets and roads at the conclusion of each day's operation.
3. It shall be the responsibility of CONTRACTOR to promptly clean up and remove any oil and/or fuel spills caused by CONTRACTOR or his Sub-contractors during the course of the project. Contaminated soil shall be properly disposed of by CONTRACTOR in accordance with all applicable laws. CONTRACTOR shall be responsible for any damages to OWNER resulting from CONTRACTOR's negligence in promptly cleaning up said spills.

1.5 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Prior to Final Application for Payment, CONTRACTOR shall remove temporary above grade or buried utilities, equipment, facilities, and materials; clean and repair damage caused by installation or use of temporary work; and restore existing facilities used during construction to original condition.

1.6 CULTURAL RESOURCES

- A. CONTRACTOR's attention is directed to the National Historic Preservation Act of 1966 (16 U.S.C. 470) and 36 CFR 800 which provides for the preservation of potential historical architectural, archeological, or cultural resources (hereinafter called "cultural resources").
- B. CONTRACTOR shall conform to the applicable requirements of the National Historic Preservation Act of 1966 as it relates to the preservation of cultural resources.
- C. If a suspected or unsuspected historical, archaeological, or paleontological item, feature, or site or other cultural resource is encountered during subsurface excavations at the site of construction, the following procedures shall be instituted:
 - 1. Construction operations shall be immediately stopped in the vicinity of the discovery and ENGINEER and OWNER shall be notified of the nature and exact location of the finding. CONTRACTOR shall not damage the discovered objects and shall provide written confirmation of the discovery to ENGINEER within two (2) calendar days.
 - 2. OWNER and ENGINEER will then immediately notify the State Historical Preservation Office (SHPO) and the Utah Geological Survey (UGS).
 - 3. SHPO and UGS will investigate the finding and determine if the resource requires protection and the disposition of the said resource.
- D. If SHPO and UGS determine that the potential find is a bona fide cultural resource, CONTRACTOR shall suspend work at the location of the find under the provisions for changes contained in Articles 10, 11, and 12 of the General Conditions, Section 00 70 00 – General Conditions.

PART 2 PRODUCTS

2.1 TEMPORARY EROSION CONTROL MATERIALS

A. EROSION CONTROL BLANKETS

- 1. Erosion control blankets shall meet the requirements of the Erosion Control Technology Council (ECTC) and the FHWA Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-03 Section 713.17 as a Type 3.B Extended Term Double Net Erosion Control Blanket. The erosion control blanket shall be fabricated from UV-stabilized polypropylene and a straw/coconut blend. The blanket shall be **Model SC150 by Tensar North American Green, Excel CS-3 by Western Excelsior**, or approved equal. The functional longevity shall be 24 months minimum.

B. SILT FENCE

1. Use woven fabric meeting the following properties.

| Table 1 - Silt Fence Geotextile | | | |
|--|-------------|-------------------|-------------------------|
| Property | ASTM | MARV's | |
| | | Standard | High Performance |
| Grab Tensile Strength, lbs. | D 4632 | 90 ^(a) | 120 ^(a) |
| Grab Elongation, % | D 4632 | < 40 | < 40 |
| Flux, gal/min/ft ² | D 4491 | 15 | 90 |
| Apparent Opening Size, (AOS-US sieve) | D 4751 | > 20 | > 30 |
| Ultraviolet Degradation, % | D 4355 | 70 | 90 |
| NOTES (a) Percent of tensile strength retained determined after weathering per ASTM D 4355 for 500-hours | | | |

2. High performance fence to have tape yarns in one principle direction only.
3. Add stabilizers or inhibitors to make the filaments resistant to sunlight or heat deterioration.
4. Finish edges to prevent outer yarn from pulling away from the fabric.
5. Sheets of fabric may be sewn or bonded together. Provide minimum width recommended by manufacturer.
6. No deviation from any requirement in Table 2 due to the presence of seams.
7. Manufactured with pockets for posts, hems with cord, or with posts pre-attached using staples or button head nails.

C. POSTS

1. Minimum length: 4-feet.
2. Steel: Round, U shaped, T shaped, or C shaped with a minimum weight of 1.3-pounds per foot, and have projections for fastening wire.
3. Wood as follows:
 - a. Soft wood posts at least 3-inches in diameter, or nominal 2 x 4-inches and straight to provide a fence without noticeable misalignment.
 - b. Hard wood post providing a minimum cross sectional area of 2.25 square-inches.
4. Fasteners for Wooden Posts:
 - a. Wire staples No. 17 gage minimum with a crown at least 3/4-inches wide and legs at least 1/2-inch long.
 - b. Nails 14 gage minimum, 1-inch long with 3/4-inch button.

PART 3 EXECUTION

3.1 SILT FENCE

- A. Beginning work means acceptance of existing conditions.
- B. Maintain the silt fence until revegetation is complete (defined as when cover reaches a density of at least 70% of pre-disturbance levels. (See storm water permit requirements in Section 01 41 00).
- C. Clear area of any debris and obstructions that may damage geotextile.
- D. Place post in all low points.
- E. Install posts a maximum of 8-feet apart with at least 18-inches in the ground. If not possible to achieve depth, secure posts to prevent overturning.
- F. Attach filter fabric by wire, cord, pockets, staples, nails, or other effective means.
 - 1. When using a wire support fence, provide at least 6 horizontal wires with a minimum of 12 gage wire. Space vertical wires 6-inches maximum. Secure geotextile to the up-slope side of the post. Extend wire into the trench a minimum of 2-inches and extend a maximum of 36-inches above the ground surface.
- G. Install fabric so 6 to 8-inches of fabric is left at the bottom to be buried. Splice together only at support posts with at least a minimum overlap of 18-inches. Extend buried portion 6-inches deep and the rest upstream of the fabric fence.
- H. Sediment Removal: Remove sediment before deposit reaches 1/2 of the height of the silt fence, or extend height of silt fence. After removal of sediment, dress landscape.
- I. Schedule of Locations: Typical locations include the toe of fill slopes, the downhill side of fill slopes, the downhill side of large cut areas, and at natural drainage areas. Limit geotextile materials to handle an area equivalent to 1,000 square feet per 10-feet of fence. Use caution should site slope be steeper than 1:1 (horizontal:vertical), and water flow rates exceed 1 cubic foot per second per 10-feet of fence face.

- END OF SECTION -

SECTION 01 55 26
TRAFFIC CONTROL

PART 1 GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall comply with all rules and regulations of the City, County, and State authorities regarding the closing of public streets or highways. If conditions justify, ENGINEER may authorize CONTRACTOR to conduct his work in specific areas and to specific tasks to avoid sporadic and unorganized work efforts.
- B. All work performed on or within the right-of-way of state roads shall have traffic control devices in place before work begins that meet the requirements of Utah Department of Transportation's "Specifications for Excavation on State Highways".
- C. No road shall be closed by CONTRACTOR to the public except by express permission of the City in which the work is located and after obtaining the required permits. Where it is necessary to close a county or city road to thru traffic, the road shall be closed to thru traffic only - not local traffic. The road shall be closed for one block only, not over 700 feet. The road shall be barricaded at each point of public access with barricades meeting the Utah Department of Transportation's specifications.
- D. Traffic must be kept open on those roads and streets where no detour is possible. CONTRACTOR shall, at all times, conduct his work so as to insure the least possible obstruction to traffic and normal commercial pursuits. All obstructions within traveled roadways shall be protected by approved signs, barricades, and lights where necessary for the safety of the traveling public. The convenience of the general public and residents, and the protection of persons and property are of prime importance and shall be provided for by CONTRACTOR in an adequate and satisfactory manner.
- E. Excavations on project sites from which the public is excluded shall be marked or guarded in a manner appropriate for the hazard.

1.2 TRAFFIC CONTROL

- A. For the protection of traffic in public or private streets and ways, CONTRACTOR shall provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of the "Manual on Uniform Traffic Control Devices for Streets and Highways, Part VI - Temporary Traffic Control," published by U.S. Department of Transportation, Federal Highway Administration. CONTRACTOR shall take all necessary precautions for the protection of the work and the safety of the public. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. CONTRACTOR shall station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdictions. All signs, signals, and barricades shall conform to the requirements of Subpart G, Part 1926, of the OSHA Safety and Health Standards for Construction.
- B. If at any time the conditions indicate that CONTRACTOR's protective facilities and service are inadequate to assure the safety of the public or CONTRACTOR's workers,

CONTRACTOR shall provide additional facilities or services as may be necessary to assure protection at no additional cost to the OWNER.

- C. Where required, CONTRACTOR shall obtain a traffic control permit from the governing agency prior to beginning work, and shall comply with all requirements of the permit.

1.3 MEASUREMENT AND PAYMENT

- A. Traffic Control shall not be measured or paid as a separate item, but shall be included as part of the various items to which it relates.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

- END OF SECTION -

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
- C. Furnish interchangeable components from same manufacturer for components being replaced.

1.2 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.3 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.
- E. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- F. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- G. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- H. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.4 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

1.5 PRODUCT SUBSTITUTION PROCEDURES

- A. ENGINEER will consider requests for Substitutions only after Notice of Award.
- B. Substitutions may be considered when a product becomes unavailable through no fault of CONTRACTOR.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that CONTRACTOR:
 - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 - 2. Will provide the same warranty for a Substitution as for specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to OWNER.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse OWNER for review or redesign services associated with re-approval by authorities having jurisdiction.
- E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
- F. Substitution Submittal Procedure:
 - 1. Submit four copies of request for Substitution for consideration to ENGINEER.
 - 2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
 - 3. ENGINEER may require CONTRACTOR to provide additional data about the proposed substitution.
 - 4. ENGINEER will be the sole judge as to the type, function, and quality of any such substitution and ENGINEER's decision shall be final.
 - 5. ENGINEER will notify CONTRACTOR in writing of decision to accept or reject request.
 - 6. Acceptance by ENGINEER of a substitution proposed by CONTRACTOR shall not relieve CONTRACTOR of the responsibility for full compliance with the Contract Documents and for the adequacy of the substitution.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL

- A. Products shall be installed in accordance with the manufacturers' requirements in a workmanlike manor.

- END OF SECTION -

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SECTION 01 71 13
MOBILIZATION

PART 1 GENERAL

1.1 DESCRIPTION

- A. This Section is provided to cover CONTRACTOR's cost of general and miscellaneous responsibilities and operations not normally attributed to, or included in, any other single bid item. This shall include, but not necessarily be limited to, work described or enumerated in this section under the following subsections.

1.2 MOVING TO AND FROM THE JOB SITE

- A. This shall include CONTRACTOR's preliminary arrangement for starting and stopping construction operations, work schedules, and transportation of equipment and personnel to and from the project.

1.3 CLEAN-UP

- A. The cost of all clean-up work as specified and not covered under other items shall be included in the Bid. Values shall be included in the Schedule of Values, lump-sum price, for "Mobilization/Demobilization".

1.4 TEMPORARY UTILITIES

- A. The cost of water, power, etc. required by CONTRACTOR in performing the work specified in the contract shall be included in the Bid. Values shall be included in the Schedule of Values, lump-sum price, for "Mobilization/Demobilization".

1.5 PERFORMANCE BOND, PAYMENT BOND, AND INSURANCE

- A. The cost of the performance bond, payment bond, and any required insurance and/or other miscellaneous cost associated with this project shall be included with the Bid. Values shall be included in the Schedule of Values, lump-sum price, for "Mobilization/Demobilization".

1.6 PERMITS

- A. CONTRACTOR shall provide all necessary permits for completion of the work. Values shall be included in the Schedule of Values, lump-sum price, for "Mobilization/Demobilization".

1.7 PRE-CONSTRUCTION VIDEO RECORDS

- A. CONTRACTOR is required to produce a preconstruction video recording of areas where work is to be performed. The video record shall be of professional quality and the coverage shall be such, as to allow accurate determination of location, size, and conditions, etc. of existing features and improvements within the rights-of-way. The Contractor shall provide the Owner with a copy of the rights-of-way video in DVD format before construction begins.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

- END OF SECTION -

SECTION 01 76 30
PROTECTION OF EXISTING FACILITIES

PART 1 GENERAL

1.1 DESCRIPTION

A.Any existing facilities, disturbed which are located in or adjacent to the line of work such as curbs, gutters, drive approaches, sidewalks, driveways, fences, underground pipes, conduits, or utilities, shall be cleaned up and restored in kind by CONTRACTOR and in accordance with the specifications contained herein governing the various types of services involved.

B.CONTRACTOR shall not perform work that would affect any oil, gas, sewer, or water pipeline; any telephone, fiber optic, television cable, or electric transmission line; any fence; or any structure, until authorization has been obtained from OWNER of the improvement. Provide OWNER of the improvement due notice of the beginning of the work, and remove, shore, support, or otherwise protect such improvement or replace the same.

1.2 RELATED WORK

A.Related work specified in other sections:

1. Section 01 78 50 – Project Closeout

1.3 RESTORATION OF FENCES

A.Where it is necessary to remove any fence to facilitate CONTRACTOR's operation, CONTRACTOR shall obtain prior agreement with OWNER for removal of the fence, and shall be responsible for any damage due to negligence of CONTRACTOR. As soon as practical, the fence shall be restored substantially to the same or improved condition as it was prior to the commencement of the work. Where livestock is present CONTRACTOR shall provide temporary fencing to keep livestock away from the construction area.

1.4 UNDERGROUND SERVICE ALERT

A.Prior to any excavation in the vicinity of any existing underground facilities, including all water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities; and all roadway and state highway rights-of-way, CONTRACTOR shall notify the regional notification center (Blue Stakes of Utah) at 1-800-662-4111 or 811 or submit an on-line request at www.bluestakes.org at least 2 days, but no more than 7 days, prior to such excavation.

1.5 INTERFERING STRUCTURES AND UTILITIES

A.CONTRACTOR shall exercise all possible caution to prevent damage to existing structures and utilities, whether above ground or underground. Prior to submittal of Shop Drawings, and prior to commencing any excavations for new pipelines or structures, conduct investigations, including exploratory excavations and borings, to

determine the location and type of underground utilities and services connections that could result in damage to such utilities. It shall be the responsibility of CONTRACTOR to locate and expose all existing underground and overhead structures and utilities in such a manner as to prevent damage to same. CONTRACTOR shall notify all utility offices concerned at least 48 hours in advance of construction operations in which a utility agency's facilities may be involved. This shall include, but not be limited to, irrigation water, culinary water, telephone, television cables, fiber optic communication, gas, sewer, storm drain, traffic signals, street lighting and electric. CONTRACTOR shall be responsible for any and all changes to, reconnections to public utility facilities encountered or interrupted during prosecution of the work, and all costs relating hereto shall be at CONTRACTOR's expense. CONTRACTOR shall contract with and pay Public Utility Agencies for work required in connection with all utility interferences and handle all necessary notifications, scheduling, coordination, and details. The cost of public utility interferences shall be included in CONTRACTOR's lump sum or unit price bid covering the major contract facility to which interference or changes are attributable.

B.All exploratory excavations shall be performed as soon as practicable after Notice to Proceed and, in any event, a sufficient time in advance of the construction to avoid possible delays to CONTRACTOR's progress. Prepare a report identifying each utility by its size, elevation, station and material of construction. Immediately notify ENGINEER and the utility in writing as to any utility discovered in a different position than as marked in the field or shown on the Drawings, or any utility which is not marked in the field or not shown on the Drawings.

C.The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the utility. Conform to local agency requirements for backfill and pavement repair subsequent to performing exploratory excavations.

D.Any damages to private property, either inside or outside the limits of the easements provided by OWNER, shall be the responsibility of CONTRACTOR. Any roads, structures, or utilities damaged by the work shall be repaired or replaced in a condition equal to or better than the condition prior to the damage. Such repair or replacement shall be accomplished at CONTRACTOR's expense without additional compensation from OWNER.

E.CONTRACTOR shall remove and replace small miscellaneous structures such as fences and culverts which are damaged by the construction activity at his own expense without additional compensation from OWNER. CONTRACTOR shall replace these structures in a condition as good as or better than their original condition.

F.At points where CONTRACTOR's operations are adjacent to or across properties of railway, fiber optic, telephone, irrigation canal, power, gas, water, or adjacent to other property (damage to which might result in considerable expense, loss, and inconvenience), no work shall be started until all arrangements necessary for the protection thereof have been made.

G.The locations of the major existing culinary water lines, sewer lines, storm water, gas pipes, underground electric, cable television, fiber optic communication, and telephone lines that are shown on the plans were taken from city maps, and maps supplied by the utility owner. No excavations were made to verify the locations shown for underground utilities, unless specifically stated on the Drawings. It should be expected that some

location discrepancies will occur. Neither OWNER nor its officers or agents shall be responsible for damages to CONTRACTOR as a result of the locations of the utilities being other than those shown on the plans or for the existence of utilities not shown on the plans.

H.CONTRACTOR shall be solely and directly responsible to OWNERS and operators of such properties for any damage, injury, expense, loss or inconvenience, delay, suits, actions, or claims of any character brought because of an injury or damage which may result from the carrying out of the work to be done under the contract.

I.All utilities including all water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities encountered along the line of the work shall remain continuously in service during all operations under the Contract, unless other arrangements satisfactory to ENGINEER are made with OWNER of said utility.

J.In the event of interruption to either domestic or irrigation water, or to other utility services as a result of accidental breakage, or as a result of being exposed or unsupported, CONTRACTOR shall promptly notify the proper authority. CONTRACTOR shall cooperate with the authority in restoration of service as soon as possible, and shall not allow interruption of any water or utility service outside working hours unless prior approval is received.

K.In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of CONTRACTOR, be notified by OWNER to move such property within a specified reasonable time. When utility lines that are to be moved are encountered within the area of operations, CONTRACTOR shall notify ENGINEER a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.

L.Where the proper completion of the WORK requires the temporary or permanent removal and/or relocation of an existing Utility or other improvement which is indicated, CONTRACTOR shall remove and, without unnecessary delay, temporarily replace or relocate such Utility or improvement in a manner satisfactory to ENGINEER and OWNER of the facility. In all cases of such temporary removal or relocation, restoration to the former location shall be accomplished by CONTRACTOR in a manner that will restore or replace the Utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.

1.6 RIGHTS-OF-WAY

A.CONTRACTOR shall be required to confine construction operations within the dedicated rights-of-way for public thorough fares, or within areas for which construction easements have been obtained, unless they have made special arrangements with the affected property owners in advance. CONTRACTOR shall be required to protect stored materials, cultivated trees and crops, and other items adjacent to the proposed construction site.

B.CONTRACTOR shall submit for approval by ENGINEER the type and size of equipment used, and the methods for work performed on the rights-of-way across private properties, to avoid or minimize injury to trees, shrubs, gardens, lawns, fences, driveways, retaining walls, or other improvements within the rights-of-way.

C.The construction easement widths and access to private properties are as shown on the Drawings and as described in the easement documents; however, CONTRACTOR is to minimize impacts to surface improvements within the right-of-way. CONTRACTOR shall obtain a signed release from the property owner, approving restoration of work in the construction easements across or bordering private properties. See Project Closeout Section 01 70 00, 1.4.D.

D.Property owners affected by the construction shall be notified by CONTRACTOR at least 48 hours in advance of the time the construction begins. During all construction operations, CONTRACTOR shall construct and maintain such facilities as may be required to provide access by all property owners to their property. No person shall be cut off from access to his property for a period exceeding 8 hours unless CONTRACTOR has made special arrangements with the affected persons. CONTRACTOR shall, daily or more frequently if necessary, grade all disturbed areas to be smooth for motor vehicle traffic.

1.7 PROTECTION OF SURVEY, STREET OR ROADWAY MARKERS

A.CONTRACTOR shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced. Survey markers or points disturbed by CONTRACTOR shall be accurately restored after street or roadway resurfacing has been completed.

1.8 TREES OR SHRUBS WITHIN PROJECT LIMITS

A.Except where trees or shrubs are indicated to be removed, CONTRACTOR shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of-way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the jurisdictional agency or OWNER. Existing trees and shrubs which are damaged during construction shall be trimmed or replaced by CONTRACTOR or a certified tree company under permit from the jurisdictional agency and/or OWNER. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs.

1. Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to the trunk or large branch. Spikes shall not be used for climbing live trees. Cuts over 1-1/2 inches in diameter shall be coated with a tree paint product that is waterproof, adhesive, and elastic, and free from kerosene, coal tar, creosote, or other material injurious to the life of the tree.
2. CONTRACTOR shall immediately notify the jurisdictional agency and/or OWNER if any tree or shrub is damaged by CONTRACTOR's operations. If, in the opinion of said agency or OWNER, the damage is such that replacement is necessary, CONTRACTOR shall replace the tree or shrub at its own expense. The tree or shrub shall be of a like size and variety as the one damaged, or, if of a smaller size, CONTRACTOR shall pay to OWNER of said tree a compensatory payment acceptable to the tree or shrub owner, subject to the approval of the jurisdictional agency or OWNER. The size of the tree or shrub shall be not less than 1-inch diameter nor less than 6 feet in height.

1.9 RESTORATION OF PAVEMENT

- A. Pavement work shall meet the specifications for installation as noted in APWA Section 33 12 16 or in accordance with more stringent requirements of City, County, or State agencies where the project is located.
- B. Concrete pavement restoration shall meet the specifications for installation as noted in APWA Plan 256.2 and APWA Section 32 01 19 or in accordance with more stringent requirements of City, County, or State agencies where the project is located.
- C. All asphalt paved areas damaged during construction shall be replaced with similar materials of equal thickness plus 1 inch to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract or in the requirements of the agency issuing the permit. The pavement restoration requirement to match existing sections shall apply to all components of existing sections, including sub-base, base, and pavement. Pavements which are subject to partial removal shall be neatly sawcut in straight lines.
- D. Wherever required by the local agency having jurisdiction, CONTRACTOR shall place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.

1.10 CONCRETE WORK

- A. Concrete work shall meet the specifications for installation as noted in APWA Section 32 16 13 - Driveway, Sidewalk, Curb and Gutter.
- B. All flat work in streets tying into existing flatwork shall be doweled into the existing concrete. Dowels to be spaced at 12" O.C. and be No. 5 rebar x 14" for slabs up to 8 inches in thickness and No. 8 rebar x 18" for slabs over 8 inches.

1.11 LAWNS

- A. Any lawns that are damaged or destroyed during performance of the work shall be repaired or replaced with turf sod according to APWA Section 32 92 00 - Turf and Grass.

1.12 FENCES

- A. Fences that are damaged or destroyed during performance of the work shall be repaired or replaced back to the original condition or better to the satisfaction of the land owner and OWNER.

1.13 LANDSCAPING

- A. All landscaping on private property that is damaged or destroyed during performance of the work shall be repaired or replaced back to the original condition or better to the satisfaction of the land owner and OWNER.

1.14 OTHER SURFACE IMPROVEMENTS

A.All other surface improvements not explicitly mentioned herein that are damaged or destroyed during performance of the work shall be repaired or replaced back to original condition or better.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

- END OF SECTION -

SECTION 01 78 50
PROJECT CLOSEOUT

PART 1 GENERAL

1.1 FINAL CLEANUP

- A. CONTRACTOR shall promptly remove from the vicinity of the completed work, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the work by OWNER will be withheld until CONTRACTOR has satisfactorily complied with the foregoing requirements for final cleanup of the project site.

1.2 TOUCH-UP AND REPAIR

- A. CONTRACTOR shall touch up or repair all finished surfaces on structures, equipment, fixtures, etc., that have been damaged prior to final acceptance. Surface on which such touch-up or repair cannot be successfully accomplished shall be completely refinished or in the case of hardware and similar small items, the item shall be replaced.

1.3 CLOSEOUT TIMETABLE

- A. CONTRACTOR shall establish dates for equipment testing, acceptance periods and on-site instructional periods (as required under the Contract). Such dates shall be established not less than one week prior to beginning any of the foregoing items, to allow OWNER, ENGINEER, and their authorized representatives sufficient time to schedule attendance at such activities.

1.4 MAINTENANCE AND GUARANTEE

- A. CONTRACTOR shall comply with the maintenance and guarantee requirements contained in Article 6 of the General Conditions, Section 00 72 00.
- B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as part of such required repair work, and any repair or resurfacing which becomes necessary by reason of such required repair work shall be completed by CONTRACTOR at no cost to OWNER.
- C. CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order from OWNER. If CONTRACTOR fails to make such repairs or replacement promptly, OWNER reserves the right to do the work and CONTRACTOR and his surety shall be liable to OWNER for the cost thereof.
- D. CONTRACTOR shall obtain a signed release from the property owner approving restoration of work in the construction easements across or bordering private property.

1.5 BOND

- A. CONTRACTOR shall provide a bond to guarantee performance of the provisions contained in Paragraph "Maintenance and Guarantee" above, and Article 13 of the General Conditions of the Contract.

1.6 FINAL ACCEPTANCE

- A. Final acceptance and final payment shall not be made until all provisions of the General Conditions of the Contract Article 14 have been satisfied.

1.7 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, Product Data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by OWNER.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements
 - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work
 - 3. Field changes of dimension and detail
 - 4. Details not on original Contract drawings
- G. Submit documents to Engineer with claim for final Application for Payment.

1.8 CONTRACT CLOSEOUT

- A. As a condition precedent to final acceptance of the project, the Contractor shall complete the following forms and submit the original and two copies of each form to the Project Representative.
 - 1. Contractor's Certificate of Substantial Completion
 - 2. Contractor's Certificate of Final Completion
 - 3. Contractor's Final Waiver of Lien
 - 4. Consent of Surety for Final Payment
 - 5. Affidavit of Payment
 - 6. Affidavit of Release of Liens by the Contractor

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

CONTRACTOR'S CERTIFICATE OF SUBSTANTIAL COMPLETION

OWNER

TO: Jordan Valley Water Conservancy District
8215 South 3200 West
West Jordan, Utah 84088

PROJECT: _____

ATTENTION: _____

FROM: _____
Firm or Corporation

This is to certify that I, _____ am an authorized official of _____
_____ working in the capacity of _____
_____ and have been properly authorized by said form or corporation to sign the following
statements pertaining to the subject contract.

I know of my own personal knowledge, and do hereby certify, that the work of the Contract described above has been substantially performed, and materials used and installed to date in accordance with, and in conformity to, the Contract drawings and specifications. A list of all incomplete work is attached.

The Contractor hereby releases the Owner and its agents from all claims and liability to the Contractor for anything done or finished for or relating to the Work, as specified in the Project Manual, except demands against the Owner for the remainder of progress payments retained to date, and unresolved written claims prior to this date.

The Contract Work is now substantially complete, ready for its intended use, and ready for your inspection. You are requested to issue a Certificate of Substantial Completion.

Signature: _____

Date: _____

CONTRACTOR'S CERTIFICATE OF FINAL COMPLETION

OWNER

TO: Jordan Valley Water Conservancy District
8215 South 3200 West
West Jordan, Utah 84088

PROJECT: _____

ATTENTION: _____

FROM: _____
Firm or Corporation

This is to certify that I, _____ am an authorized official of _____
_____ working in the capacity of _____
_____ and have been properly authorized by said form or corporation to sign the following
statements pertaining to the subject contract.

I know of my own personal knowledge, and do hereby certify, that the work of the Contract described above has been substantially performed, and materials used and installed to date in accordance with, and in conformity to, the Contract drawings and specifications.

The Contractor hereby releases the Owner and its agents from all claims and liability to the Contractor for anything done or finished for or relating to the Work. The Contract Work is now complete in all parts and requirements, ready for its intended use, excepting the attached list of minor deficiencies and the reason for each being incomplete to date, for which exemption from final payment requirements is requested (if no exemptions requested, write [none]) _____. The Work is now ready for your final inspection. The following items are required from the Contractor prior to application for final payment and are submitted herewith, if any:

I understand that neither the issuance, by the Owner, or a Certificate of Final Completion, nor the acceptance thereof by the Owner, shall operate as a bar claim against the Contractor under the terms of the guarantee provisions of the Contract Documents.

Signature: _____
Date: _____

CONTRACTORS FINAL WAIVER OF LIEN

TO ALL WHOM IT MAY CONCERN:

WHEREAS, the undersigned has furnished labor and materials for (A) _____

in the City of _____, County of Salt Lake, State of Utah, of which Jordan Valley Water Conservancy District is the Owner.

NOW THEREFOR, this _____ day of _____, 20____, for and in consideration of the sum of (B) _____ dollars paid simultaneously herewith, the receipt whereof is hereby acknowledged by the undersigned, the undersigned does hereby waive and release any lien* right to, or claim of lien with respect to and on said above described premises, and the improvements thereon, and on the monies or other consideration due or to become due from the Owner, on account of labor, services, materials, fixtures, apparatus or machinery heretofore or which may hereafter be furnished by the undersigned to or for the above described premises by virtue of said contract.

(C) _____ (SEAL)
(Name of sole ownership, corporation or partnership)

(C) _____ (SEAL)
(Signature of Authorized Representative)

Title: _____

INSTRUCTION FOR FINAL WAIVER:

- A. Project name.
- B. Final Contract amount received (total amount of Contract as adjusted).
- C. If the waiver is for a corporation, corporate name should be used, corporate seal affixed, and title of officer signing waiver should be set forth; if waiver is for a partnership, the partnership name should be used, partner should sign and designate himself/herself as partner.

* The word Lien as used herein shall include Stop Orders, Stop Notices, or Freeze Orders on monies or other consideration of the Owner which are due or are to become due on the Contract referenced above.

CONSENT OF SURETY FOR FINAL PAYMENT

Project Name: _____

Location: _____

Type of Contract: _____

Amount of Contract: _____

In accordance with the provisions of the above named contract between the Owner and the Contractor, the following named surety:

on the Payment Bond of the following named Contractor:

hereby approves of final payment to the Contractor, and further agrees that said final payment to the Contractor shall not relieve the Surety Company named herein of any of its obligations to the following named Owner (as set forth in said Surety Company's bond):

Jordan Valley Water Conservancy District
8215 South 3200 West
West Jordan, Utah 84088

IN WITNESS WHEREOF, the Surety Company has hereunto set its hand and seal this __ day of _____, 20__.

(Name of Surety Company)

(Signature of Authorized Representative)

Title: _____

AFFIDAVIT OF PAYMENT

TO ALL WHOM IT MAY CONCERN:

WHEREAS, the undersigned has been employed by Jordan Valley Water Conservancy District to furnish labor and materials under a contract dated _____ for the project named _____ in the City of _____ County of Salt Lake, State of Utah.

NOW THEREFORE, this _____ day of _____, 20____, the undersigned, as the Contractor for the above named Contract pursuant to the conditions of the Contract, hereby certifies that, except as listed below, he has paid in full or has otherwise satisfied all obligations for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or its property might in any way be held responsible.

EXCEPTIONS: (If none, write [none]. If required by the Owner, the Contractor furnish bond satisfactory to the Owner for each exception).

{AFFIX CORPORATE}
{SEAL HERE}

Contractor (Name of sole ownership,
Corporation or partnership)

(Signature of Authorized Representative)

Title: _____

AFFIDAVIT OF RELEASE OF LIENS BY THE CONTRACTOR

TO ALL WHOM IT MAY CONCERN:

WHEREAS, the undersigned has been employed by Jordan Valley Water Conservancy District to furnish labor and materials under a contract dated _____ for the project named _____ in the City of _____ County of Salt Lake, State of Utah.

NOW THEREFOR, this _____ day of _____, 20_____, the undersigned, as the Contractor for the above named Contract pursuant to the conditions of the Contract, hereby certifies that to the best of his/her knowledge, information and belief, except as listed below, the Releases or Waivers of Lien* attached hereto include the Contractor, all subcontractors, all suppliers of material and equipment, and all performers of work, labor or services, who have or may have liens against any property of the Owner and on the monies or other consideration due to becomes due from the Owner arising in any manner in connection with the performance of the Contract referenced above.

EXCEPTIONS: (If none, write "none". If required by the Owner, the Contractor furnish bond satisfactory to the Owner for each exception).

ATTACHMENTS:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Release or Waiver of Liens from subcontractors and material suppliers.

{AFFIX CORPORATE}
{SEAL HERE}

Contractor (Name of sole ownership,
Corporation or partnership)

(Signature of Authorized Representative)

Title: _____

* The word Lien as used herein shall include Stop Orders, Stop Notices, or Freeze Orders on monies or other consideration of the Owner which are due or are to become due on the Contract referenced above.

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SECTION 01 91 00
COMMISSIONING, TESTING AND STARTUP

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Commissioning description.
 2. Submittals.
 3. Commissioning services.
 4. Commissioning responsibilities.
 5. Commissioning reports.
 6. Test equipment.
 7. Verification check and startup procedures.
 8. Functional performance test procedures.
 9. Function performance test methods.
 10. Deficiencies and test approvals.
 11. Demonstration.

1.2 COMMISSIONING DESCRIPTION

- A. Commissioning: Systematic process of ensuring systems perform interactively according to design intent and Owner's operational needs. Commissioning process encompasses and coordinates system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training, and verification of actual performance.
- B. Commissioning does not relieve Contractor of responsibility to provide finished and fully functioning Project.

1.1 CONTRACTOR SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- B. Qualifications Data: Submit to ENGINEER prior to start of Work:
- C. Furnish one copy of verification check and startup plan to ENGINEER for review and approval.
- D. Submit written training plan to ENGINEER for review and approval prior to conducting training.
- E. ENGINEER will review and approve submittals for conformance to Contract Documents as related to commissioning process for primary purpose of aiding development of functional testing procedures and secondarily to verify compliance with equipment specifications.

1.2 CLOSEOUT SUBMITTALS

- A. Commissioning Record: CONTRACTOR shall submit one copy of commissioning record for inclusion in operation and maintenance manuals.

- B. Final Commissioning Report: CONTRACTOR shall submit one copy of final commissioning report.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with specified requirements and guidelines.
- B. Perform Work in accordance with State, Municipality, District or other specified standards.
- C. Maintain one copy of each document on site.

1.4 COMMISSIONING SERVICES

- A. CONTRACTOR shall employ and pay for services of independent firms as required for the work, acceptable to OWNER to perform specified commissioning and/or startup.

1.5 COMMISSIONING RESPONSIBILITIES

- A. CONTRACTOR Responsibilities:
 - 1. Include requirements for commissioning submittal data, operation and maintenance data, commissioning tasks and training in each purchase order and subcontract for equipment and systems indicated to be commissioned.
 - 2. Facilitate coordination of commissioning of work.
 - 3. Cooperate with independent firms, and provide access to the Work and to manufacturers' facilities.
 - 4. Require equipment and system installers to review and provide comments on functional test procedures.
 - 5. Require manufacturers to review commissioning test procedures for equipment installed by manufacturer.
 - 6. Furnish proprietary test equipment required by manufacturers to complete equipment and system tests.
 - 7. Furnish qualified personnel to assist in completing commissioning.
 - 8. Furnish manufacturer's qualified field representatives to assist in completing commissioning.
 - 9. Ensure equipment and system installers execute commissioning responsibilities according to Contract Documents and schedule.
 - 10. Coordinate Owner's personnel training.
 - 11. Prepare operation and maintenance manuals. Update original sequences of operation reflecting actual installation.
 - 12. Ensure equipment and system installers correct deficiencies and make necessary adjustments to operation and maintenance manuals and Record Documents for issues identified in testing.

1.6 COMMISSIONING REPORTS

- A. Reports: Submit reports regularly to Owner/Engineer.
- B. Functional Performance Test Procedures: Develop test procedures including forms to be completed during commissioning. Include completed documentation in operation and maintenance manuals.

1.7 MEASUREMENT AND PAYMENT

- A. There shall be no measurement or payment for Commissioning, Testing or Startup but it shall be included as part of the various items to which it relates.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

- A. Testing Equipment: Calibrated within last year; of sufficient quality and accuracy to test and measure system performance within the specified tolerances unless otherwise specified for individual equipment or systems.
- B. Recalibrate test equipment according to manufacturer's recommended intervals and when dropped or damaged.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify equipment and systems are installed in accordance with individual specification sections.
- B. Verify utility and power connections are complete and services operational.

3.2 VERIFICATION CHECK AND STARTUP PROCEDURES

- A. Notify ENGINEER/OWNER and schedule verification check and startup activities with each party required to complete verification check and startup minimum 2 weeks in advance.
- B. Allow ENGINEER to witness verification check and startup.
 - 1. Primary Equipment: ENGINEER will witness procedures for each piece of equipment.
 - 2. Secondary Equipment: ENGINEER will witness sampling of each type unit as specified in Commissioning Plan.
- C. Verification Check and Startup:
 - 1. Perform verification check and startup in accordance with approved verification check and startup plan.
 - 2. Complete each procedure in sequence performed by party assigned to each procedure.
 - 3. Record completion of each procedure. Indicate results of procedure where required. Sign and date plan by individual performing procedure.
 - 4. Submit executed plan to ENGINEER within 2 days of completion.
- D. Deficiencies and Approvals:
 - 1. ENGINEER will review verification check and startup reports and issue deficiency report or approval.
 - 2. Correct deficiencies and resubmit updated verification check and startup report with

statement indicating corrections made for ENGINEER approval.

3.3 FUNCTIONAL PERFORMANCE TEST PROCEDURES

- A. Notify ENGINEER of completion of verification check and startup activities.
- B. CONTRACTOR shall witness and document results of functional performance tests.
- C. Demonstrate each piece of equipment and system is operating according to documented design intent and Contract Documents.
- D. Operate each piece of equipment and system through each specified mode of operation including seasonal, occupied, unoccupied, warm up, cool down, partial load and full load conditions.

3.4 FUNCTIONAL PERFORMANCE TEST METHODS

- A. Perform testing and verification by using manual testing or by monitoring performance and analyzing results using control system trend log capabilities or by stand-alone data loggers as specified for each piece of equipment or system.
- B. Simulated Conditions: Simulating conditions, not by overwritten values, is permitted. Timing tests to use real conditions is encouraged wherever practical.
- C. Overwritten Values: Overwriting sensor values to simulate conditions may be used with caution and avoided when possible.
- D. Simulated Signals: Using signal generator to create simulated signals to test and calibrate transducers automatic temperature controls is generally recommended over using sensors as signal generators with simulated conditions or overwritten values.
- E. Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test specific sequence is acceptable. Reset setpoint after completing test.
- F. Indirect Indicators: Using indirect indicators for responses or performance is permitted only after visually and directly verifying and documenting indirect readings through control system representing actual conditions and responses over tested parameter range.
- G. Perform each function and test under conditions simulating actual conditions as close as is practically possible.
- H. Sampling: Multiple identical pieces of equipment or equipment with only small size or capacity differences may be functionally tested using sampling strategy when permitted by other sections.

3.5 DEFICIENCIES AND TEST APPROVALS

- A. Deficiencies:
 - 1. CONTRACTOR shall record and report deficiencies to Owner.
 - 2. Minor deficiencies may be corrected during tests at installers discretion. Deficiency

- and resolution will be documented on procedure form.
3. Failure to attend scheduled verification check, startup, or functional performance test will be considered deficiency.
 4. When deficiency is identified, CONTRACTOR shall discuss issue with party executing test.
 - a. When party executing test accepts responsibility to correct deficiency:
 - 1) CONTRACTOR submits deficiency report to Owner, and party executing test.
 - 2) Party executing test corrects deficiency, signs statement of correction on deficiency form certifying equipment is ready retesting and submits form to ENGINEER.
 - 3) CONTRACTOR reschedules test and test is repeated until satisfactory performance is achieved.
 - b. When party executing test disputes deficiency or responsibility for deficiency:
 - 1) CONTRACTOR submits deficiency report to ENGINEER/OWNER, and party executing test and party believed to be responsible for deficiency.
 - 2) CONTRACTOR negotiates resolution with parties involved and refers continuing disputes to OWNER/ENGINEER for resolution in accordance with Contract Documents.
 - 3) CONTRACTOR documents resolution process.
 - 4) When resolution is decided, appropriate party corrects deficiency, signs statement of correction on deficiency form certifying equipment is ready for retesting and submits form to OWNER/ENGINEER.
 - 5) CONTRACTOR reschedules test and test is repeated until satisfactory performance is achieved.

B. Retesting Costs:

1. When verification check and startup or functional performance test deficiency is discovered requiring rescheduling or retesting:
 - a. Owner will deduct additional testing compensation from final payment due to CONTRACTOR.

3.6 DEMONSTRATION

- A. Demonstrate equipment and systems and train Owner's personnel as specified in individual equipment and system specifications.
- B. ENGINEER/OWNER will develop criteria for determining training was satisfactorily completed, including attending some training sessions.

- END OF SECTION -

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SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Removal of designated piping and valves within the existing structures.
- B. If demolition of electrical equipment is required, see the requirements in the Electrical Specifications.

1.2 RELATED WORK

- A. Related work in other sections includes but is not limited to:
 - 1. Section 01 33 00 Submittal Procedures

1.3 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- B. Shop Drawings and Schedule: Describe demolition, removal procedures, sequence and schedule.

1.4 CLOSEOUT SUBMITTALS

- A. Provide Project Record Documents: Record actual locations of any changes to the design.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Piping modifications shall include the materials noted in the specific Sections related to the changes.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Document condition of adjacent structures and buildings indicated to remain.

3.2 PREPARATION

- A. Contact OWNER not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Provide, erect, and maintain temporary barriers and security devices.

- C. Notify adjacent owners of work which may affect their property, potential noise or vibration, utility outage, or disruption seven days prior to the start of Work. Coordinate with Owner.
- D. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.
- E. Protect existing structures indicated to remain.

3.3 DEMOLITION REQUIREMENTS

- A. Conduct demolition to minimize interference with adjacent structures.
- B. Conduct operations with minimum interference to public or private accesses.
- C. Maintain egress and access at all times. Do not close or obstruct roadways without permits.
- D. Water sprinkling, temporary enclosures, chutes, and other suitable methods shall be used to limit dust and debris rising and scattering in the area. CONTRACTOR shall comply with local, State, and Federal environmental regulations pertaining to environmental protection. Water shall not be used if it creates hazardous or objectionable conditions such as ice, flooding, or pollution.
- E. Cease operations immediately when adjacent structures appear to be in danger. Notify OWNER and ENGINEER.

3.4 STRUCTURE DEMOLITION

- A. Disconnect, remove as required, and cap designated utilities. Identify utilities at termination of demolition. Record termination or capped location on Record Documents.
- B. Remove the existing piping as noted on the Drawings.
- C. Remove existing structures as noted on the Drawings.
- D. Demolish and remove components in an orderly and careful manner.
- E. Protect all existing structures not to be removed.

3.5 CLEAN UP

- A. Remove and properly dispose of demolished materials from site as work progresses.
- B. Leave areas of work in clean condition.
- C. Adjacent structures shall be cleaned of dust, dirt, and debris caused by the demolition, as requested by ENGINEER or directed by governing authorities, and adjacent areas shall be returned to pre-demolition conditions.

- END OF SECTION -

SECTION 03 31 05
CONTROLLED LOW STRENGTH MATERIAL

PART 1 GENERAL

1.1 REQUIREMENTS

- A. CONTRACTOR shall provide Controlled Low Strength Material (CLSM), complete and in place, in accordance with the Contract Documents.
- B. CLSM shall be placed where indicated and may be used, if ENGINEER approves, for the following purposes:
 - 1. Normal CLSM with high slump, non-segregating consistency that readily flows and fills voids and difficult to reach places: pipe zone fill, trench zone fill, pipe abandonment, structure backfill, and structure cavity fill.
 - 2. Foundation CLSM is used where higher early strengths are required and future excavation is not likely to be required.

1.2 RELATED WORK

- A. Related work in other sections includes but is not limited to:
 - 1. Section 01 33 00 Submittal Procedures
 - 2. Section 31 23 15 Excavation and Backfill for Buried Pipelines

1.3 REFERENCES

- A. The latest edition of the following publications form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - 1. ASTM C 33 Standard Specification for Concrete Aggregates
 - 2. ASTM C 94 Standard Specification for Ready-Mixed Concrete
 - 3. ASTM C 138 Standard Test Method for Density (Unit Weight), Yield and Air Content (Gravimetric) of Concrete
 - 4. ASTM C 150 Standard Specification for Portland Cement
 - 5. ASTM C 260 Standard Specification for Air-Entraining Admixtures for Concrete.
 - 6. ASTM C 403 Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
 - 7. ASTM C 494 Standard Specification for Chemical Admixtures for Concrete
 - 8. ASTM C 618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

- 9. ASTM C 803 Standard Test Method for Penetration Resistance of Hardened Concrete
- 10. ASTM D 4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- 11. ASTM D 4832 Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders

1.4 SUBMITTALS

- A. Submittals shall be furnished in accordance with Section 01 33 00 – Submittal Procedures.
- B. Shop Drawings:
 - 1. CLSM mix designs which show the proportions and gradations of all materials proposed for each type of CLSM indicated. Each mix design shall be accompanied by independent laboratory test results of the indicated properties.
 - 2. If Contractor proposes to provide lower strength CLSM with aggregates that do not conform to ASTM C 33, Shop Drawings shall include a testing program that will be used to control the variability of the aggregates. The testing program shall be acceptable to ENGINEER.

1.5 QUALITY ASSURANCE:

- A. All testing will be done by a testing laboratory at CONTRACTOR'S expense, except as otherwise indicated.
- B. If tests of the CLSM show non-compliance with the specifications, CONTRACTOR shall make changes as may be required to achieve compliance. Performing and paying for subsequent testing to show compliance shall be CONTRACTOR's responsibility.
- C. Correlation Tests
 - 1. CONTRACTOR shall perform a field correlation test for each mix of CLSM used in pipe zone, trench zone, or backfill used in amounts greater than 100 cubic yards or when CLSM is required to support traffic or other live loads on the fill less than 7 days.
 - 2. Field correlation tests shall be performed in a test pit similar in cross section to the WORK and at least 10-feet long at a location near the WORK. The proposed location shall be acceptable to ENGINEER.
 - 3. Laboratory and field tests shall be performed on samples taken from the same CLSM batch mix. All tests shall be performed by a laboratory at CONTRACTOR's expense.
 - 4. Testing shall be performed once each 2-hours during the first 8 hours, once each 8-hours during the first week, and once each 24-hours until the CLSM mix reaches the maximum design strength.
 - a. Compression testing shall be in accordance with ASTM D 4832.

- b. Setting test shall be in accordance with ASTM C 403.
- c. Density tests shall be in accordance with ASTM C 138.

PART 2 PRODUCTS

2.1 CONTROLLED LOW STRENGTH MATERIAL

- A. CLSM shall be a mixture of cement, pozzolan, coarse and fine aggregate, admixtures, and water, mixed in accordance with ASTM C 94.
- B. Composition: The following parameters shall be within the indicated limits and as necessary to produce the indicated compressive strengths.
 - 1. The actual mix proportions and flow characteristics shall be determined by the producer of the CLSM to meet requirements for compressive strength as specified for Normal CLSM or Foundation CLSM.
 - 2. Entrained air content shall be between 15 percent minimum and 30 percent maximum.
 - 3. Water reducing agent content as necessary.
- C. Properties
 - 1. Density shall be between 120 PCF minimum and 145 PCF maximum.
 - 2. Slump shall be as required by CONTRACTOR methods, but shall not promote segregation, nor shall slump exceed 9 inches.
 - 3. Compressive strength at 28 days:
 - a. Normal CLSM: Between 100 psi minimum and 150 psi maximum. Unless specifically indicated otherwise, all CLSM shall be Normal CLSM.
 - b. Foundation CLSM: 1,000 psi minimum.

2.2 CEMENT

- A. Cement shall be Type II in accordance with ASTM C 150.

2.3 POZZOLAN

- A. Pozzolan shall be Type F or C in accordance with ASTM C 618. Pozzolan content, by weight, in Normal CLSM shall not be greater than cement content.

2.4 AGGREGATE

- A. Aggregate shall consist of a well graded mixture of crushed rock, soil, or sand, with a nominal maximum size of 3/8-inch. One hundred percent shall pass the 1 inch sieve; no more than 30 percent shall be retained on the 3/8-inch sieve; and no more than 12 percent shall pass the number 200 sieve. If more than 5 percent of the aggregate passes the number 200 sieve, the material passing the number 200 sieve shall have a plasticity index of less than 0.73(liquid limit-20), when tested in accordance with ASTM D 4318. All aggregate shall be free from organic matter and shall not contain more alkali, sulfates, or salts than the native materials at the Site.

2.5 ADMIXTURES

- A. Air entraining admixtures shall be in accordance with ASTM C 260.
- B. Water reducing admixtures shall be in accordance with ASTM C 494.

2.6 WATER

- A. Water shall be potable, clean, and free from objectionable quantities of silt, organic matter, alkali, salt, and other impurities.

PART 3 EXECUTION

3.1 PREPARATION

- A. Subgrade and compacted fill to receive CLSM shall be prepared according to Section 31 23 15 Excavation and Backfill for Buried Pipelines.

3.2 BATCHING, MIXING AND DELIVERY

- A. Batching, mixing, and delivery of CLSM shall conform to ASTM C 94. CLSM shall be mixed at a batch plant acceptable to the ENGINEER and shall be delivered in standard transit mix trucks.

3.3 PLACEMENT

- A. CLSM shall be placed by tailgate discharge, conveyor belts, pumped, or other means acceptable to the ENGINEER. CLSM shall be directed in place by vibrator, shovel, or rod to fill all crevices and pockets. Avoid over-consolidation which causes separation of aggregate sizes.
- B. CLSM shall be continuously placed against fresh material unless otherwise approved by ENGINEER. When new material is placed against existing CLSM, the placement area shall be free from all loose and foreign material. The surface of the existing material shall be soaked a minimum of one hour before placement of fresh material but no standing water shall be allowed when placement begins.

- C. CLSM placement for piping. Pipe shall be placed on soil pads and bedding placed under the pipe from one side and vibrated, as necessary, so that the CLSM flows to the opposite side. CLSM shall then be added to both sides of the pipe and vibrated until it fills the space between the pipe and the excavated trench bottom. CLSM shall be deposited in such a manner as to avoid uplift and deposited in its final position to avoid disturbing the pipe trench causing foreign material to mix with the cement slurry.
- D. Pipe zone backfill shall not be placed or compacted until the CLSM has reached initial set. Pipes placed on steep slopes may require a stiffer mix to prevent CLSM from flowing down the trench. Vibration may be required to ensure that the CLSM fills all voids.
- E. Temperature of the CLSM shall be between 50 and 90 degrees F, when placed. CLSM shall not be placed when the air temperature is below 40 degrees F. No CLSM shall be placed against frozen subgrade or other materials having temperature less than 32 degrees F.

3.4 FINISHING

- A. The finish surface shall be smooth and to the grade indicated or directed by the ENGINEER. Surfaces shall be free from fins, bulges, ridges, offsets, and honeycombing. Finishing by wood float, steel trowel, or similar methods is not required.

3.5 CURING

- A. CLSM shall be kept damp for a minimum of 7 days or until final backfill is placed.

3.6 PROTECTION

- A. CLSM shall be protected from freezing for 72 hours after placement.
- B. No fill or loading shall be placed on CLSM until probe penetration resistance, as measured in accordance with ASTM C 803 exceeds 650 psi.
- C. CLSM shall be protected from running water, rain, and other damage until the Material has been accepted and final fill completed.

- END OF SECTION -

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SECTION 05 50 00
MISCELLANEOUS METALS

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section covers materials, fabrication, and installation of miscellaneous metals and appurtenances as specified and indicated.

1.2 RELATED SPECIFICATIONS

- A. Fabrication and erection of the platforms, ladders and stairs shall be in accordance with the Specification for the Design, Fabrication and Creation of Structural Steel for Buildings of the latest edition of the A.I.S.C. Manual, and Section 1910.27 of the latest edition of the OSHA standards, except as specified herein.

1.3 REFERENCES

- A. The latest edition of the following publications form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

- B. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

- 1. Manual of Steel Construction

- C. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- 1. ASTM A 36 Standard Specification for Carbon Structural Steel
 - 2. ASTM A 53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - 3. ASTM A 123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. ASMT A 153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 5. ASTM A 276 Standard Specification for Stainless Steel Bars and Shapes
 - 6. ASTM A 307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength
 - 7. ASTM A 615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - 8. ASTM F 593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
 - 9. ASTM F 594 Standard Specification for Stainless Steel Nuts

1.4 RELATED WORK

- A. Related work in other sections includes but is not limited to:

- 1. Section 01 33 00 Submittal Procedures
 - 2. Section 09 90 00 Painting and Finishes

1.5 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

- B. CONTRACTOR shall submit complete shop drawings of fabricated items, such as vents, ladders, stairs, platforms, beams, pipe supports, and miscellaneous metals for approval to Engineer.
- C. Shop drawings shall conform to AISC recommendations and specifications, and shall show holes, and the like, as may be required for other parts of the work.
- D. Shop drawings shall include complete details of members and connections, anchor bolt layouts, schedules for fabrication procedures, and diagrams for the sequence of erection.
- E. Submit manufacturer's catalog data and dimensional drawings for lifting eyebolts and inserts; ladder safety posts, manhole covers and frames, and anchor bolts.
- F. Submit ICC ES Evaluation Reports for adhesive and wedge anchors and installer qualifications and procedures.

PART 2 MATERIALS

2.1 CARBON STEEL

- A. Materials for bolted or welded steel construction shall conform to ASTM A 36.

2.2 BOLTS

- A. Steel anchor and connection bolts for non-corrosive service shall conform to ASTM A 307, Grade A or B, unless otherwise noted. Bolts shall be hot-dip galvanized and provided with self-locking nuts or lock washers and plain nuts.
- B. Steel anchor and connection bolts for corrosive service shall be fabricated from stainless steel, unless indicated otherwise in the specifications or on the Drawings. Corrosive service locations are as listed below.
 - 1. Buried locations
 - 2. Submerged locations
 - 3. Locations subject to occasional flooding
 - 4. Inside hydraulic structures
 - 5. Chemical handling areas
 - 6. Inside buried manholes, vaults, and structures that do not have a gravity drain or sump pump
 - 7. Inside trenches, containment walls, and curbed areas.

2.3 STEEL PIPE

- A. Pipe for vault vents shall be Schedule 40 conforming to ASTM A 53 and shall be hot-dip galvanized.

2.4 STAINLESS STEEL

- A. All bolts, expansion bolts, nuts, washers, and expansion sleeve inserts used to attach metal supports shall be stainless steel Type 316.
- B. All ladders, wall conduits, louvers, and other items required shall be stainless steel unless noted otherwise.

2.5 HOT-DIP GALVANIZED

- A. Zinc coating for plates, bolts, anchor bolts, and threaded parts shall in in accordance with ASTM A 153. Structural steel shall be zinc coated in accordance with ASTM A 123.

2.6 COVERS AND FRAMES

- A. Manhole covers and frames shall be cast iron and designed for AASHTO HS-20 loading, unless otherwise indicated. Castings shall be smooth, clean and free from blisters, blowholes, and shrinkage. Covers shall seat firmly into the frames without rocking. Covers and frames shall fit together evenly such that the cover fits flush with the surrounding finished surface.

2.7 VAULT VENTS

- A. Fabricate vault vents as shown on the Drawings. Vault vents shall be welded steel construction and hot-dip galvanized after fabrication. Coating shall be in accordance with Section 09 90 00 – Painting and Finishes.

2.8 ADHESIVE ANCHORS

- A. Unless otherwise indicated, drilled concrete or masonry anchors shall be adhesive anchors. No substitutions will be considered without an ICC ES Report verifying strength and material equivalency. Anchors used inside potable water reservoirs shall be ANSI/NSF 61 certified.
- B. Adhesive anchors shall be a two-component system consisting of an all threaded anchor rod with nut and washer, and the adhesive capsule. Anchor rods shall be Type 304 stainless steel conforming to ASTM F 593 with nuts conforming to ASTM F 594. The adhesive capsules shall contain a polyvinyl or urethane methacrylate-based resin and accelerator within a sealed dual chamber foil capsule. Adhesive anchors shall be **Hilti HVA Capsule Adhesive Anchoring System**, or approved equal.

2.9 WEDGE ANCHORS

- A. Wedge type anchors shall be used only where indicated on the Drawings. Wedge anchors shall be a stud type expansion anchor, torque controlled, with impact section to prevent thread damage. Stud and wedge shall be Type 304 or Type 316 stainless steel conforming to ASTM A 276. Nut shall be Type 304 or Type 316 stainless steel conforming to ASTM F 594 with washer of similar material. Wedge anchor bolts shall be **Hilti Kwik Bolt 3**, or approved equal. Anchors installed in non-submerged or non-corrosive environments may be carbon steel and be **Simpson Strong-Tie Strong Bolt**, or approved equal.

2.10 POLYPROPYLENE STEPS

- A. Polypropylene steps shall have a 1/2-inch ASTM A 615 grade 60 steel reinforcement rod encased in polypropylene copolymer plastic. Steps shall have a tread width of 14-inches nominal. Steps shall be manufactured by **American Step Company, Inc., M.A. Industries**, or approved equal.

PART 3 EXECUTION

3.1 GENERAL

- A. Except as otherwise shown, the design, fabrication, and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction".
- B. Install miscellaneous metals as indicated on the drawings or as recommended by the manufacturer.
- C. Store materials above ground on platforms, skids or other supports. Keep material free from dirt, grease, and other foreign matter and protect from corrosion.
- D. Clean surfaces of metalwork to be in contact with concrete of rust, dirt, grease, and other foreign matter before placing concrete.
- E. Set embedded metalwork accurately in position and support it rigidly before concrete is placed and prevent displacement during and after placement of concrete.
- F. Repair or replace metal items damaged during installation. Follow the manufacturer's procedures for repairing damaged surfaces.
- G. Welding shall be performed by metal-arc method or shielded metal arc method as per the American Welding Society's (AWS) "Welding Handbook". During welding component parts shall be adequately clamped or supported. Avoid irregular surface, non-uniform bead pattern, and high crown. Upon completion of welding, remove weld splatter, flux, slag, and burrs. Accomplish repair, chipping, and grinding of welds in a manner that will not gouge, groove, or reduce the base metal thickness.
- H. Adhesive Anchors. Do not install anchors until the concrete has reached the required 28-day compressive strength. Drill hole in concrete by means of a percussion hammer drill. Hole shall be roughened with a brush on a power drill and then cleaned and dried. Install anchor in accordance with the manufacturer's instructions. Do not load the anchor until the adhesive has reached its indicated strength in accordance with the manufacturer's instructions.
- I. Wedge Anchors. Do not install anchors until the concrete has reached the required 28-day compressive strength. Drill hole in concrete by means of a percussion hammer drill. Hole shall be roughened with a brush on a power drill and then cleaned and dried. Install anchor in accordance with the manufacturer's instructions.
- J. Galvanizing Field Repairs
 - 1. Surface preparation shall consist of removing oil, grease, soil, and soluble material by cleaning with water and detergent (SSPC SP1) followed by brush-off blast cleaning (SSPC SP7) over an area extending at least 4 inches into the undamaged area.
 - 2. The coating shall be applied to at least 3 mils dry film thickness and shall be **Zinc-Clad XI by Sherwin-Williams, Galvax by Alvin Products, Galvite by ZRC Worldwide**, or approved equal.

- END OF SECTION -

SECTION 09 91 00
PAINTING AND FINISHES

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section covers furnishing, surface preparation, and applying paints and coatings, complete and in place, to all specified surfaces including exposed valves, piping or fittings.
- B. Definitions
 - 1. The term "paint", "coatings", or "finishes" as used herein, shall include surface treatments, emulsions, enamels, paints, epoxy resins, and other protective coatings, excepting galvanizing or anodizing, whether used as a pretreatment, primer, intermediate coat, or finish coat.
 - 2. The term "DFT" means minimum dry film thickness, without any negative tolerance.
 - 3. The term "mil" means thousandths of an inch.
 - 4. The term "SSPC" means The Society for Protective Coatings.
- C. The following surfaces shall not be coated:
 - 1. Concrete, unless otherwise required herein or on the Drawings.
 - 2. Stainless steel
 - 3. Machined surfaces
 - 4. Grease fittings
 - 5. Glass
 - 6. Equipment nameplates
 - 7. Platform gratings, stair treads, door thresholds, and other walk surfaces, unless specifically indicated to be coated.
- D. The protective coatings applicator (Applicator) shall possess a valid state license as required for the performance of the painting and coating work called for in this specification and shall provide 5 references which show the Applicator has previous successful experience with the indicated of comparable coating systems. Include the name, address, and the telephone number for the owner of each installation for which the Applicator provided the protective coating.

1.2 RELATED WORK

- A. Related work in other sections includes but is not limit to:
 - 1. Section 01 33 00 - Submittal Procedures
 - 2. Section 33 12 00 - Mechanical Appurtenances
 - 3. Section 33 92 10 - Steel Pipe, Specials, and Fittings

1.3 REFERENCES AND STANDARDS

- A. Work covered by this Specification shall meet or exceed the provisions of the latest editions of the following Codes and Standards in effect at the time of award of the Contract:

1. OSHA Occupation Safety and Health Act: State of Utah and Federal
2. ICRI International Concrete Repair Institute Guideline No. 310.2 –
Selecting and Specifying Concrete Surface Preparation for
Sealers, Coatings, and Polymer Overlays

B. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

1. ANSI A 13.1 Standard for Scheme for the Identification of Piping Systems
2. ANSI Z 535 Standard for Safety Colors

C. AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

1. ASTM A 123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM C 309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
3. ASTM D 6943 Standard Practice for Immersion Testing of Industrial Protective Coatings Linings
4. ASTM D 1653 Standard Test Methods for Water Vapor Transmission of Organic Coating Films
5. ASTM D 2370 Standard Test Method for Tensile Properties of Organic Coatings
6. ASTM D 2794 Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
7. ASTM D 4263 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
8. ASTM D 4414 Standard Practice for Measurement of Wet Film Thickness by Notch Gages
9. ASTM D 4417 Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
10. ASTM D 7234 Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
11. ASTM D 7682 Standard Test Method for Replication and Measurement of Concrete Surface Profiles Using Replica Putty
12. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials
13. ASTM F 1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
14. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

D. AMERICAN WATER WORKS ASSOCIATION (AWWA)

1. AWWA C 210 Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
2. AWWA C 222 Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings

E. AMERICAN CONCRETE INSTITUTE (ACI)

1. ACI 301 Specifications for Structural Concrete

F. NACE International (NACE)

1. NACE RP0287 Field Measurement of Surface Profile of Abrasive Blast-Cleaned Steel Surfaces Using a Replica Tape
2. NACE SP0188 Standard Practice for Discontinuity (Holiday) Testing of Protective Linings
3. NACE SP0892 Standard Practice for Coatings and Linings over Concrete for Chemical Immersion and Containment Service
4. NACE No. 1/SSPC-SP 5 White Metal Blast Cleaning
5. NACE No. 6/SSPC-SP13 Surface Preparation of Concrete

1.4 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- B. CONTRACTOR shall supply shop drawings for approval on all paint materials at least 30 days prior to installation. Submittals shall include the following data sheets:
 1. For each paint system used herein, furnish a Paint System Data Sheet (PSDS), Technical Data Sheets, and paint colors available (where applicable) for each product used in the paint system, except for products applied by equipment manufacturers.
- C. Where ANSI/NSF 61 approval is required, submit ANSI/NSF 61 certification letter for each coating in the system indicating the product application limits on size of tank or piping, dry film thickness, number of coats, specific product tests, colors certified, and approved additives.
- D. Quality Control Submittals:
 1. Furnish a list of references for the Applicator substantiating the requirements as specified.
 2. Manufacturer's certification stating factory applied coating systems meets or exceeds requirements specified herein.
 3. If the manufacturer of finish coating differs from that of shop primer, provide both manufacturers' written confirmation that materials are compatible.

1.5 PAINT DELIVERY, STORAGE, AND HANDLING

- A. Deliver paint to the project site in unopened containers that plainly show, at the time of use, the designated name, date of manufacture, color, and name of manufacturer.
- B. Store paints in a suitable protected area that is heated or cooled as required to maintain temperatures within the range recommended by the manufacturer.

1.6 QUALITY ASSURANCE

- A. All inspection for quality assurance shall ultimately be the responsibility of CONTRACTOR. OWNER retains the right to observe, accept, or reject the work based on the results of CONTRACTOR's inspection or observations by ENGINEER, at OWNER's discretion, in accordance with the specifications.

- B. Repair and recoat all runs, overspray, roughness, or any other signs of improper application in accordance with paint manufacturer's instructions and as reviewed by ENGINEER.
- C. Observations by OWNER or ENGINEER, or the waiver of inspection of any particular portion of the work, shall not be construed to relieve CONTRACTOR of his responsibility to perform the work in accordance with these specifications.

1.7 MANUFACTURER'S SERVICES

- A. Furnish paint manufacturer's representative to visit jobsite at intervals during surface preparation and painting as may be required for product application quality assurance, and to determine compliance with manufacturer's instructions and these specifications, and as may be necessary to resolve field problems attributable to, or associated with, manufacturer's products furnished under this Contract.

1.8 SPECIAL CORRECTION OF DEFECTS REQUIREMENTS

- A. An inspection may be conducted during the eleventh month following completion of coating work. CONTRACTOR and a representative of the coating material manufacturer shall attend this inspection. Defective work shall be repaired in accordance with these specifications and to the satisfaction of OWNER. OWNER may, by written notice to CONTRACTOR, reschedule the inspection to another date within the one year correction period or may cancel the inspection altogether. CONTRACTOR is not relieved of its responsibilities to correct defects whether or not the inspection is conducted.

PART 2 PRODUCTS

2.1 GENERAL

- A. CONTRACTOR shall use suitable coating materials as recommended by the manufacturer. Materials shall comply with Volatile Organic Compound (VOC) limits applicable at the Site.
- B. Where manufacturers and product numbers are listed, it is to show the type and quality of coatings that are required. If a named product does not comply with VOC limits in effect at the time of Bid opening, that product will not be accepted, and CONTRACTOR shall propose a substitution product of equal quality that does comply. Proposed substitute materials will be considered as indicated below. Coating materials shall be materials that have a record of satisfactory performance in industrial plants, manufacturing facilities, and water and wastewater treatment plants.
- C. In any coating system, only compatible materials from a single manufacturer shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, a barrier coat shall be applied between existing prime coat and subsequent field coats to ensure compatibility.
- D. Colors and shades of colors of coatings shall be as indicated or selected by OWNER. Each coat shall be of a slightly different shade to facilitate observation of surface coverage of each coat. Finish colors shall be as selected from the manufacturer's standard color samples by OWNER.

E. Substitute or "Or-Equal" Products

1. Basis of Design: The Coating Systems listed below in paragraph 2.3 are based on products from Tnemec, Sherwin Williams, Devoe, and Wasser.
2. Product Substitution: To establish equality under Section 01 60 00 – Product Requirements, the specified coating systems are the minimum standard of quality for this project. Equivalent materials of other manufacturers may be substituted only by approval of ENGINEER. Requests for material substitutions shall be in accordance with requirements of the project specification.
3. Product Requirements: CONTRACTOR shall furnish satisfactory documentation from the manufacturer of the proposed substitute or "or equal" product that the material meets the indicated requirements and is equivalent or better in the following properties: Quality, Durability, Resistance to abrasion and physical damage, Life expectancy, Ability to recoat in the future, Solids content by volume, Dry film thickness per coat, Compatibility with other coatings, Suitability to chemical attack, Temperature limitations during application and in service, Type and quality of recommended undercoats or topcoats, Ease of repairing damaged areas, and stability of colors.
4. Manufacturers of "or equal" products shall provide direct performance comparison with the materials specified, in addition to complying with all other requirements of these Specifications. "Or equal" products shall employ the same generic type materials and system components as the specified coating systems.
5. CONTRACTOR shall bear any additional costs, if a proposed substitution requires changes or additional work.

2.2 COLORS

- A. Provide colors as selected by OWNER or ENGINEER unless otherwise specified herein.
- B. Colors shall be formulated with colorants free of lead, lead compounds, or other materials which might be affected by the presence of hydrogen sulfide or other gas likely to be present at the project.
- C. Proprietary identification of colors is for identification only. Any authorized manufacturer may supply color matches.
- D. Equipment colors;
 1. Equipment shall mean the machinery or vessel itself plus the structural supports and fasteners.
 2. Paint non-submerged portions of equipment in the same color as the process piping it serves, except as indicated below:
 - a. Dangerous parts of equipment and machinery: OSHA Orange
 - b. Fire protection equipment and apparatus: OSHA Red
 - c. Radiation hazards: OSHA Purple
 - d. Physical hazards in normal operating area: OSHA Yellow
 3. Fiberglass reinforced plastic (FRP) equipment with an integral colored gel coat does not require painting, provided the color is as specified.
- E. Piping color coding shall be in accordance with ANSI A13.1, Division of Drinking Water R-309-525, and International Plumbing Code.

1. Color code non-submerged metal piping except electrical conduit. Paint fittings and valves the same color as the pipe unless otherwise specified.
2. Pipe supports: If pipe supports are not galvanized or stainless steel, supports shall be painted ANSI No. 70 light gray as specified in ANSI Z535.
3. Fiberglass reinforced plastic (FRP) pipe and polyvinyl chloride (PVC) pipe located outside of buildings and enclosed structures will not require painting, unless noted otherwise on the Drawings.

2.3 COATING SYSTEMS

A. System No. 1 Steel – Immersion Potable Water NSF 61 Certification

1. Materials

| | |
|---------------------------|--|
| Type | Epoxy conforming to AWWA C 210 and D 102. |
| VOC content, max, g/L | 250 |
| Volume Solids, min, % | 67 |
| Demonstrated Suitable for | Long term immersion in water, resistant to corrosion, good color retention |
| Certification | NSF 61 if in contact with potable water |

2. Surface preparation and Coating System

| Surface Preparation | Products | Total System (mils) |
|--|---|---|
| SSPC-SP10 Near-White Blast Cleaning with minimum angular profile of 1.5 mils | Primer: Tnemec V140 Pota-Pox Plus Intermediate: Tnemec V140 Pota-Pox Plus Finish: Tnemec V140F Pota-Pox Plus | Primer: 3-5 DFT Intermediate: 4-6 DFT Finish: 4-6 DFT |
| | Primer: Sherwin Williams Tank Clad HS Intermediate: Sherwin Williams Tank Clad HS Finish: Sherwin Williams Tank Clad HS | |
| | Primer: Devoe Bar-Rust 233H Intermediate: Devoe Bar-Rust 233H Final: Devoe Bar-Rust 233H | |

3. Application

- a. For use on the interior and exterior of steel or concrete tanks, reservoirs, pipes, valves, pumps, equipment in potable water service, including concrete embedded surfaces of metallic items under submerged conditions, such as wall pipes, pipes, pipe sleeves, access manholes, gate guides and thimbles, and structural steel, except reinforcing steel, and the following specific surfaces unless noted otherwise:
 - 1) Buried dished heads and associated non-shop coated buried piping.

B. System No. 2 Steel – Immersion Non-Potable Water

1. Materials

| | |
|---------------------------|--|
| Type | High Solids Epoxy |
| VOC content, max, g/L | 250 |
| Volume Solids, min, % | 82 |
| Demonstrated Suitable for | Ferrous surfaces, superior color and gloss retention, exceptional resistance to weathering, chemical fumes, and salt spray |

2. Surface preparation and Coating System

| Surface Preparation | Products | Total System (mils) |
|--|---|--------------------------------------|
| SSPC-SP10 Near-White Blast Cleaning with a minimum angular anchor profile of 2.0 mils | Primer: Tnemec Series 104 HS Finish: Tnemec Series 104 HS | Primer: 8-10 DFT Finish: 8-10 DFT |
| | Primer: Sherwin Williams Dura-Plate UHS Primer Finish: Sherwin Williams Dura-Plate UHS | |

3. Application

- a. For use on the interior and exterior of steel or concrete not in potable water service, including concrete embedded surfaces of metallic items under submerged conditions, such as wall pipes, pipes, pipe sleeves, access manholes, gate guides and thimbles, and structural steel, except reinforcing steel

4. Special Requirements

- a. The surface preparation and primer shall be shop applied to all surfaces prior to installation.

C. System No. 3 Steel – Interior Exposed

1. Materials

| | |
|---------------------------|--|
| Type | Polyamidoamine Epoxy |
| VOC content, max, g/L | 250 |
| Volume Solids, min, % | 67 |
| Demonstrated Suitable for | Ferrous, galvanized, surfaces in industrial exposure, resistant to mild corrosion and chemical fumes, has good color and gloss retention |
| Certification | None |

2. Surface preparation and Coating System

| Surface Preparation | Products | Total System (mils) |
|--|--|--|
| SSPC-SP6 Commercial Blast Cleaning with a minimum angular anchor profile of 1.5 mils | Primer: Dimetcote 302 H zinc primer Intermediate: Amerlock 2 or PSX 700 Finish: Wasser Amerlock 2 or PSX 700 | Primer: 3-5 DFT Inter.:5-7 DFT Finish: 2-4 DFT |

3. Application

- a. All exposed metal surfaces located inside of structures, excluding pre-painted electrical cabinets or equipment. For pipelines, use on exterior pipe surfaces only. Interior pipe surfaces shall be coated with System No. 1 Steel – Immersion Potable Water NSF 61 Certification.

4. Special Requirements

- a. The surface preparation and primer shall be shop applied to all surfaces prior to installation. Finish coats need only be applied to the surfaces exposed after completion of construction.

- 5. Color: Blue for water piping, color to be approved by owner.

D. System No. 4 Steel – Exterior Exposed

- 1. Exterior exposed steel pipe shall be zinc coated in accordance with ASTM A 123. All other steel exposed steel surfaces shall be in accordance with the following:
- 2. Materials

| | |
|---------------------------|--|
| Type | Zinc-Rich primer with Polyamidoamine Epoxy (intermediate coat), and Aliphatic Acrylic Polyurethane (topcoat) |
| VOC content, max, g/L | 340 Zinc Primer 250 Intermediate and Finish Coats |
| Demonstrated Suitable for | Ferrous, galvanized, surfaces in industrial exposure, highly resistant to abrasion, wet conditions, corrosive fumes, and exterior weathering |
| Certification | None |

3. Surface preparation and Coating System

| Surface Preparation | Products | Total System (mils) |
|--|--|--|
| SSPC-SP6 Commercial Blast Cleaning with a minimum angular anchor profile of 1.5 mils | Primer: Wasser MC-Moizinc100 Intermediate: Wasser MC-CR100 Finish: Wasser MC FerroX A100 | Primer: 3-5 DFT Inter.:5-7 DFT Finish: 2-4 DFT |

4. Application

- a. All exposed steel surfaces located outside of structures.

5. Special Requirements

- a. The surface preparation and primer shall be shop applied to all surfaces prior to installation. Finish coats need only be applied to the surfaces exposed after completion of construction.

E. System No. 5 Buried Steel Pipe

- 1. Coatings and finishes shall be in accordance with Section 09 98 10 Pipeline Coatings and Linings.

F. System No. 6 Steel – Doors and Frames

1. Materials

| | |
|---------------------------|--|
| Type | Modified Polyamidoamine Epoxy with Aliphatic Acrylic Polyurethane (topcoat) |
| VOC content, max, g/L | 250 |
| Demonstrated Suitable for | Interior and Exterior Industrial, Architectural, and Commercial applications |

2. Surface preparation and Coating System

| Surface Preparation | Products | Total System (mils) |
|--|--|------------------------------------|
| SSPC-SP2/SP3 Hand and Power Tool Cleaning; feather rough edges; remove loose rust, dirt, and other contaminants with sandpaper | Primer: Tnemec Series 135 Chem-Build Finish: Tnemec Series 1075 Endura-Shield II | Primer: 3-5 DFT Finish: 3-5 DFT |
| | Primer: Sherwin Williams Macropoxy 646 Fast Cure Epoxy Finish: Sherwin Williams HS Polyurethane 250 | |
| | Primer: Devco Devran 224 HS Finish: Devco Devthane 379H | |

3. Application

- a. Factory primed steel doors and frames
- b. Exterior and Interior steel in non-corrosive and non-immersion environments.
- c. Maintenance of existing marginally prepared rusty steel and tightly adhering old coatings.

G. System No. 7 Cast/Ductile Iron – Exterior and Interior Exposed

1. Materials

| | |
|---------------------------|--|
| Type | Urethane, Aromatic, Aliphatic |
| VOC content, max, g/L | 250 |
| Demonstrated Suitable for | Ferrous, galvanized, nonferrous, cast/ductile iron surfaces in industrial exposure, highly resistant to abrasion, wet conditions, corrosive fumes, and exterior weathering |

2. Surface preparation and Coating System

| Surface Preparation | Products | Total System (mils) |
|--|--|--|
| SSPC-SP6 Commercial Blast Cleaning with a minimum angular anchor profile of 1.5 mils | Primer: Wasser MC-FerroClad Primer Intermediate: Wasser MC-CR100 Finish: Wasser MC Ferrox A100 | Primer: 3-5 DFT Inter.:5-7 DFT Finish: 2-4 DFT |

3. Application

- a. Exposed cast/ductile iron surfaces located inside and outside of structures requiring painting and the following specific surfaces unless noted otherwise:
 - 1) All exposed cast/ductile iron pipe

- 4. Color: Wisconsin Blue for interior pipelines, by OWNER for all other surfaces.

2.4 SPECIAL COATING SYSTEMS

- A. System 200 - PVC Tape: Prior to wrapping the pipe with PVC tape, the pipe and fittings first shall be primed using a primer recommended by the PVC tape manufacturer. After being primed, the pipe shall be wrapped with a 20-mil adhesive PVC tape, half-lapped, to a total thickness of 40 mils. PVC Tape wrap buried pipe where indicated on the Drawings.

- B. System 201 – External Retardant Sealer and Coating, Concrete and Masonry

1. Materials and Coating System

- a. All exterior masonry and above grade concrete surfaces shall be coated with TEX-COTE Graffiti Gard IIIs Exterior/Interior Graffiti Repellent System (two-component, solvent, aliphatic Urethane System), as manufactured by Textured Coatings of America, Inc. The TEX-Cote Graffiti Gard IIIs system shall consist of two basic coatings: 1. TY-Cote Clear - Base Coat which acts as a “fill coat” for the substrate and maintains clarity, and 2. TEX-COTE Graffiti Gard IIIs - Finish Coating, a two component, solvent, aliphatic urethane system clear finish.

2. Preparation

- a. Surface cracks, holes, or other imperfections in concrete surfaces only that exceed 1/64 of an inch shall be filled with pointing mortar. Masonry joints found to be unsound, hollow, or otherwise defective shall be raked out to a depth of 1/2 inch and pointed with mortar.

- b. Remove loose particles and foreign matter. Remove oil or foreign substance with a cleaning agent which will not affect the coating.
 - c. Scrub and rinse surfaces with water, and let dry.
 - d. Protect adjacent surfaces not scheduled to receive coating and landscaping, property and vehicles from over spray and drift.
 - e. Concrete shall cure a minimum of 28 days before application.
 - f. Apply coating per manufacturer's recommendations and instructions.
3. Application
- a. Exterior masonry and concrete walls.
- C. System 202 – Polyethylene Encasement: Application of polyethylene encasement shall be in accordance with ANSI/AWWA C105 using Method A. Provide polyethylene encasement where indicated on the drawings or per Section 30 05 05 – Ductile Iron Pipe.

2.5 CONCRETE FINISHES

- A. Exterior Above Grade Concrete: Concrete surfaces exposed to view outside the building and including 6 inches below finished grade on the building or structure should be finished with a "Class A" finish. Products for the "Class A" finish are identified or specified in Section 03 30 00 - Cast-In-Place Concrete.
- B. Interior Above Grade Concrete: Interior above grade concrete shall be finished with a "Class B" finish. Products for the "Class B" finish are identified or specified in Section 03 30 00 - Cast-In-Place Concrete.

PART 3 EXECUTION

3.1 GENERAL

- A. The intention of this specification is for all new surfaces, interior and exterior, wood, dry wall, masonry, concrete, and metal, whether atmospheric or submerged exposure, to be painted whether specifically mentioned or not, except as modified herein. Concealed structural steel surfaces shall receive a prime coat only unless modified herein.
- B. Surface preparation and coating application shall be in accordance with these specifications and the coating manufacturer's written product data sheets and written recommendations of the manufacturer's technical representative. Where conflict occurs between the manufacturer's recommendations and these specifications, the more stringent of the two shall apply unless approved by ENGINEER.
- C. For immersion coatings, obtain full cure for completed system before immersing or allowing exposure to water of condensation for more than 12 hours.

3.2 REGULATORY REQUIREMENTS

- A. Meet federal, state, and local requirements limiting the emission of volatile organic compounds and worker exposures.
- B. Protect workers and comply with applicable federal, state, and local air pollution and environmental regulations for surface preparation, blast cleaning, disposition of spent

aggregate and debris, coating application, and dust prevention including but not limited to the following Acts, Regulations, Standards, and Guidelines:

1. Clean Air Act
2. National Ambient Air Quality Standard
3. Resource Conservation and Recovery Act (RCRA)
4. SSPC Guide 6

- C. Comply with applicable federal, state, and local regulations for confined space entry.
- D. Provide and operate equipment that meets explosion proof requirements.

3.3 ENVIRONMENTAL CONDITIONS

- A. Do not apply paint in extreme heat, temperatures below 40 degrees F, nor in dust, smoke-laden atmosphere, damp or humid weather. The Applicator shall adhere to the manufacturer's recommendations regarding environmental conditions. The Applicator shall monitor humidity, air temperature, and surface temperature with properly calibrated instruments.
- B. Do not perform abrasive blast cleaning whenever relative humidity exceeds 85 percent, nor whenever surface temperature is less than 5 degrees F above dew point of ambient air. Strictly adhere to manufacturer's recommendations.
- C. Surface preparation power tools and blast equipment shall contain dust collection devices that will prevent discharge of dust particles into the atmosphere around electrical or mechanical equipment unless otherwise permitted by ENGINEER.
- D. Where weather conditions or project requirement dictate, the Applicator shall provide and operate dehumidification equipment to maintain environmental conditions suitable for abrasive blasting and coating application as specified.

3.4 WORKMANSHIP

- A. Skilled craftsmen and experienced supervision shall be used on coating work.
- B. Coating shall be done in a workmanlike manner so as to produce an even film of uniform thickness. Edges, corners, crevices, and joints shall receive special attention to insure thorough surface preparation. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so complete that the addition of another coat would not increase the hiding. Special attention shall be given so that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas, and installations shall be protected by the use of drop cloths or other precautionary measures.
- C. Damage to other surfaces resulting from the work shall be cleaned, repaired, and refinished to original condition.

3.5 STORAGE, MIXING, AND THINNING OF MATERIALS

- A. Unless otherwise indicated, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials,

for preparation of surfaces for coating, and for other procedures relative to coating shall be strictly observed.

- B. Coating materials shall be used within the manufacturer's recommended shelf life.
- C. Coating materials shall be stored under the conditions recommended by the Product Data Sheets, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings from different manufacturers shall not be mixed together.

3.6 SURFACE PREPARATION

- A. All surfaces which receive paint or other coatings shall be prepared in accordance with the recommendations of the manufacturer of the material being used. The Applicator shall examine surfaces to be coated and shall correct surface defects before application of any coating material. Marred or abraded spots on shop-primed and on factory-finished surfaces shall receive touch-up restoration prior to any field coating application.
- B. Perform sandblasting for piping and any other items and equipment where specified and as required to restore damaged surfaces previously shop or field blasted and primed. Materials, equipment, and procedures shall meet requirements of the Society for Protective Coatings (formerly the Steel Structures Painting Council).

3.7 PROTECTION OF MATERIALS NOT TO BE PAINTED

- A. Surfaces that are not to receive coatings shall be protected during surface preparation, cleaning, and coating operations.
- B. Remove, mask or otherwise protect hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted.
- C. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces.
- D. Protect working parts or mechanical and electrical equipment and motors from damage.
- E. Care shall be exercised not to damage adjacent work during blasting operations. Spraying shall be conducted under carefully controlled conditions. CONTRACTOR shall be fully responsible for and shall promptly repair any and all damage to adjacent work or adjoining property occurring from blasting or coating operations.

3.8 SURFACE PREPARATION STANDARDS

- A. The following referenced surface preparation specifications of the the Society for Protective Coatings shall form a part of this specification:
 - 1. Solvent Cleaning (SSPC SP1): Removal of oil, grease, soil, salts, and other soluble contaminants by cleaning with solvent, vapor, alkali, emulsion, or steam.
 - 2. Hand Tool Cleaning (SSPC SP2): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by hand chipping, scraping, sanding, and wire brushing.

3. Power Tool Cleaning (SSPC SP3): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by power tool chipping, descaling, sanding, wire brushing, and grinding.
4. White Metal Blast Cleaning (SSPC SP5): Removal of all visible rust, oil, grease, soil, dust, mill scale, paint, oxides, corrosion products and foreign matter by blast cleaning.
5. Commercial Blast Cleaning (SSPC SP6): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 33 percent of each square inch of surface area.
6. Brush-Off Blast Cleaning (SSPC SP7): Removal of all visible oil, grease, soil, dust, loose mill scale, loose rust, and loose paint.
7. Near-White Blast Cleaning (SSPC SP10): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 5 percent of each square inch of surface area.
8. Surface Preparation of Concrete (SSPC-SP13): Removal of protrusions, laitance and efflorescence, existing coatings, form-release agents, and surface contamination by detergent or steam cleaning, abrasive blasting, water jetting, or impact or power tool methods as appropriate for the condition of the surface and the requirements of the coating system.

3.9 FERROUS METAL SURFACE PREPARATION (UN GALVANIZED)

- A. The minimum abrasive blasting surface preparation shall be as indicated in the coating system schedules included in this Section. Where there is a conflict between these requirements and the coating manufacturer's printed recommendations for the intended service, the higher degree of cleaning shall apply.
- B. Oil, grease, welding fluxes, and other surface contaminants shall be removed by solvent cleaning per SSPC SP1 - Solvent Cleaning prior to blast cleaning.
- C. Round or chamfer all sharp edges and grind smooth burrs and surface defects and weld splatter prior to blast cleaning.
- D. Surfaces shall be cleaned of dust and residual particles of the cleaning operation by dry air blast cleaning, vacuuming, or another approved method prior to painting.
- E. Enclosed areas and other areas where dust settling is a problem shall be vacuum cleaned and wiped with a tack cloth.
- F. Damaged or defective coating shall be removed by the blast cleaning to meet the clean surface requirements before recoating.
- G. If the required abrasive blast cleaning will damage adjacent work, the area to be cleaned is less than 100 square feet, and the coated surface will not be submerged in service, then SSPC SP2 or SSPC SP3 may be used.
- H. Shop-applied coatings of unknown composition shall be completely removed before the indicated coatings are applied. Valves, castings, ductile or cast iron pipe, and fabricated pipe or equipment shall be examined for the presence of shop-applied temporary

coatings. Temporary coatings shall be completely removed by solvent cleaning per SSPC SP1 before the abrasive blast cleaning has been started.

- I. Shop primed equipment shall be solvent-cleaned in the field before finish coats are applied.
- J. Exposed ductile iron pipe shall be given a shop coat of rust-inhibitive primer conforming to these specifications. Abrasive blasting of the asphaltic coating on ductile iron pipe will not be allowed.

3.10 FERROUS METAL SURFACE PREPARATION (GALVANIZED)

- A. Galvanized ferrous metal shall be alkaline cleaned per SSPC SP1 to remove oil, grease, and other contaminants detrimental to adhesion of the protective coating system, followed by brush off blast cleaning per SSPC SP16.
- B. Pretreatment coatings of surfaces shall be in accordance with the printed recommendations of the coating manufacturer.

3.11 CAST-IN-PLACE CONCRETE SURFACE PREPARATION

- A. Concrete surfaces to receive protective coating shall be cast with a Smooth Form Finish in accordance with ACI 301. Surfaces shall not be rubbed, sacked, troweled or otherwise finished in any manner that will obscure or cover the parent concrete surface with materials other than materials as specified in this Section.
- B. All surfaces must be clean, dry and free of oil, grease and other contaminants, prior to preparation in accordance with NACE No. 6/SSPC-SP13. Concrete surfaces must be sound and capable of supporting the corrosion protection lining system.
- C. Prepare concrete surfaces in accordance with NACE No. 6/SSPC-SP13 Joint Surface Preparation Standards and ICRI Technical Guidelines. Abrasive blast, shot-blast, water jet or mechanically abrade concrete surfaces to remove laitance, curing compounds, hardeners, sealers, existing coatings, and other contaminants and to provide the recommended ICRI-CSP Profile.
- D. Level or grind concrete substrates to produce a uniform and smooth surface, including removal of sharp edges, ridges, form fins, and other concrete protrusions.
- E. Unless required for proper adhesion, surfaces shall be dry prior to coating. The presence of moisture shall be determined with a moisture detection device such as Delmhorst Model BD-2100, or equal.

3.12 SHOP COATING REQUIREMENTS

- A. Unless otherwise indicated, items of equipment or parts of equipment which are not submerged in service shall be shop-primed and then finish-coated in the field after installation with the indicated or selected color. The methods, materials, application equipment, and other details of shop painting shall comply with this Section. If the shop primer requires top coating within a specific period of time, the equipment shall be finish coated in the shop and then be touched up after installation.

- B. Items of equipment or parts and surfaces of equipment which are submerged or inside an enclosed hydraulic structure when in service, with the exception of pumps and valves, shall have surface preparation and coating performed in the field.
- C. For certain pieces of equipment it may be undesirable or impractical to apply finish coatings in the field. Such equipment shall be primed and finish coated in the shop and touched up in the field with the identical material after installation. CONTRACTOR shall require the manufacturer of each such piece of equipment to certify as part of its Shop Drawings that the surface preparation is in accordance with these specifications. The coating material data sheet shall be submitted with the Shop Drawings for the equipment.
- D. For certain small pieces of equipment the manufacturer may have a standard coating system that is suitable for the intended service conditions. In such cases, the final determination of suitability will be made during review of the Shop Drawing submittals. Equipment of this type generally includes only indoor equipment such as instruments, small compressors, and chemical metering pumps.
- E. Shop-painted surfaces shall be protected during shipment and handling by suitable provisions including padding, blocking, and the use of canvas or nylon slings. Primed surfaces shall not be exposed to the weather for more than 2 months before being top coated, or less time if recommended by the coating manufacturer.
- F. CONTRACTOR shall make certain that the shop primers and field topcoats are compatible and meet the requirements of this Section. Copies of applicable coating manufacturer's data sheets shall be submitted with equipment Shop Drawings.
- G. Damage to shop-applied coatings shall be repaired in accordance with this Section and the coating manufacturer's printed instructions.

3.13 APPLICATION

A. General

1. Schedule inspection with ENGINEER in advance for cleaned surfaces and all coats prior to each succeeding coat.
2. Apply coatings in accordance with the paint manufacturer's recommendations and these specifications, whichever is more stringent. Allow sufficient time between coats to assure thorough drying of previously applied paint.
3. Blast cleaned ferrous metal surfaces shall be painted before any rusting or other deterioration of the surface occurs. Blast cleaning shall be limited to only those surfaces that can be coated in the same day.
4. Special attention shall be given to materials that will be joined so closely that proper surface preparation and application are not possible. Such contact surfaces shall be coated prior to assembly or installation.
5. Finish coats, including touch-up and damage repair coats shall be applied in a manner that will present a uniform texture and color matched appearance.
6. Non-buried steel piping shall be abrasive blast cleaned and primed before installation.
7. Finish coats shall be applied after concrete, masonry, and equipment installation is complete, and the working areas are clean and dust free.

3.14 CURING OF COATINGS

- A. CONTRACTOR shall maintain curing conditions in accordance with the conditions recommended by the coating material manufacturer or by this Section, whichever is the most stringent, prior to placing the completed coating system into service.
- B. In the case of enclosed areas, forced air ventilation, using heated air if necessary, may be required until the coatings have fully cured.

3.15 SHOP AND FIELD OBSERVATION AND TESTING

- A. CONTRACTOR shall give ENGINEER a minimum of 3 Days advance notice of the start of any field surface preparation or coating application, and a minimum of 7 Days advance notice of the start of any surface preparation activity in the shop.
- B. Observation by ENGINEER, or the waiver of inspection of any particular portion of the work, shall not relieve CONTRACTOR of its responsibility to perform the work in accordance with these Specifications.
- C. CONTRACTOR shall furnish inspection devices in good working condition for the detection of holidays and measurement of dry film thicknesses of coatings. Dry-film thickness gauges shall be made available for ENGINEER's use while coating is being done, until final acceptance of such coatings. CONTRACTOR shall furnish the services of a trained operator of the holiday detection devices until the final acceptance of such coatings. Holiday detection devices shall be operated only in the presence of ENGINEER.
- D. CONTRACTOR shall test for continuity all coated ferrous surfaces inside a steel reservoir, other surfaces that will be submerged in water or other liquids, surfaces that are enclosed in a vapor space in such structures, and surfaces coated with any of the submerged and severe service coating systems. Areas that contain discontinuities shall be marked and repaired or recoated in accordance with the coating manufacturers' printed instructions and then be retested.
 - 1. Coatings with thickness exceeding 20-mils total DFT: Pulse-type holiday detector such as Tinker & Razor Model AP-W, D.E. Stearns Co. Model 14/20, or equal shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the required coating thickness.
 - 2. Coatings with thickness of 20-mils or less total DFT: Tinker & Razor Model M1 nondestructive type holiday detector, K-D Bird Dog, or equal shall be used. The unit shall operate at less than 75 volts. For thicknesses between 10- and 20-mils, a nonsudsing type wetting agent, such as Kodak Photo-Flo or equal, shall be added to the water prior to wetting the detector sponge.
- E. On ferrous metals, the dry film coating thickness shall be measured in accordance with the SSPC Paint Application Specification No. 2 using a magnetic type dry film thickness gauge such as Mikrotest Model FM, Elcometer Model 111/1EZ, or equal. Each coat shall be tested for the correct thickness. No measurements shall be made until at least 8 hours after application of the coating. On non-ferrous metals and other substrates, the coating thicknesses shall be measured at the time of application using a wet film gauge.

- F. Evaluation of blast cleaned surface preparation will be based upon comparison of the blasted surfaces with the standard samples available from NACE, using NACE standards TM-01-70 and TM-01-75.
- G. Visually inspect concrete, nonferrous metal, plastic, drywall, and wood surfaces to ensure proper and complete coverage has been attained.

3.16 CLEANUP

- A. Place cloths and waste that might constitute a fire hazard in closed metal containers or destroy at the end of each day.
- B. Upon completion of the work, remove staging, scaffolding, and containers from the site or destroy in a legal manner.
- C. Completely remove paint spots, oil, or stains upon adjacent surfaces and floors and leave entire job clean.
- D. Damages due to overspray on buildings, vehicles, trees, or other surfaces not specified to be painted would be the responsibility of CONTRACTOR.

3.17 MANUFACTURER' SERVICES

- A. Furnish paint manufacturer's representative to visit jobsite at intervals during surface preparation and painting as may be required for product application quality assurance, and to determine compliance with manufacturer's instructions and these specifications, and as may be necessary to resolve field problems attributable to, or associated with, manufacturer's products furnished under this Contract.

- END OF SECTION -

SECTION 09 98 10
PIPELINE COATINGS AND LININGS

PART 1 GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall apply external coating and internal lining on steel pipe, field coating of joints, and field repair of coating damage, complete and in place, in accordance with the specifications.
- B. Existing buried steel pipe shall be repaired with the cement mortar lined and coated system. New buried steel pipe shall be epoxy lined and coated and encased with CLSM.
- C. Exposed steel pipe shall be epoxy lined and coated in accordance with Section 09 91 00 – Painting and Finishes, unless noted otherwise.

1.2 RELATED WORK

- A. It is CONTRACTOR's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR's Work.
- B. Related work in other sections includes but is not limit to:
 - 1. Section 01 33 00 Submittals
 - 2. Section 09 91 00 Painting and Finishes
 - 3. Section 33 11 10 Miscellaneous Appurtenances
 - 4. Section 33 92 10 Steel Pipe, Specials, and Fittings (AWWA C200, modified)

1.3 REFERENCES AND STANDARDS

- A. Work covered by this Specification shall meet or exceed the provisions of the latest editions of the following Codes and Standards in effect at the time of award of the Contract.
- B. Occupation Safety and Health Act: State of Utah and Federal
- C. AMERICAN STANDARD FOR TESTING AND MATERIALS (ASTM)
 - 1. ASTM D 4541 Standard Test for Pull-Off Strength of Coatings Using Portable Adhesion Testers
- D. AMERICAN WATER WORKS ASSOCIATION (AWWA)
 - 1. AWWA C205 Cement-Mortar Protective Lining and Coating for Steel Water Pipe-4-inch and Larger- Shop Applied.
 - 2. AWWA C210 Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
 - 3. AWWA C216 Heat-shrinkable Cross-linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines

4. AWWA C217 Cold-Applied Petrolatum Tape and Petroleum Wax Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines

E. FEDERAL INTERNATIONAL ORGANIZATION (ISO)

1. ISO 8502-3 Preparation of steel substrates before application of paints and related products – Tests for the assessment of surface cleanliness – Part 3: Assessment of dust on steel surfaces prepared for painting (pressure-sensitive tape method)

F. NATIONAL ASSOCIATION OF CORROSION ENGINEERS INTERNATIONAL (NACE)

1. NACE RP 274 High Voltage Electrical Inspection of Pipeline Coatings Prior to Installation
2. NACE RP 287 Field Measurement of Surface Profile of Abrasive Blast-Cleaned Steel Surface Using Replica Tape

G. SOCIETY FOR PROTECTIVE COATINGS (SSPC)

1. SSPC-SP-1 Solvent Cleaning Surface Preparation
2. SSPC-SP-2 Hand Tool Cleaning Surface Preparation
3. SSPC-SP-3 Power Tool Cleaning Surface Preparation
4. SSPC-SP-5 White Metal Abrasive Blast Surface Preparation
5. SSPC-SP-6 Commercial Abrasive Blast Surface Preparation
6. SSPC-SP-10 Near White Metal Abrasive Blast Surface Preparation
7. SSPC-SP-11 Power Tool to Bare Metal

1.4 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 – Submittals.
- B. Submit catalog cuts and other manufacturer's performance information for products proposed that demonstrate compliance with the Specifications herein described. Provide a copy of approved coating system submittals to the coating applicator. Provide Paint System Data Sheets (PSDS) and/or Material Safety Data Sheets (MSDS) for coating and lining materials.
- C. Quality Control Submittals
 1. Applicator's experience with list of references substantiating compliance.
- D. If the manufacturer of field-applied coating differs from that of the shop-applied primer, furnish written confirmation from both manufacturers that the 2 coating materials are compatible

1.5 QUALITY ASSURANCE

- A. All inspection for quality assurance shall ultimately be the responsibility of CONTRACTOR. OWNER retains the right to observe, accept, or reject the work based on the results of CONTRACTOR's inspection or observations by ENGINEER, at OWNER's discretion, in accordance with the specifications.

- B. Coating applicator shall have a minimum of 2 years experience applying the specified coating system and the application supervisor (Certified Applicator) for the coating application personnel shall have a minimum of 5 years practical experience in application of the indicated products.
- C. Coating and/or lining manufacturer technical representative shall be present for a minimum of 3 days to furnish technical assistance and instruction at the start of coating and/or lining operations within the shop and at the Site. During these visits, the technical representative shall observe surface preparation and coating application and conduct tests of the coating to insure conformance with application instructions, recommended methods, and conditions.
- D. Coating and/or lining manufacturer shall furnish 8 hours per month of field or shop coating technical support if requested by ENGINEER.
- E. Technical representative shall provide a written report to ENGINEER for each visit. Report shall include copies of test data collected, description of observations, and recommended corrective actions. Report shall be submitted within 10 working days after the visit. When deemed necessary by ENGINEER, work will not be permitted to proceed until the recommended corrective actions have been implemented. After corrective recommendations have been implemented; the manufacturer representative shall return and certify that the application complies with the manufacturer's coating application recommendations.
- F. Additional visits by the manufacturer's representative shall be made at sufficient intervals during surface preparation and coating or lining as may be required for product application quality assurance and to determine compliance with manufacturer's instructions, and as may be necessary, to resolve problems attributable to or associated with, manufacturer's products furnished for this project.
- G. Repair and recoat all runs, overspray, roughness, or any other signs of improper application in accordance with paint manufacturer's instructions and as reviewed by ENGINEER.
- H. CONTRACTOR shall notify OWNER and minimum of 14 days prior to the commencement of any work. CONTRACTOR shall provide OWNER and/or ENGINEER with full access to facilities and application documentation. Observation by OWNER and/or ENGINEER, or the waiver of inspection of any particular portion of the work, shall not be construed to relieve CONTRACTOR of his responsibility to perform the work in accordance with these specifications.

1.6 DEFINITIONS

- A. **Manufacturer's Representative:** Employee of coating manufacturer who is factory trained and knowledgeable in technical aspects of manufacturer's products and systems. Sales representatives are not acceptable as a technical representative unless written authorization from the coating manufacturer is furnished stating the sales representative has full authority to act on behalf of the coating manufacturer.

1.7 ABBREVIATIONS

| | |
|------|---------------------------------------|
| ANSI | American National Standards Institute |
| AWWA | American Water Works Association |
| MDFT | Minimum Dry Film Thickness |
| Mil | Thousandths of an Inch |
| OSHA | Occupation Safety and Health Act |
| SSPC | Society for Protective Coatings |

1.8 SPECIAL WARRANTY REQUIREMENT

- A. CONTRACTOR and coating applicator shall warrant the work under this Section against defective workmanship and materials for a period of two (2) years commencing on the date of final acceptance of the pipeline.
- B. This warrantee shall be in addition to the prime CONTRACTOR's warrantee that covers repair of all defective work, including linings and coatings.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply paint in extreme heat, temperatures below 40 degrees F, nor in dust, smoke-laden atmosphere, damp or humid weather.
- B. Do not perform abrasive blast cleaning whenever relative humidity exceeds 85 percent, nor whenever surface temperature is less than 5 degrees F above dew point of ambient air. Strictly adhere to manufacturer's recommendations.

1.10 MEASUREMENT AND PAYMENT

- A. Pipeline Coatings and Linings shall not be measured or paid as a separate item but shall be included as part of the item to which it relates.

PART 2 PRODUCTS

2.1 GENERAL

- A. Exterior and interior pipe and fitting surfaces shall be prepared and coated in accordance with referenced standards, written directions of the coating or lining manufacturers, and this Section, whichever is more stringent.
- B. Pipeline coating or lining materials shall be the products of a single manufacturer. Product substitutions during the project will not be considered or permitted.
- C. Coating applicator shall provide a monitoring system approved by the coating manufacturer that constantly records pipe and coating conditions during coating application. Recorded monitoring parameters shall include pipe temperature, line speed, surface preparation, holiday test and other parameters applicable to the type of coating.
- D. Coatings and linings will be stored, handled and applied per the manufacturer's written directions.

2.2 CONTRACTOR FURNISHED TEST EQUIPMENT

- A. Contractor shall provide the following coating test equipment for field testing of pipe for holidays.
 - 1. Holiday Test Equipment:
 - a. Elcometer Model D236, 0 to 30 kV high voltage tester
 - b. External Pipe rolling spring probe, sized for the Project pipe diameter.
 - c. Right Angle Wire Brush Probe, 20 inches or larger.
 - d. Telescopic probed extension handle, 2- to 4-foot length range.
- B. Equipment to be turned over to the OWNER upon completion of the Work. Equipment shall be in full working condition with all manuals, cases, and accessories supplied with equipment or required to be provided.

2.3 SHOP-APPLIED BURIED COATINGS

A. General

- 1. Buried steel pipe shall be shop-coated with the required coating system and a 1-inch thick cement mortar coating with $\pm 1/4$ " tolerance, as specified herein.
- 2. Buried coated pipe and fittings passing through a structure wall or floor shall be coated for a minimum of 2-inches beyond the interior wall or floor surface.
- 3. Pipe that is atmospherically exposed shall be shop primed as specified herein and in accordance with Section 09 91 00 – Painting and Finishes.

B. Cement Mortar Coat:

- 1. Apply cement mortar coat on steel pipe and fittings in accordance with AWWA C205, except as modified herein.
- 2. Shop Applied Coating System
 - a. Cement: Conform to ASTM C150, Type II or V.
 - b. Aggregate shall be silica sand or other aggregate that is not subject to leaching. Conform to ASTM C33.
 - c. Cement mortar mixture shall consist of 1 part cement to not more than 3 parts aggregate.
 - d. Water for cement mortar: Clean and free from organic matter, strong alkalis, vegetable matter, and other impurities. Use no more than 4-1/2 gallons of water per sack of cement.
 - e. Cement mortar coating: Nominal 1 inch thick coating with permitted tolerance of $\pm 1/4$ inch.

2.4 EXTERIOR COATING FOR EXPOSED STEEL PIPE

A. Exterior Coating System

- 1. All atmospherically exposed or vault piping shall be shop primed with the coating system as specified in Section 09 91 00 – Painting and Finishes.
- 2. Exposed pipe to be shop primed per Section 09 91 00 – Painting and Finishes, with intermediate and finish coats to be applied in the field after installation is complete.

3. Shop applied inorganic zinc primer shall not be applied at thickness greater than recommended by manufacturer. Excess primer to be removed using method recommended by coating manufacturer.
4. Manufacturer of shop-applied primer shall be coordinated with field application to provide a completed system by a single manufacturer as specified in Section 09 91 00 – Painting and Finishes. OWNER approval of a coating system with two or more coating manufacturers will required written approval from all coating manufacturer's as to compatibility and acceptance under warranty.

2.5 INTERIOR SHOP-APPLIED LININGS

A. Cement Mortar Lining

1. Clean and cement mortar line steel pipe and fittings in accordance with AWWA C205.
2. Cement shall conform to ASTM C150, Type II.
3. Shop applied cement mortar lining shall be uniform in thickness over the full length of the pipe joint.
4. Aggregate shall be silica sand or other aggregate that is not subject to leaching. Conform to ASTM C33.
5. Water for cement mortar: Clean and free from organic matter, strong alkalis, vegetable matter, and other impurities.

B. Liquid Applied Epoxy Lining

1. Exposed steel pipe inside vaults shall be epoxy lined in accordance with Section 09 91 00 – Painting and Finishes, unless noted otherwise.
2. Provide liquid epoxy primer and lining in accordance with Section 09 91 00 – Painting and Finishes in all cement mortar lined metallic pipe at insulating joints for a minimum of two pipe diameters on each side of the insulated joint.
 - a. Epoxy shall be applied over the cement mortar lining where specified for the pipeline lining material.
 - b. Prepare the cement mortar lining by abrasive blasting to remove all laitance and provide a surface profile.
 - c. Cement mortar shall be allowed to cure for a minimum of 15 days prior to surface preparation and coating application or 7 days with steam curing.
 - d. Mortar lining shall be dry when epoxy lining is applied.
3. Epoxy coatings shall be NSF certified coatings suitable for potable water contact in accordance with ANSI/NSF Standards 60 and 61.

2.6 SPECIALS, FITTINGS, AND CONNECTIONS

- A. Coating and lining application for special sections, connections, and fittings shall conform to coating system and application requirements in this Section. Internal Mortar lining shall be applied to all specials, fittings and pipes with outlets.
- B. Specials, fittings, and pipes with outlets shall be defined as any pipe section with turnouts for blowoffs, interconnects, any valve, or other appurtenances; tees; crosses; wyes; laterals; manholes; mitered angles or elbows; and pipes that require special fabrication that prevents mechanical production application of the indicated coating system from end to end of pipe joint as defined herein.

- C. In addition to the items listed above as specials, the following items shall also be considered as specials: Pipe joints with pass through holes.
- D. Hand-applied tape coatings will not be permitted on any specials, fittings, connections, pipes with outlets and elbow fittings.
- E. Provide a cement mortar coating on specials, fittings, and connections to match pipeline, where pipeline coating requires a cement mortar coating.

2.7 EXTERIOR FIELD JOINT COATING

- A. Pipe joints shall be field coated after pipe assembly in accordance with AWWA C216, except as modified herein.
- B. Field joint coating shall be compatible with the shop-applied coating system and be provided by the same manufacturer or a manufacturer approved by the pipe coating manufacturer.
- C. Field joint coating materials shall be as follows or an equal.
 - 1. Heat Shrink Sleeves
 - a. Filler Material: Provide filler material for push-on, flange, and coupling type joints. Filler material shall adhere to pipe and heat shrink sleeves and shall not melt under joint welding temperatures. Size and type shall be as recommended by the sleeve manufacturer for type of pipe and joint. Filler material shall be applied in a manner and of sufficient thickness that no tenting or voids remain under the heat shrink sleeve. Filler material shall be **Canusa Aqua Seal SG79 or Raychem Covalence 939 Filler**.
 - b. Joint Coating: Heat shrink, cross-linked polyolefin wrap or sleeve with an adhesive, backing and sleeve with a total of 200-mils minimum thickness, suitable for pipeline operating temperature, as recommended by the manufacturer and shall meet the requirements of AWWA C 216.
 - c. Provide standard recovery sleeve for girth weld or bell and spigot steel pipe joints. High recovery sleeves shall be provided for flange joints, coupling style joints.
 - d. Width of heat shrink sleeves shall be sufficient to overlap existing coating 3 inches minimum. Overlap on tape coated steel pipe shall be based on a sequential 3-inch wide step from outer wrap to middle wrap to inner wrap.
 - e. Consider sleeve shrinkage during installation and joint profile in determining sleeve width required. Overlapping of 2 or more heat shrink sleeves to achieve the necessary width on pipe joints will not be permitted without OWNER approval.
 - f. Manufacturers: **AquaSleeve by Canusa-CPS, Covalence by Berry CPG**, or approved equal.
 - 2. Hand Applied Tape Wrap – Not Allowed.
 - 3. Wax Tape Coating
 - a. Wax tape coatings shall be limited to field application on joints, fittings, or irregular shapes or complex configurations that are not suited for the use of heat shrink wrap coating systems.
 - b. Apply coating in accordance with AWWA C217, except as modified herein.
 - c. Provide filler material to fill and smooth irregular surfaces, such that no tenting or voids remain under the applied wax tape.

- d. Protect coating from damage and provide special sand backfill protect wax coating from damage.
- e. Coating System
 - 1) Surface Preparation: SP3 Power Tool or SP11 Power Tool to Bare Metal.
 - 2) Primer: Petroleum or petrolatum wax.
 - 3) Filler Material: Filled petroleum or petrolatum wax.
 - 4) Inner Tape: Petroleum or petrolatum wax impregnated fabric, 6-inch width maximum, 40-mils thick.
 - 5) Outer Wrap: PVC or tape suitable for application to inner tape.
- f. Wax tape coating system shall be as manufactured by, or approved equal:
 - 1) **Petrolatum Tapes by Denso North American**
 - 2) **Wax-Tape by Trenton**

2.8 INTERIOR FIELD JOINT COATING

- A. Surface preparation and field lining of pipe joints shall be with the same coating system as the shop-applied lining.
- B. Field application shall be performed by qualified personnel trained on the proper application of the coating system.
- C. Field coating application requirements shall be the same as the shop-applied coating requirements. Provide heating and/or dehumidification equipment as required to meet the environmental conditions necessary for proper coating application.

2.9 REPAIR OF COATINGS AND LININGS

- A. General
 - 1. Coating or lining repair materials shall be compatible with the shop-applied coating or lining system and shall be approved by the coating or lining manufacturer.
- B. Coating Repair Materials
 - 1. Heat Shrink Sleeves (major repair)
 - a. Filler Mastic: Provide mastic filler to fill tape void as required.
 - b. Full Wrap Coating: Cross-linked polyolefin wrap with a mastic sealant, 85-mil thickness minimum, suitable for pipeline operating temperature, sleeve material recovery as recommended by the manufacturer. Sleeve length shall provide a minimum of 3-inches overlap onto intact pipe coating.
 - c. Manufacturers: **AquaSleeve by Canusa-CPS, Covalence by Berry CPG**, or approved equal.
 - 2. Heat-Applied Patches (minor repair)
 - a. Heat applied adhesive, polyolefin-backed, mastic coated tape, 12-inches maximum size.
 - b. Patch shall provide a minimum of 2-inches overlap onto intact pipe coating.
 - c. Manufacturers: **CRP patch by Canusa, PERP patch Berry CPG**, or approved equal.

C. Exposed Pipe Coating System

1. Touch-up repair all damage to primer and/or intermediate coats with the specified coating system prior to final coating of the pipeline in accordance with Section 09 91 00 – Painting and Finishes.

PART 3 EXECUTION

3.1 ENVIRONMENTAL LIMITATIONS

A. General

1. Products shall comply with federal, state, and local requirements limiting the emission of volatile organic compounds and worker exposure.
2. Comply with applicable federal, state, and local, air pollution and environmental control regulations for surface preparation, blast cleaning, disposition of spent aggregate and debris, and coating application.
3. Do not perform abrasive blast cleaning whenever the relative humidity exceeds 85 percent or whenever surface temperature is less than 5 degrees above the dew point of the ambient air.
4. Do not apply coatings when:
 - a. Surface and ambient temperatures exceed the maximum or minimum temperatures recommended by the coating manufacturer or these specifications.
 - b. In dust or smoke-laden atmosphere, blowing dust or debris, damp or humid weather, or under conditions that could cause icing on the metal surface.
 - c. When it is expected that surface temperatures would drop below 5 degrees above dew point within 4 hours after application of coating.
5. Where weather conditions or project requirements dictate, CONTRACTOR shall provide and operate heaters and/or dehumidification equipment to allow pipe surfaces to be abrasive blasted and coated as indicated and in accordance with the manufacturer's coating application recommendations.
6. Work activities may be restricted until adequate temperature and humidity controls are in place and functioning within the environmental limits given.
7. Coating applicator shall provide a monitoring system approved by the coating manufacturer that constantly records pipe and coating conditions during coating application. Recorded monitoring parameters shall include pipe temperature, line speed, surface preparation, holiday test, and other parameters applicable to the type of coating.

B. Temperature Control

1. In cold weather or if moisture collects on the pipe, if the temperature of the pipe is less than 45 degrees F, preheat the pipe to a temperature of 50 degrees F or 5 degrees above dew point, whichever is greater.
2. When temperatures are above or below the coating manufacturer's recommended application temperatures, CONTRACTOR shall provide temperature controls as necessary to permit the work to proceed within the manufacturer's temperature limitations.
3. Provide tenting, insulating blankets, baffles, or bulkheads as required to zone and control heating or cooling effectiveness.
4. Heating shall be with indirect propane fired heaters that do not increase humidity levels within the working area. Heaters shall be sized for the area to be heated.

C. Dehumidification

1. CONTRACTOR shall provide dehumidification equipment when necessary for shop or field environmental control during surface preparation and/or coating application. Dehumidification equipment shall be properly sized to maintain dew point temperature 5 degrees or more below surface temperature of metal surfaces to be cleaned and coated.
2. Cleaned metal surfaces shall be prevented from flash rusting throughout the project duration; condensation or icing shall be prevented throughout surface preparation and coating application.
3. Daily environmental condition monitoring and maintenance requirements of the equipment shall be documented in writing and posted near the equipment for review if required by ENGINEER.
4. Re-blasting of flash rusted metal surfaces or removal of damaged coatings because of equipment malfunction, shutdown, or other events that result in the loss of environmental control, will be at the sole expense of CONTRACTOR. Cleaned metal surfaces subject to flash rusting shall be cleaned to the same cleanliness as prior to the flash rust formation and shall be approved by the ENGINEER.
5. If the required environmental conditions cannot be maintained throughout the coating process, the CONTRACTOR will be required to provide the following:
 - a. CONTRACTOR shall provide and operate desiccant dehumidification equipment to maintain environmental conditions for 24 hours a day during abrasive blasting and coating application and cure. Liquid, granular, or loose lithium chloride drying systems will not be acceptable.
 - b. CONTRACTOR shall provide dehumidification equipment sized to maintain dew point temperature 5°F or more below surface temperature of metal surfaces to be cleaned and coated. System shall provide ventilation within the environmentally controlled areas to meet the following requirements:
 - 1) Two air exchanges per hour, minimum
 - 2) Maintenance of personnel exposure limits (PEL) at 50 percent of OSHA PEL limits for all chemicals used in the performance of the Work.
 - 3) Maintenance of lower explosive limits (LEL) to less than 50 percent of the most volatile solvent used in the performance of the Work.
 - c. Dehumidification equipment shall also provide ventilation at a minimum of 0.75 air exchanges per hour within all non-accessible work areas for worker protection or as required for maintaining PEL and LEL explosive limits as defined herein, whichever is more stringent.
 - d. Dehumidification equipment type, size, air flow, and power requirements shall be designed by a qualified company knowledgeable in dehumidification equipment, and its operation based on Project requirements and anticipated seasonal weather conditions for the Project schedule. Design to include evaluation of existing conditions, humidity, and temperature, proper air exchange requirements, ventilation requirements, ducting requirements for adequate air flow, and any other issues necessary to achieve the specified performance and environmental conditions throughout the duration of the Project.
 - e. CONTRACTOR to submit written recommendations from dehumidification Subcontractor for enclosure work area size, bulkhead venting, duct work for each bulkhead section, any secondary ventilation requirements for coating cure, dust collection equipment CFM requirements, and drying requirements for blast hose compressed air necessary to maintain environmental control as specified herein.

- f. At a minimum, work area shall be separated into surface preparation work zones, coating application zones, and coating cure zones.
- g. Dehumidification Subcontractor shall either operate the equipment or provide training to CONTRACTOR on the proper operation and setup of dehumidification equipment. Dehumidification Subcontractor shall provide a technical representative on-site for a minimum of two 8 hour days to insure proper operation of the equipment, achievement of desired environmental control, and to insure CONTRACTOR can properly setup, operate, monitor, and maintain equipment.

3.2 OBSERVATION OF WORK

- A. CONTRACTOR shall give ENGINEER a minimum of 14 days advance notice of the start of any coating work to allow scheduling for shop or field observation. Notify ENGINEER a minimum 3 days in advance of actual start of surface preparation and coating application Work.
 1. Provisions shall be made to allow ENGINEER full access to facilities and appropriate documentation regarding coating application.
 2. Observation by ENGINEER or the waiver of observation of any particular portion of the coating work shall not be construed to relieve CONTRACTOR of responsibility to perform the coating in accordance with these Specifications.
 3. Materials shall be subject to observation for suitability as ENGINEER may determine, prior to or during incorporation into the work.

3.3 SURFACE PREPARATION

A. General

1. Inspect and provide substrate surfaces prepared in accordance with these Specifications and the printed directions and recommendations of coating manufacturer whose product is to be applied.
2. Visible oil, grease, dirt, and contamination shall be removed in accordance with SSPC-SP1, solvent cleaning.
3. Surface imperfections such as metal slivers, burrs, weld splatter, gouges, or delaminations in the metal shall be removed by filing or grinding prior to abrasive surface preparation.
4. Protect prepared pipe from humidity, moisture, and rain. Flash rust, imperfections, or contamination on cleaned pipe surface shall be removed by reblasting.
5. Priming and coating of pipe shall be completed the same day as surface preparation.

B. Weld Surface Preparation

1. Application
 - a. Spray applied coating systems do not require weld grinding.
 - b. Grind welds on tape wrap coated pipe or apply weld stripe tape over the weld, at the pipe fabricator's option, unless otherwise indicated.
2. Weld Grinding: Under the weld grinding option, welds taller than 3/32-inch above pipe surface shall be ground to a tolerance of +3/32-inch to zero-inches above the pipe surface as measured on the highest side of the weld.
3. Weld Stripe Tape
 - a. Weld stripe tape shall be applied to primed metal.

- b. Tape shall either have no polyethylene backing or be double sided adhesive tape to permit adhesion of the inner corrosion protection layer to the weld stripe tape.
- c. Apply tape with a pressure roller to fully conform the tape to the weld surface.
- d. Adhesion of the weld stripe tape shall be the same as for the coating system.

C. Steel Surface Preparation

1. Surface preparation of steel pipe shall be in accordance with SSPC surface preparation standards utilizing the degree of cleanliness appropriate to the coating system to be applied.
2. Grit and/or shot abrasive mixture and gradation shall be as required to achieve the degree of cleanliness and coating adhesion required.
3. Pipe cleaned by abrasive blasting with recyclable steel grit and/or shot or other abrasive shall be cleaned of debris and spent abrasive in an air wash separator.
4. Work shall be performed in a manner that does not permit the cleaned metal surface to rust back or flash rust.
5. Rust back or flash rust shall be fully removed with the steel surface cleanliness equal to the required metal surface cleanliness prior to rust back or flash rusting. Determination of the equivalent surface cleanliness shall be at ENGINEER'S sole discretion.

3.4 SHOP-APPLIED COATING SYSTEMS

A. Cement Mortar Coatings

1. Buried steel pipe shall have a cement mortar coating applied in accordance with AWWA C205, except as modified herein.
2. Cement Mortar Coating:
 - a. Reinforcement:
 - 1) For pipe and specials smaller than 48-inches in diameter, reinforce coating with spirally-wound No. 12 gage steel wire spaced at 1-inch centers or with No. 4 gage steel wire at 1/2-inch centers positioned approximately in center of mortar coating.
 - 2) For pipe and specials 48-inches in diameter and larger, reinforce coating with 2 layers of spirally-wound No. 12 gage steel wire spaced at 1-inch centers or with No. 4 gage steel wire at 1/2-inch centers positioned approximately in center of mortar coating.
 - 3) Lap ends of reinforcement strips 4-inches and tie or loop free ends to assure continuity of reinforcement.
 - 4) All steel wire reinforcement placed in the mortar coating shall be electrically isolated from the pipe. Electric isolation will be tested using high voltage spark test by the manufacturer prior to shipment to the project site. Provide certification that electrical isolation of reinforcement wire from steel pipe.
 - b. Specials Fittings:
 - 1) Special fittings shall be mortar coated as specified.
 - c. Coating Defects:
 - 1) Coating defects shall be repaired as specified in AWWA C205, except as modified herein.

B. Epoxy Coatings

1. Exposed steel pipe inside vaults shall have an epoxy coating per Section 09 91 00 – Painting and Finishes, unless noted otherwise.

3.5 EXTERIOR COATING HOLDBACK

- A. Coating holdbacks shall be straight and cut through the full thickness of the coating.
- B. Cutbacks shall be completed in a manner that permits field coating of joints in accordance with the manufacturer's recommendations and these requirements.
- C. Holdbacks shall be as required for proper jointing of pipe, considering joint welding requirements, and be as follows:

| Mortar Coating | |
|-----------------------|-------------------------|
| All joints | As shown on the details |
| Epoxy coating | |
| Push-on joint, spigot | Flush with spigot end |
| Push-on, bell | Flush with bell end |
| Welded, spigot | 3-inches, minimum |
| Welded, Bell | 4-inches, minimum |

D. Holdback Corrosion Protection

1. Holding primer for corrosion protection of cutbacks or holdbacks shall be compatible with the joint coating system, shall prevent corrosion of prepared pipe ends for duration of storage and construction, and be recommended for buried exposures.
2. Primer shall be compatible with welding operations and shall not result in running or melting of the coating during welding operations.
3. Application and thickness of holding primer shall be in accordance with the primer manufacturer's recommendations, but shall not impair the clearances required for proper joint installation.
4. Any corroding holdback areas shall be abrasively blasted to SP10 or power tool cleaned to bare metal in accordance with SP11 prior to applying joint coating.

3.6 PIPE LINING APPLICATION

A. Shop-Applied Cement Mortar Lining

1. Place mortar lining used in steel piping and steel plate specials in pipe to thickness below.

| Pipe Diameter, Inches | Lining Thickness, Inches | Tolerances, Inches |
|----------------------------------|-------------------------------------|-------------------------------|
| 4 through 10 | 3/8 | -1/16, +1/8 |
| 11 through 24 | 5/16 | -1/16, +1/8 |
| 24 through 36 | 3/8 | -1/16, +1/8 |
| Greater than 36 | 1/2 | -1/16, +3/16 |

2. Centrifugally line straight sections of pipe. Lining of special pieces or fittings shall be by mechanical, pneumatic, or hand placement. Provide cement mortar lining of uniform thickness. Finish to a smooth dense surface.
 - a. Steel plate specials larger than 16-inches in diameter shall have lining reinforced with 2-inch by 4-inch No. 13-gauge welded steel wire mesh.
 - b. Brace and support pipe during lining application to minimize pipe distortion or vibration. Bracing and supports shall not damage the pipe, coating, or lining.
 - c. Tightly close ends of pipe and fittings with plastic sheet caps within 30 minutes of lining application. Plastic end caps shall be of sufficient thickness and strength to resist shipping, handling, and storage stresses.
 - d. Damage to the cement mortar lining, including disbondment, cracking, or blistering, caused by improper curing, shipping, handling, or installation shall be repaired in accordance with AWWA specifications.
 - e. Other requirements of mortar lining materials and processes are in AWWA C205.

B. Liquid Epoxy Lining:

1. Epoxy lining shall be applied in accordance with Section 09 91 00 – Painting and Finishes.
2. Clean and coat the interior of cement mortar lined pipe at insulating joints or where specified with two coats of epoxy coating
 - a. Epoxy coating applied at insulating joints shall be applied to both sides of the insulating joint for a minimum of one pipe diameter. If only one side of the joint can be coated, the coating shall be applied for a minimum of two pipe diameters.
 - b. Mortar lining shall be allowed to cure 15 days or steam cured not less than 7 days prior to surface preparation of the mortar and epoxy coating application. Hand applied mortar lining shall be allowed to cure a minimum of 15 days or as required to meet the coating manufacturer's requirements for application on cement or concrete, whichever is greater.
 - c. Prepared mortar lining by abrasive blasting to remove all laitance and create a suitable anchor profile.
 - d. Epoxy coating shall be applied in two coats minimum, at a total coating thickness of 16 mils dry film thickness. Coating applied over cement mortar lining shall be applied in a manner that will minimize gassing and pinholes in the completed lining.
 - e. Mortar lining shall be dry during epoxy lining application.

3.7 FIELD COATING JOINTS

A. General

1. Remove oil or grease contamination by solvent wiping the pipe and adjacent coating in accordance with SSPC-SP1, Solvent cleaning.
2. Clean pipe surface and adjacent coating of mud, rust, and other foreign contaminants in accordance with SSPC-SP11, Power Tool Cleaning to Bare Metal or abrasively field blast joints in accordance with SSPC-SP10, near white blast, that exhibit any surface rust. Clean the full circumference of the pipe and a minimum of 6-inches onto the existing coating.
3. Remove loose or damaged pipe coating at joint and either repair the coating or increase the length of the joint coating, where reasonable and practical.
4. Complete joint bonding (where shown) of pipe joints before application of joint coating. Joint bonds shall be installed per Section 26 42 00 – Galvanic Cathodic Protection Systems. Joint bonds shall be low profile bonds, and gaps and crevices around the bonds shall be filled with mastic sealant.
5. CONTRACTOR shall electrically test completed joint coating for holidays with high voltage spark tester.

B. Post-Welding of Joints:

1. Post-welded joints are defined as welded pipe joints that are coated prior to completing interior welds.
2. Post welded joints shall be coated and protected as follows:
 - a. Joint coating shall be heat shrink joint sleeves only. Tape wrapped joints will not be acceptable.
 - b. Provide 6-inch wide non-shrinking layer centered over the interior weld location, such as **CRP patch by Canusa or PERP by Berry CPG** patch materials. Heat resistant tape will not be acceptable.
 - c. Finished external joint coatings shall be fully buried with a minimum of 12-inches of soil cover, prior to any interior welding.
3. CONTRACTOR shall demonstrate that the joint welding procedures will not significantly damage the coating by fully excavating the first 2 post-welded joints for inspection of the coating condition. Up to 3 additional post-welded joints for excavation by CONTRACTOR will be selected for inspection of joint coating condition.
4. Any damage to the external joint coating system will require the CONTRACTOR to modify welding methods and or coating materials until a non-damaged system is attainable. All weld damaged joint coatings shall be removed and replaced with the new suitable system.

C. Heat Shrink Sleeve Joint Coating

1. Store, handle, and apply field heat shrink sleeve coatings in accordance with AWWA C216 and these specifications.
2. Store sleeves in shipping box until use. Keep dry and sheltered from exposure to direct sunlight. Store off the ground or concrete floors and maintain at a temperature between 60 and 100 degrees F as recommended by the sleeve manufacturer.
3. Metal pipe surface shall be free of dirt, dust, and flash rusting prior to sleeve application. Surface preparation shall be in accordance with the joint coating manufacturer's recommendations. At a minimum, surfaces shall be prepared by

abrasive blasting to SSPC-SP10 or by power tool cleaning to bare metal in accordance with SSPC-SP11.

4. Preheat pipe uniformly as recommended by the sleeve manufacturer. Monitor pipe temperature using a surface temperature gauge, infrared thermometer, or color changing crayons. Protect preheated pipe from rain, snow, frost, or moisture with tenting or shields and do not permit the joint to cool.
5. Fill cracks, crevices, gaps, and step-downs greater than 1/4- inch with filler mastic in accordance with the manufacturer's recommendations for the full circumference of the pipe.
6. Apply heat shrink sleeve when it is at a minimum temperature of 60 degrees F and while maintaining the pipe temperature above the preheat temperature above. Apply sleeve in accordance with the manufacturer's instructions and center the sleeve over the joint to provide a minimum 3 inch overlap onto the existing pipe coating.
7. Completed joint sleeve shall be fully bonded to the pipe and existing coating surface without voids. Mastic beading shall be visible along the full circumference of the sleeve. There shall be no wrinkling or excessive burns on the sleeves. Sleeves that do not meet these requirements shall be removed and the joint recoated. Minor coating repairs may be made using heat applied patch material indicated.
8. Allow the sleeve to cool before backfilling. In hot climates, provide shading from direct sunlight. Water quenching will be allowed only when permitted by the sleeve manufacturer.
9. Heat shrink joint coatings which have become wrinkled or disbonded because of prolonged exposure to UV light or thermal cycling shall be removed and replaced.
10. Double coating of defective or damaged heat shrink coatings will not be permitted. Any double coated heat shrink sleeves shall be immediately rejected and CONTRACTOR shall remove and recoat the joint.

D. Cement Mortar Coating

1. Field repair cement mortar coating in accordance with AWWA C205.
2. Joint Diapers
 - a. Polyethylene Foam:
 - 1) Cut into strips wide enough to match uncoated field joint area.
 - 2) Slit to thickness of 1/4-inch that will expose a hollow or open cell surface on one side.
 - 3) Foam liner shall be attached to fabric backing with open or hollow cells facing towards pipe.
 - 4) Foam strip shall cover full interior circumference of grout band with sufficient length to permit 8-inch overlap of foam at or near top of joint.
 - 5) Splices to provide continuity of material will be permitted.
 - 6) Protect polyethylene foam material from direct sunlight.

3.8 REPAIR OF COATING AND LININGS

A. General

1. Areas where holidays are detected or coating is visually damaged, such as blisters, tears, rips, bubbles, wrinkles, cuts, or other defects shall be repaired. Areas where no holidays are detected, but are visually damaged shall also be repaired.

2. Maximum defects allowable shall be as indicated for the coating system.

B. Cement Mortar Coating and Lining

1. Cement mortar coating that is cracked or disbonded shall be repaired in accordance with AWWA C205, except for mortar overcoat on tape wrapped steel.
2. Disbonded mortar coating shall be removed and patched.
3. Mortar coating with disbondment greater than 25 percent of the pipe surface shall be rejected and recoated.
4. Cracks in mortar coating and lining shall be repaired in accordance with AWWA C205.

C. Epoxy Coating and Lining

1. Epoxy coating and linings shall be repaired in accordance with Section 09 91 00 – Painting and Finishes.

3.9 INSPECTION AND TESTING

A. Inspection

1. Applicator shall inspect and test the coating system in accordance with referenced standards and these specifications, whichever is more stringent.
2. The frequency of the testing shall be determined by the applicator, but shall not be less than the requirements of this specification.
3. CONTRACTOR will conduct random independent inspections and tests for the final acceptance or rejection of pipe coating or lining.
4. CONTRACTOR to perform holiday testing in the field using equipment provided as specified in Paragraph 2.2. Tests will be completed in the presence of the OWNER's representative on each joint of pipe and fitting once the pipe has been lifted and lowered into the trench. Holidays shall be repaired as specified.

B. Surface Profile Testing

1. Surface profile of abrasive blasted surfaces to be tested with "Press-O-Film" tester tape or equivalent in accordance with NACE RP287.
2. Tester tape shall be suitable for the intended profile height.
3. Profile shall be measured to a minimum tolerance of 0.1 mils, maximum.
4. Electronic surface profilometers shall be used, as deemed necessary, to verify tester tape measurements.

C. Adhesion Testing, General

1. Adhesion testing shall be conducted at the shop prior to shipment. Pipe shipped without adhesion testing will be field-tested. Pipe rejected in the field will be returned to the shop for repair at the sole expense of the CONTRACTOR.
2. A minimum of 2 pipes will be tested for adhesion from each lot of pipe coated up to 4,000 square feet of pipe. An additional adhesion test will be conducted on every increment up to 3,000 square feet of pipe coated in excess of the first 4,000 square feet of pipe. (i.e. if one workday of production is 8,000 square feet of pipe, 4 adhesion tests will be conducted on the pipe lot.

3. A pipe lot is defined as the quantity of pipe that is coated by a single crew within a work shift, but not to exceed 12 hours.
4. The pipe coating applicator shall repair coating damage from adhesion testing.
5. Adhesion tests will be performed not less than 24 hours after coating application. Tests conducted prior to 24 hours will be acceptable only if the test meets or exceeds the adhesion criterion and the test was requested by the pipe fabricator.
6. Pipe will be randomly selected for adhesion testing. OWNER reserves the right to perform adhesion testing at any time or location.
7. If any pipe tested fails the adhesion test, all pipes within the lot will be rejected. Each pipe within the rejected pipe lot will then be individually tested for adhesion and accepted or rejected on a pipe-by-pipe basis.
8. Rejected pipe shall have the coating fully removed from the pipe and the pipe abrasive blasted and recoated.

D. Holiday Testing

1. Coating thickness used for holiday testing shall be the minimum coating thickness.
2. Dry Film Thickness Testing
 - a. Coatings shall be tested for dry film thickness using a properly calibrated magnetic pull off or eddy current equipment.
 - b. Coating thickness measurements shall be conducted as necessary and without limitation. Testing conformance to the requirements of SSPC PA-2 is specifically excluded from this specification.

3.10 HANDLING, TRANSPORTATION, AND STORAGE

- A. Pipe shall be handled in such a manner as to protect the pipe and coating from damage.
- B. Coated pipe shall not be shipped or installed until coating has developed full adhesion and cure.
- C. During coating application, storage, loading, and transportation, every precaution shall be taken to protect and prevent damage to pipe, lining, and coating. Forklift equipment shall have load-bearing surfaces padded with suitable material. Lift pipe with web slings a minimum of 12-inches wide and of a type that will not damage the coating. Metal chains, cables, tongs, forklifts or other equipment likely to damage the coating will not be permitted. Dragging or skidding of pipe on grade or in the trench will not be permitted.
- D. Provide transportation vehicles with padded bolsters between each layer of pipe and heavy padding under load ties. Bolsters shall be curved to fit the outside of the pipe and 12-inches wide, minimum. Pipe contact locations shall be heavily padded with carpet and strips of the outer tape wrap material (adhesive side against the carpet) during shipment to the Site and from the storage yard to the point of installation.
- E. Pipe shall not be stored on rocks, gravel, or other hard materials that might damage the coating. Provide padded 12-inch wide skids and chucks, sand bags, select loamy or sand berms, or suspended from cutback ends, where possible, to minimize coating damage. Pipe shall not be laid on asphalt without suitable padding at contact points.
- F. Pipe shall be inspected by CONTRACTOR at the Site for damage. Any damage to the pipe, lining, or coating shall be repaired if a satisfactory repair can be made; otherwise, the damaged section shall be replaced at the sole expense of CONTRACTOR.

- G. No metal tools or heavy objects shall be permitted to come into contact unnecessarily with the finished coating. Workers shall not be permitted to walk on the coating except when absolutely necessary. When required, shoes with rubber or composition soles and heels or other suitable footwear that will not damage coating shall be used.
- H. Long-term Exposure: Pipe shall either be provided with UV inhibitor for length of above grade exposure or covered to prevent UV degradation of outer wrap. Amount of UV stabilizers required shall depend on the project location, laying schedule, anticipated length of exposure, and type of outer wrap. Coating manufacturer shall be consulted for recommended UV inhibitors requirements or pipe shall be stored under a protective cover. Protective covering can be colored plastic sheeting, canvas, or other UV blocking material. Clear plastic sheets are not acceptable. Areas of coating that display UV degradation shall be removed and repaired at sole cost of CONTRACTOR.
- I. End Caps: Pipe ends of mortar lined pipe and fittings shall be tightly closed with a plastic wrap to aid in curing and to minimize drying out of and contamination of the lining. Plastic end cap shall consist of a minimum of one 10-mil sheet of polyethylene or other suitable material. End caps shall be substantial enough to resist shipment, handling, and storage loads and to remain firmly attached in place. The plastic end cap shall remain intact and in place until pipe installation. Damaged or missing plastic end caps shall be repaired or replaced.
- J. Bracing
 1. The manufacturer shall install adequate bracing or strutting to keep the pipe from becoming deformed or damage from occurring to the coating or linings. Strut-type bracing shall be installed as soon as possible after application of lining. Struts shall remain in place during handling, storage, transportation, and installation of pipe and fittings until after the pipe zone material is compacted. Adequate strutting shall be provided by pipe manufacturer, so that after completion of backfilling, pipe deflection or elongation shall not exceed one percent of the nominal inside diameter of cement-mortar-lined pipe.
 2. The minimum bracing shall consist of crossed struts (horizontal and vertical). The maximum spacing along the pipe shall be near each end and at the one-third points for each 48-foot section of pipe, with a minimum of 4 sets of struts per 48-foot section of pipe. Random lengths of pipe shall have an equivalent number of sets of struts, with a minimum of one set of struts in a 10-foot section of pipe
 3. The struts shall be installed with pads and wedges in such a manner that the pipe lining will not be damaged and the struts will not be dislodged during shipping and handling of the pipe. If struts are welded, they shall be installed and removed in such a manner to prevent damage to the steel cylinder, lining, or coatings. Damage shall be repaired to the satisfaction of ENGINEER.

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SECTION 22 11 25
SUBMERSIBLE SUMP PUMPS

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section includes submersible sump pumps intended for operation with clear liquids. The Contractor shall provide pumps and appurtenances for complete and operable installations according to the contract documents.

1.2 RELATED SECTIONS

- A. Related work in other sections includes but is not limited to:
 - 1. Division 26 Electrical Provisions

1.3 MEASUREMENT AND PAYMENT

- A. There shall be no separate measurement and payment for this section. Full compensation for pumps shall be considered as included in the contract unit or lump sum bid prices for the various items of the contract to which the sump pumps relate.

1.4 SYSTEM DESCRIPTION

- A. Pumps shall be suitable for use in pumping drainage from floor drains and equipment drains which may contain small quantities of dirt, oil and grease. Pumps shall be suitable for heavy-duty continuous service.
- B. All submersible sump pumps shall have the following operating characteristics.

| Parameters | Valve Vault |
|-----------------------|-------------|
| 1. Pump capacity, gpm | 40 |
| 2. Head, ft | 15 |
| 3. Minimum rated HP | 0.5 |

1.5 ENVIRONMENTAL CONDITIONS

- A. Sump pumps will be located within the vaults as shown. The expected temperature range of water is between 40 and 75 degrees F.

1.6 SUBMITTALS

- A. The following information shall be provided in accordance with Section 01 33 00: Submittal Procedures Catalog information describing the pump as well as head, capacity, level control switch, and power ranges.

PART 2 PRODUCTS

2.1 MATERIAL

- A. Each pump shall be of the completely immersible type designed to operate completely submerged but capable of intermittent operation with the motor exposed. The motor chamber shall be oil filled and hermetically sealed. The shaft bearings shall be oil lubricated and designed for the radial and thrust loads imposed by the specified operating conditions. The motor impeller shall be mounted on a common steel shaft with a mechanical seal and shall be designed to be completely removable from the motor end of the pump. The impeller shall be capable of passing a 3/4-inch diameter sphere.
- B. Pumps shall be suitable for automatic operation using an attached level-controlled switch. The power cable shall be sealed at the motor bell and of sufficient length to reach, without splices to the junction box shown. The pumps shall be designed for operation of 120-volt, single phase, 60 hertz electric service.

2.2 MANUFACTURER

- A. The pumps shall be Tsurumi HS (Z) 2.4S-62 - 0.5 HP, no equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Sump pumps shall be installed where shown in strict accordance with the pump manufacturer's recommendations.

- END OF SECTION -

SECTION 26 05 00
ELECTRICAL GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION

- A. It is the intent of this part of the Contract Documents to cover all Work and materials necessary for erecting complete, ready for continuous use, a tested and working electrical system, substantially as indicated on the Plans and as hereinafter specified.

1.2 GENERAL PROVISIONS

- A. Minimum sizes of equipment, electric devices, etc., are indicated but it is not intended to show every offset and fitting, nor every structural or mechanical difficulty that will be encountered during the installation of the Work.
- B. All Work indicated on the Plans is approximately to scale, but actual dimensions and detailed drawings should be followed as closely as field conditions permit. Field verification of scale dimensions on Plans is directed since actual locations, distances, levels, etc. will be governed by field conditions.
- C. Discrepancies indicated on different Plans, between Plans and actual field conditions, or between Plans and Contract Documents shall be promptly brought to the attention of ENGINEER for a decision.
- D. The alignment of equipment and conduit shall be varied due to architectural changes, or to avoid work of other trades, without extra expense to OWNER.
- E. CONTRACTOR shall furnish and install all parts and pieces necessary to the installation of equipment in accordance with the best practice of the trade and in conformance with the requirements of these Contract Documents.
- F. All items not specifically mentioned in these Contract Documents or noted on the Plans or accepted Shop Drawings, but which are obviously necessary to make a complete working installation, shall be deemed to be included herein.
- G. CONTRACTOR shall lay out and install electrical work prior to placing floors and walls. He shall furnish and install all sleeves and openings through floors and walls required for passage of all conduits. Sleeves shall be rigidly supported and suitably packed or sealed to prevent ingress of wet concrete.
- H. CONTRACTOR shall furnish and install all inserts and hangers required to support conduits and other electrical equipment. If the inserts, hangers, sleeves, etc. are improperly placed or installed, CONTRACTOR shall do all necessary work, at his own expense, to rectify the errors.
- I. All electrical equipment shall be capable of operating successfully at full-rated load, without failure, at an ambient air temperature of 40 degrees C, and

specifically rated for an altitude of 4500 feet.

- J. CONTRACTOR shall submit Shop Drawings, data and details to ENGINEER on all controls, fixtures, wiring, electrical equipment, conduit, etc. for review and acceptance prior to use of any components in the work.
- K. All materials, equipment, and parts comprising any unit or part thereof specified or indicated on the Plans shall be new and unused, of current manufacture, and of highest grade consistent to the state of the art. Damaged materials, equipment and parts are not considered to be new and unused and will not be accepted.

1.3 REGULATIONS AND CODES

- A. Electrical Work, including connection to electrical equipment integral with mechanical equipment, shall be performed in accordance with the latest published regulations of each of the following as well as all State and local codes.
 - 1. NATIONAL ELECTRICAL CODE (NEC)
 - 2. NATIONAL ELECTRICAL SAFETY CODE (NESC)
 - 3. INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)
 - 4. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
 - 5. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - 6. INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)
 - 7. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
 - 8. NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)
 - 9. FEDERAL OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)
 - 10. UNDERWRITERS' LABORATORIES, INC. (UL).

1.4 COORDINATION OF THE ELECTRICAL SYSTEM

- A. CONTRACTOR shall verify all actual equipment and motor full-load and locked-rotor current ratings. The necessary minimum equipment, wire, and conduit sizes are indicated on the Plans. If CONTRACTOR furnishes equipment of different ratings, CONTRACTOR shall coordinate the actual current rating of equipment furnished with the branch circuit conductor size, the overcurrent protection, the controller size, the motor starter, and the branch circuit overcurrent protection. The branch circuit conductors shall have a carrying capacity of not less than 125 percent of the actual full-load current rating. The size of the branch circuit conductors shall be such that the voltage drop from the overcurrent protection devices up to the equipment shall not be greater than 2 percent when the equipment is running at full-load and rated voltage.

1.5 TEST

- A. The electrical Work shall be free from improper grounds and from short circuits. The correctness of the wiring shall be verified first by visual comparison of the conductor connections with connection diagrams. Individual circuit continuity checks shall next be made by using electrical circuit testers. Last, the

correctness of the wiring shall be verified by the actual electrical operation of the electrical and mechanical devices. Any deviation from the wiring indicated on the Plans or accepted Drawings shall be corrected and indicated on the Plans.

1.6 CONFORMS TO RECORD DOCUMENTS DRAWINGS

- A. Prior to completion of the Contract, CONTRACTOR shall furnish ENGINEER with a set of Electrical Plans marked with any changes, deviations or additions to any part of the electrical work.
- B. Each conductor shall be identified as required by the Contract Documents. This identification shall be indicated on the Record Documents Drawings to enable rapid and accurate circuit tracing by maintenance personnel.

1.7 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 - SUBMITTAL PROCEDURES.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Where indicated on the Plans and where required by applicable codes, CONTRACTOR shall furnish and install nameplates which shall be black lamicoid with white letters. The nameplates shall be fastened to the various devices with round head stainless steel screws. Each disconnect means for service, feeder, branch, or equipment conductors shall have nameplates indicating its purpose. All nameplates shall have 3/8-inch high lettering.

2.2 AUTOMATIC EQUIPMENT WARNING SIGNS

- A. Permanent warning signs shall be mounted at all mechanical equipment which may be started automatically or from remote locations. Signs shall be in accordance with OSHA regulations and shall be suitable for exterior use. The warning signs shall be fastened with round head stainless steel screws or bolts, located and mounted in a manner acceptable to ENGINEER.
- B. Warning signs shall be 7 inches high by 10 inches wide, colored yellow and black, on not less than 18-gauge vitreous enameling stock. Sign shall read:

CAUTION
THIS EQUIPMENT STARTS
AUTOMATICALLY
BY REMOTE CONTROL

PART 3 EXECUTION - Not Used

- END OF SECTION -

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SECTION 26 05 05
ELECTRICAL EQUIPMENT

PART 1 GENERAL

1.1 DESCRIPTION

- A. This Section includes general electrical equipment used to complete the electrical system.

1.2 RELATED WORK

- A. Related Work specified in other Sections:
1. Section 01 33 00 Submittal Procedures
 2. Section 26 05 00 Electrical General Requirements
 3. Section 26 05 13 Conductors and Cables
 4. Section 26 05 33 Raceway

1.3 SUBMITTALS

- A. Submittals will be required for all electrical equipment and shall be made in accordance with Section 01 33 00 Submittal Procedures.

PART 2 MATERIALS

2.1 LIGHTING SWITCHES

- A. Manufacturers:
1. Hubbell 1221I (ivory), 1221W (white)
 2. P&S 20AC1I (ivory), 20AC1W (white)
 3. Leviton 1221-2I (ivory), 1221-2W (white)
 4. Or approved equal
- B. Industrial Extra Heavy-Duty Specification Grade: Snap switches shall have the number of poles as indicated on the Drawings, [ivory] [white], rated at 20 ampere.
- C. Device Cover Plates:
1. Vault Areas: Stainless steel cover plates shall be utilized.

2.2 RECEPTACLES

- A. Manufacturers:
1. Hubbell No. IG5352I (ivory), IG5352W (white)
 2. P&S No. 5362-I (ivory), 5352-W (white)
 3. Leviton No. 8300-I (ivory), 8300-W (white)
 4. Or approved equal
- B. Special receptacles, covers, etc. shall be as specified herein or as indicated on the Plans.

- C. Device Cover Plates:
 - 1. Vault: Stainless steel cover plates shall be utilized.
- D. Ground Fault Interrupter Receptacles (GFI): GFI outlets shall be duplex ivory GFI receptacles, 2-pole, 3-wire grounded, 125 volts AC, rated at 20 amperes.
 - 1. Manufacturers:
 - a. Hubbell No. GF5262I
 - b. General Electric
 - c. P&S 2091-I
 - d. Leviton 5362-IGI
 - e. Or approved equal.

2.3 ENCLOSURES

- A. Manufacturers:
 - 1. Hammond
 - 2. Hoffman
 - 3. Rittal
 - 4. Or approved equal.
- B. This Specification includes enclosures to house electrical controls, instruments, terminal blocks, etc. If not indicated otherwise they shall be NEMA 12 for indoor and NEMA 3R for outdoor installations. For Vault, contractor shall provide NEMA 4X fiberglass enclosure with hinged cover and quick release latches. Enclosure shall be supplied with internal panel..
- C. A rolled lip shall be provided around three sides of the door and around all sides of the enclosure opening. The gasket shall be attached with oil-resistant adhesive and held in place with steel retaining strips. Exterior hardware, such as clamps, screws, and hinge pins, shall be of stainless steel. A hasp and staple shall be provided for padlocking. Each enclosure shall have a print pocket.
- D. PILOT DEVICES:
 - 1. Manufacturers:
 - a. Allen-Bradley, Bulletin 800T, 30 mm
 - b. C3 Controls
 - c. Eaton
 - d. General Electric
 - e. Square D, Type K, 30 mm - Class 9001
 - f. Or equal.
 - 2. Indicating lights, pushbuttons and selector switches shall be miniature oiltight units. Contact blocks in control circuits shall be NEMA ICS, B150, rated 5 amperes inductive at 120 volts AC. Contact blocks for signal circuits shall be rated 0.06 amperes at 30 volts AC or DC and shall be hermetically sealed and reed switches. Pilot lights for 120 volt AC circuits shall be LED type. Pilot lights for 24 volt circuits shall be rated 28 volts. Where group lamp test circuits are not specified, individual pilot light assemblies shall be "push-to-test" type. Pilot lights shall be capable of being changed from the front of the panel without special tools.
- E. TERMINAL BLOCKS:
 - 1. Manufacturers:

- a. Allen-Bradley
 - b. Buchanan
 - c. Eaton
 - d. Entelec (ABB) M4/6
 - e. Phoenix Contact
 - f. Square D Co.
 - g. Weidmuller, Z Series
 - h. Or equal.
- 2. Terminal blocks shall be of the size required for conductors therein and a minimum of 50 percent spares shall be provided in each terminal box.
 - 3. Provide only screw type terminals.
- F. CIRCUIT BREAKERS:
- 1. Manufacturer/Model
 - a. Phoenix Contact TMC Series
 - b. Eaton FAZ Series
 - c. Approved equal
 - 2. Provide DIN rail mounted circuit breakers. Ratings shall be determined by contractor as required or as shown on the drawings.
- G. FUSE BLOCKS:
- 1. Manufacturers:
 - a. Entelec (ABB), M10/13.SF2
 - b. Or approved equal.
 - 2. DIN rail mounted.
 - 3. Terminals shall accommodate 22-10 AWG solid or stranded wires.
 - 4. Provide terminals rated for 600 VAC/VDC and 15 amperes.
 - 5. Device shall be UL listed.
- H. 24 HOUR TIME SWITCH:
- 1. Manufacturer/Model
 - a. Tork/8001 Series or 8009A
 - b. No equal.
 - 2. Description: Many daily on/off operations per day.
 - 3. Electrical: Input Supply - 120 VAC, 60 Hz., 3 watts
 - 4. Output Contacts: SPDT
 - 5. Scheduling:
 - a. Minimum ON setting 15 minutes
 - b. Minimum OFF setting 15 minutes.
 - c. Dial has 96 captive tabs.
 - 6. Duty Cycle: ½, 1, 2, 3, 4, 6, 12 and 24 hours.
 - 7. Environmental:
 - a. Operating Temperature: -40-deg F to 165-deg F
 - b. Enclosure: lockable hasp.

2.4 LIGHTING

- A. Lighting fixtures shall be as described below and as indicated on the Plans.
- B. Fixtures shall include lamps, ballasts, poles, mounting hardware, etc. to provide complete operating units.
- C. Fluorescent fixtures shall be rapid start type.
- D. Catalog data including applicable coefficients of utilization tables, isolux chart of illumination on a horizontal plane, beam efficiency, horizontal and vertical beam spread, and beam lumens shall be submitted to the ENGINEER for review and acceptance for all fixtures before fixtures are manufactured. Substitutions will be permitted only if acceptable to the ENGINEER.
- E. Light Emitting Diode(LED) Lighting
 - 1. The LED Fixture shall consist of a LED Luminaire Assembly, LED Driver and mounting hardware.
 - 2. LED Fixture requirements are as described below:
 - a. The input to the LED Lighting Fixture shall be 120 to 277VAC ($\pm 10\%$), 60HZ or as indicated in the Contract Document.
 - b. Correlated Color Temperature (CCT) shall be minimum 4000K or as indicated in the Contract Document.
 - c. Color Rendering Index (CRI) shall be 70.
 - d. A minimum of 50,000 operating hours before reaching the L70 lumen output degradations point without catastrophic failure, or as indicated in the Contract Document.
 - e. Conform with UL 8750.
 - f. Compliance to FCC CFR Section 15.
 - 3. LED Luminaire Assembly
 - a. Definition: Luminaire Assembly is the LED assembly without LED driver.
 - b. Input voltage shall be 24VDC, 36VDC or as indicated in the Contract Document.
 - c. CCT, CRI, Minimum life and UL conformity requirements are as defined in above.
 - 4. LED Driver
 - a. Must operate input voltage between 120VAC to 277VAC ($\pm 10\%$).
 - b. Operating frequency must be 60Hz.
 - c. Must be rated to operate between -40°C to $+50^{\circ}\text{C}$.
 - d. Must have a minimum efficiency of 85%.
 - e. Self protected including short circuit protection.
 - f. Compliance to FCC CFR Section 15.
 - g. Driver must have a Power Factor (PF) of 0.90.
- F. Types and ratings: As shown on "Lighting Fixture Schedule" on Drawings.

2.5 CONTROL PANELS

- A. ENCLOSURES
 - 1. Manufacturers:
 - a. Hammond Manufacturing

- b. Hoffman
 - c. Rittal
 - d. Saginaw Control & Engineering (SCE)
 - e. Or approved equal.
2. This specification includes enclosures to house electrical controls, instruments, terminal blocks, etc. If not indicated otherwise they shall be NEMA 12 for indoor and NEMA 3R for outdoor installations.
 3. A rolled lip shall be provided around three sides of the door and around all sides of the enclosure opening. The gasket shall be attached with oil-resistant adhesive and held in place with steel retaining strips. Exterior hardware, such as clamps, screws, and hinge pins, shall be stainless steel. A hasp and staple shall be provided for padlocking. Each enclosure shall have a print pocket.
 4. Enclosures shall be from 14 gauge steel with seams that are continuously welded. Doors shall have full length piano hinges with the door removable by pulling the hinge pin.
 5. Finish - Steel: Finish shall be white enamel interior, light grey enamel, ANSI 61 exterior, over phosphatized surfaces. Special finishes and colors shall be furnished for wet locations. Plans should be checked for special conditions.

2.6 PROCESS SWITCHES

A. LEVEL SWITCH - FLOAT

1. Manufacturer/Model:
 - a. IMO Industries, Inc. Gems Sensors Division, LS-270.
 - b. Or approved equal.
2. Stem: 316 Stainless steel
3. Float: Buna N
4. Operating Temperature:
 - a. Water: to 180-degrees F.
5. Minimum Liquid Specific Gravity: .65
6. Pressure (MAX): 150 PSI
7. Switch Rating: 20 VA
8. Electrical Termination: No. 22 AWG, 24-inches long, Polymeric Lead Wires.
9. Selectable Normally Open (NO) or Normally Closed (NC) by inverting float on unit stem.

PART 3 INSTALLATION

- A. Installation shall be as per manufacturers specifications.

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SECTION 26 05 13
CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Installation of wires or cables required for power distribution, service, feeders, and branch circuits.

1.2 RELATED WORK

- A. Related Work specified in other Sections:
 - 1. Section 26 05 05 Electrical Equipment
 - 2. Section 26 05 33 Raceway
 - 3. Section 25 05 34 Electrical Boxes and Fittings
 - 4. Section 31 23 15 Excavation and Backfill for Buried Pipelines

1.3 REFERENCES

- A. NFPA 70: National Electrical Code.
- B. UL: Underwriters' Laboratories, Inc.

1.4 SUBMITTALS

- A. Field Test Data: Submit megohmmeter test data for circuits under 600 volts.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Building Conductors: Copper, 600 Volt insulation, THW.
- B. Branch Circuit Conductors and All Conductors #3 AWG and Smaller: Copper conductor, with TW, THHN, or THWN insulation #10 AWG and smaller, and THW larger than #10 AWG, where ambient temperature conditions exceed 140 degrees F.
 - 1. Size all conductors per NFPA 70.
 - 2. Minimum size to be #12 AWG.
 - 3. Stranded conductors for #8 AWG and larger.
 - 4. For outlets to fixtures, and in fixture channels (in dry areas); THHN insulated conductor.
 - 5. In damp locations, under slabs, on exterior provide THWN.
- C. Fire Alarm System Conductors: Cross-linked thermo setting polyethylene (RW90 X-link) type insulating.
- D. Provide permanent plastic name-tag indicating load feed.
- E. Use type XHHW conductors for water pumping and regulator stations.

- F. Cable Supports: OZ cable supports for vertical risers, type as required by application.

2.2 COLOR AND CODING OF CONDUCTORS

- A. 120/240 volt.
 - 1. A-Phase - Black
 - 2. B-Phase - Red
 - 3. Neutral - White
 - 4. Ground - Green

PART 3 EXECUTION

3.1 INSTALLATION

- A. Make conductor length for parallel feeders identical.
- B. Lace or clip groups of feeder conductors at distribution center, pull-boxes, and wireway. Neatly arrange wiring within cabinets, junction boxes, fixtures, etc.
- C. Provide copper grounding conductors and straps.
- D. Install wire and cable in code conforming raceway.
- E. Use non-detrimental wire pulling lubricant for pulling No. 4 AWG and larger wire.
- F. Install wire in conduit runs after concrete and masonry work is complete and after moisture is swabbed from conduits.
- G. Color code conductors to designate neutral conductor and phase.
- H. Furnish necessary reels, reel jacks, and other pulling aids required to prevent damage to wires and cable.
- I. Splicing:
 - 1. Install wires and cables continuous without splices from sources of supply to distribution equipment and from source of supply to motor, lighting, or power outlet.
 - 2. Do not use pull boxes for making splices.
 - 3. Do not install splices in conduits.
- J. Install all wiring per NFPA 70.
- K. Use of cable with more conductors than specified; CONTRACTOR's option. When done, tape off and labeled extra conductors as spares.

3.2 CONDUCTOR CONNECTIONS

- A. Use approved pressure type solderless connectors and lugs for service entrance, feeder, equipment connections and terminal posts.

- B. Use connectors of a type compatible to conductors, locations, and load.
- C. Make neutral connection and taps individually in order to prevent the possibility of an "open-neutral".
- D. Make branch circuit connections with UL approved solderless connectors. Do not depend solely upon a single insulating material to secure connection as well as to insulate it.
- E. After first either silver plating the bars or applying suitable non-oxidizing agents, bolt buss bar connections with adequate nonferrous bolts, washers, and lock washers.
- F. Insulate joints and taps with patented or molded plastic insulators. Use tapes compatible with conductor jackets, temperature, and other conditions.

3.3 AFTER INSTALLATION TEST FOR CABLE 600 VOLTS AND BELOW

- A. Prior to energization, test cable and wire for continuity of circuit for short circuits. Megger all circuit of 100 amp and greater rating.
- B. Correct malfunctions.
- C. Submit record of megohmmeter readings to ENGINEER.

3.4 IDENTIFICATION OF FEEDERS

- A. Affix a marker stamped or embossed on each cable at each entry to and exit for each manhole, pullhole, pullbox, cable tray switchgear and switch, identifying circuit; i.e. "MCCI", "PANEL L" "NO 1" etc.
- B. Identification letters to be 1/8 inch size minimum.
- C. Markers to be rigid, noncorrosive, attached to feeder cables with feeder identification.
- D. Nylon straps to be used to tie the markers.

- END OF SECTION -

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SECTION 26 05 33
RACEWAY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Flexible or rigid conduits, couplings, supports, and nonmetallic ducts.

1.2 RELATED WORK

- A. Related Work specified in other Sections:
 - 1. Section 26 05 13 Conductors
 - 2. Section 33 23 15 Excavation and Backfill for Buried Pipelines.
 - 3. Section 32 92 00 or Section 32 93 13 - Landscape restoration.
 - 4. Section 33 05 25 Pavement restoration.

1.3 REFERENCES

- A. ANSI C80.1: Rigid Steel Conduit - Zinc-Coated.
- B. ANSI C80.3: Electrical Metallic Tubing - Zinc-Coated.
- C. FS W-F-406: Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible.
- D. FS WW-C-566: Conduit, Metal, Flexible.
- E. NEMA TC6: PVC and ABS Plastic Utilities Duct for Underground Installation.
- F. NEMA TC9: Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation.
- G. NFPA 70: National Electric Code.
- H. UL: Underwriters' Laboratories, Inc.

PART 2 PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. General: Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) as indicated; with minimum trade size of 3/4 inch.
- B. Rigid Metal Conduit (RMC): ANSI C80.1.
- C. Intermediate Metal Conduit (IMC): ANSI C80.1.
- D. Rigid and Intermediate Steel Conduit Fittings: Provide fully threaded malleable steel couplings; raintight and concrete tight where required by application. Provide Myers Hub (rigid water-tight conduit hub) at conduit termination, use OZ Type B bushings on conduits 1-1/4 inch and larger.

- E. Electrical Metallic Tubing (EMT): ANSI C80. 3.
- F. EMT Fittings: Provide insulated throat non-indenter type malleable steel fittings; concrete tight where required by application. Install OZ Type B bushings on conduits 1-1/4 inches and larger.
- G. Flexible Metal Conduit (FMC): FS WW-C-566, Zinc-coated steel.
- H. Flexible Metal Conduit Fittings: FS W-F-406, Type 1, Class 1, Style A.
- I. Liquid Tight Flexible Metal Conduit: Provide liquid-tight, flexible metal conduit; constructed of single strip, flexible continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coated with liquid-tight jacket of flexible polyvinyl chloride (PVC).
- J. Liquid-Tight Flexible Metal Conduit Fittings: FS W-F-406, Type1, Class 3, Style G.
- K. Expansion Fittings: OZ Type AX, or equivalent to suit application.
- L. PVC Coated RGS Conduit:
 1. Requirements of article "Rigid Metal Conduit - Steel (RGS)" shall apply.
 2. Coating: Apply minimum 40-mil, gray polyvinyl chloride (PVC) coating over exterior and apply urethane coating uniform and consistent to interior of conduit. Internal coating shall be nominal 2 mil thickness. Conduit having areas with thin or no coating, not acceptable. Protect conduit threads by urethane coating. PVC coating shall have been investigated by UL as providing primary corrosion protection for rigid metal conduit.

2.2 NON-METALLIC CONDUIT AND DUCTS

- A. General: Minimum trade size: 3/4 inch.
- B. Underground PVC Plastic Utilities Duct: NEMA TC6, Type I for encased burial in concrete, Type II for direct burial.
- C. Duct Fittings: NEMA TC9, match to duct type and material.

2.3 CONDUIT, TUBING, AND DUCT ACCESSORIES

- A. Provide conduit, tubing and duct accessories of types and sizes, and materials, complying with manufacturer's published product information, which mate and match conduit and tubing. Provide manufactured spacers in all duct bank runs.

2.4 LOCKNUTS, BUSHINGS, CONNECTORS, COUPLINGS, AND SUPPORTS

- A. General: Provide malleable bushings, except that plastic bushings may be used in lieu of phenolic-lined malleable bushings where "insulating bushings" are required.
- B. Provide "double-locknut" system (2 locknuts) throughout, each being tightened

wrench tight as to effectively bond outlet box or cabinet to conduit.

- C. Sealing Bushing: OZ Type FSK, WSK, or CSMI as required by application. Provide OZ type CSB internal sealing bushings.
- D. Provide insulated-through type ground bushing of the malleable type.
- E. Provide connectors or couplings that are proper for the conduit they are used with. Make watertight when required.
- F. Provide cadmium plated or galvanized fittings.
- G. Provide fittings with die-cut threads unless approved otherwise.
- H. EMT connectors used with #4 and larger cable shall have throat liners of suitable plastic insulation.

2.5 CONDUIT OUTLET BOXES

- A. Refer to Section 26 05 34 Electrical Boxes and Fittings.

2.6 SCHEDULE OF LOCATIONS

- A. Galvanized steel conduit in concrete and exposed in vault.
- B. For underground conduit use rigid, threaded, galvanized steel conduit, or solvent welded PVC conduit
- C. Make connections to motors and equipment with PVC jacketed flexible conduit and liquid tight connectors. Provide ½-inch minimum size for motor connections.
- D. Provide flexible conduit for fixture and control wiring with sufficient length of flexible conduit to avoid transmission of vibration.

PART 3 EXECUTION

3.1 PREPARATION

- A. Excavate; Section 31 23 16 Excavation and Backfill for Buried Pipelines.

3.2 INSTALLATION

- A. Install conduit concealed in all areas, excluding mechanical and electrical rooms, connections to motors, and connections to surface cabinets.
- B. For exposed runs attach surface-mounted conduit with clamps.
- C. Coordinate installation of conduit in masonry work.
- D. Unless indicated otherwise, do not install conduit larger than 2-1/2 inches in concrete slabs. Provide a minimum concrete cover around conduits of 2-inches.

- E. Install conduit free from dents and bruises. Plug ends to prevent entry of dirt and moisture.
- F. Clean out conduit before installation of conductor.
- G. Alter conduit routing to avoid structural obstructions, minimizing crossovers.
- H. Fill end of conduit with fiberglass where conduits leave heated area and enters unheated area.
- I. Provide flashing and pitch pockets, making watertight joints where conduits pass through roof or waterproofing membranes.
- J. Install UL approved expansion fittings complete with grounding jumpers where conduits cross building expansion joints. Provide bends or offsets in conduit adjacent to building expansion joints where conduit is installed above suspended buildings.
- K. Route all exposed conduits parallel or perpendicular to building lines.
- L. Make interconnections between difference types of raceways with manufactured fittings approved by UL.
- M. Size raceways per NFPA 70 tables. Do not reduce from any sized indicated.
- N. Do not exceed sizes permitted in slabs or walls.
- O. Do not exceed number of bends allowed in conduit by NFPA 70.
- P. Make joints wrench tight or otherwise with minimum resistance to the flow of fault currents.
- Q. Use furred spaces and chases to an advantage in concealing conduits.
- R. Make field bends only where needed and then carefully to minimize wire pulling tensions and for best appearance in exposed runs.
- S. Test conduit runs with lignum vital ball (mandrel) of 85-percent of conduit diameter.
- T. Cut conduit with hacksaw or other approved pipe cutting tool and ream ends to clean out all burrs before connecting.
- U. Keep conduits at least 6-inches away from steam or hot water pipes, breaching, and boilers, but in no case permit conductors to reach higher than rated temperatures. Avoid traps in runs and slope conduit to drain.
- V. Fasten raceways securely in place. Firmly fasten conduit within 3-feet of each outlet, junction box, cabinet, or fitting. Support metallic conduit, rigid (heavy wall) and EMT at least every 10-feet. Support rigid nonmetallic conduit in strict accordance with NFPA70. Use raceway fasteners designed for the purpose.

3.3 SPECIAL CONDUIT FITTINGS

- A. Use special conduit fittings as required or indicated. Use UL approved fittings suitable for location and usage made.
- B. At expansion joints use special fittings if cast in concrete slabs.
- C. Building Expansion Joints: Where surface conduits, raceways, panels, or light fixtures, span building expansion joints, make satisfactory arrangements to provide the movement provided for in building structure plus or minus nominal joint width.

3.4 PULL BOXES, WIREWAYS, AND GUTTERS

- A. Furnish as indicated, plus any such items required to assemble conduits and other raceways. Provide Section 26 35 34 Electrical Boxes and Fittings as dictated by wire pulling requirements. Unless indicated otherwise face into secondary or unfinished rooms.
- B. Construction: Code gage galvanized sheet steel and sized strictly in conformance with NFPA 70 requirements.
- C. Finish: Free of burrs, sharp edges, unreamed holes, and sharp-pointed screw or bolts. Paint both inside and out.
- D. Coating: When mounted direct to concrete or masonry walls that are below grade or where there will be sweating or other moisture present on wall surface, coat backs of boxes with a heavy coat of black asphalt paint before mounting.
- E. Protection: Adequate provisions for preventing damage to conductors either during pulling in or from weights and tensions when in place.
- F. Weatherproof, rain-tight, or special type when indicated or when required by NFPA 70.

3.5 ANCHORS, FASTENERS, AND MISCELLANEOUS SUPPORTS

- A. Use compatible anchors in roof or ceiling slabs of concrete from which a load is suspended and anchors used to fasten heavy equipment without lead in their construction.
- B. Make exposed conduit fastenings with one-piece, malleable conduit clamps. Two hole, galvanized sheet metal pipe straps may be used on all concealed installations.
- C. Use companion bases or backs with conduit clamps when conduit is exposed to weather or continuous moisture.
- D. Use ring type hangers on individual runs of conduit 3-inches and larger if suspended, complete with threaded rods. Use adjustable turnbuckles when specified or otherwise as an option.

- E. Support multiple runs of suspended conduits from trapeze style hangers suspended with rigid threaded steel rods and with suitable conduit clamps or straps of the same make as cross channels used.
- F. Mount multiple runs of conduit on ceiling or wall surfaces.
- G. Do not hang or support electrical equipment and materials from roof decks.

3.6 COLOR CODING, EXPOSED CONDUIT

- A. Provide color bands 1-inch wide for conduits up to 2-inches in diameter and one-half the conduit diameter for large conduits applied at panel and pull-box locations within each room and 500-feet on centers within an area.
- B. Color Banding:
 - 1. 120/208 Volt: gray
 - 2. Low Voltage Switching: black
- C. Nonmetallic Pressure Piping Label: When applicable, engraved plastic laminate, label permanently affixed to main electrical meter panel reading "THIS STRUCTURE HAS A NONMETALLIC PRESSURE PIPING SERVICE".

- END OF SECTION -

SECTION 26 05 34
ELECTRICAL BOXES AND FITTINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Types of electrical boxes and electrical fitting work.

1.2 RELATED WORK

- A. Related Work specified in other Sections:
 - 1. Section 26 05 05 Electrical Equipment
 - 2. Section 26 05 33 Raceway
 - 3. Section 31 23 15 Excavation and Backfill for Buried Pipelines

1.3 REFERENCES

- A. NEMA OS 1: Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- B. NEMA OS 2: Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
- C. NFPA 70: National Electric Code.
- D. UL: Underwriters' Laboratories, Inc.

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 70 as applicable for installation of electrical boxes and fittings.
- B. Comply with NEMA OS 1 and NEMA OS 2 as applicable for outlet boxes, device boxes, covers and box supports.
- C. Provide electrical boxes and fittings which have been UL-listed and labeled.

PART 2 PRODUCTS

2.1 INTERIOR OUTLET BOXES

- A. One piece, galvanized cast iron or cast aluminum outlet wiring boxes, of types shapes and sizes, including box depths, to suit each respective location and installation. If of aluminum, essentially "copper free". Do not use on conduits of dissimilar metals, except with written permission.
- B. Minimum depth 1-1/4 inches or 2-1/8 inch depth for boxes with 3 or more conduit entries.
- C. Use in combination with factory or field bends when indicated or advised. Complete outlet bodies with mounting brackets, hangers, extension rings, fixture studs, cable clamps, metal straps, gaskets, cover, hubs, reducers, and other accessories.

2.2 WEATHERPROOF OUTLET BOX

- A. Corrosion-resistant cast-metal of types, shapes and sizes (including depth) required.
- B. Threaded conduit ends, cast-metal face plates with spring hinged waterproof caps suitably configured for each application, with faceplate gaskets and corrosion-resistant fasteners.

2.3 JUNCTION AND PULL BOXES

- A. Building Structure Type: Code-gage sheet steel with screw-on covers; of types, shapes and sizes to suit each respective location and installation; with welded seams and equipped with galvanized steel Section 05090 nuts, bolts, screws and washers.
- B. Buried Type: Plastic body and cover, or pre-cast concrete with screw-on traffic rated cast iron covers; of types, shapes and sizes to suit each respective location and installation; equipped with stainless steel Section 05 05 23 Bolts, Nuts and Accessories.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.
- B. Provide knockout closures to cap unused knockout holes where blanks have been removed.

3.2 INSTALLATION

- A. A. Install where indicated, complying with manufacturer's written instruction, applicable requirements of NFPA 70 and NEMA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Install cover plates for all boxes; weatherproof outlets for interior and exterior locations exposed to weather or moisture.
- C. Install boxes and fittings to ensure ready accessibility of electrical wiring. Install recessed boxes with face of box or ring flush with adjacent surface.
- D. Fasten boxes rigidly to substrates or structural surfaces to which attached, or solidly embed boxes in concrete or masonry. Use bar hangers for stud construction. Use of nails for securing boxes is prohibited. Set boxes on opposite sides of common wall with minimum 10-inches of conduit between them.

- END OF SECTION -

SECTION 31 11 00
CLEARING, GRUBBING, AND STRIPPING

PART 1 GENERAL

1.1 SUMMARY

- A. This work shall consist of removing and disposing of all trees; shrubs; brush; stumps; windfalls; roots; and other vegetation, including dead and decayed matter; and debris that exist within the designated construction limits, borrow areas, and soil stockpile areas and which are not specifically designated to remain.

1.2 DEFINITIONS

- A. Clearing: Clearing operations shall consist of cutting, removing and disposing of trees, shrubs, bushes, windfalls and other vegetation within the construction limits, borrow areas, and soil stockpile areas. All brush shall be cut off within six inches of the ground surface.
- B. Grubbing: Grubbing operations shall consist of removing and disposing of stumps, roots, debris deleterious materials, and other remains (such as organic and metallic materials) which if left in place would interfere with proper performance or completion of the contemplated work, would impair its subsequent use or form obstructions therein. Organic material from clearing or grubbing operations shall not be incorporated in fill or backfill.
- C. Stripping: Stripping operations shall consist of removing all soil material containing sod, grass, or other vegetation and topsoil to a minimum depth of six (6) inches from all areas that will receive fill or over all trenches in field or yard areas.

1.3 MEASUREMENT AND PAYMENT

- A. Measurement and payment for clearing, grubbing and stripping shall not be paid as a unit item, but considered as included in the contract unit or lump sum prices for the various items of the contract to which it relates.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 CLEARING

- A. All trees, stumps, shrubs, bushes, windfalls and other vegetation (except such trees and vegetation as may be indicated or directed by ENGINEER to be left standing) shall be cut off to within six inches of the ground surface and shall be removed from the construction limits. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by such means as the circumstances require.

3.2 GRUBBING

- A. All stumps, roots, debris, deleterious and other organic or metallic materials not suitable for foundations shall be removed completely from the construction limits, borrow areas

and soil stockpile areas. Unless otherwise permitted by ENGINEER, stumps shall be removed completely. If any stumps are permitted to remain, they shall be cut off not more than six inches above the ground.

3.3 STRIPPING

- A. Soil material containing sod, grass, or other vegetation and topsoil shall be removed to a minimum depth of six (6) inches from all areas to receive fill from the area within lines 5 feet outside all foundation walls, over all trenches, and from beneath pavement and curb and gutter areas. The stripped material shall be deposited in such locations as are acceptable to ENGINEER. Topsoil shall be placed over designated areas to be landscaped, and over all trench areas (outside of paved areas).
- B. All areas to be sodded shall have a minimum thickness of 3 inches (or thicker if required elsewhere in these documents or on the drawings) of topsoil.

3.4 DISPOSAL

- A. No open burning of combustible materials will be allowed.
- B. All trees, timber, stumps, roots, debris, shrubs, bushes, and other vegetation removed during the clearing and grubbing operations shall be removed from the project site and disposed of by CONTRACTOR subject to specific regulations imposed by laws and ordinances and in a manner that will not create a public nuisance nor result in unsightly conditions. CONTRACTOR shall assume full responsibility for acceptable disposition of the material as well as for any damages resulting from his disposal operations.

- END OF SECTION -

SECTION 31 23 15
EXCAVATION AND BACKFILL FOR BURIED PIPELINES

PART 1 GENERAL

1.1 SUMMARY

- A. This item shall consist of excavating all pipeline trenches to the lines and grades indicated on the drawings or as directed by ENGINEER in the field, and the backfilling of all pipeline trenches. Excavation shall include the removal of all materials of whatever nature encountered to the depths shown on the Drawings, or as modified in the Field by ENGINEER.

1.2 RELATED SECTIONS

- A. Related work specified in other sections:
1. Section 01 33 00 Submittal Procedures
 2. Section 01 45 00 Quality Control & Materials Testing
 3. Section 01 45 23 Testing Agency Services
 4. Section 01 50 00 Temporary Construction Utilities and Environmental Controls
 5. Section 03 31 05 Controlled Low Strength Material
 6. Section 31 23 19 Dewatering
 7. Section 33 05 07.1 Polyvinyl Chloride Pressure Pipe (Modofoed)
 8. Section 33 92 10 Steel Pipe, Specials and Fittings (AWWA C-200 Modified)

1.3 REFERENCES

- A. The latest edition of the following publications forms a part of this specification to the extent referred. The publications are referred to in the text by basic designation only.
- B. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
1. M 145 Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
 2. T 27 Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates
 3. T 88 Standard Method of Test for Particle Size Analysis of Soils
 4. T 96 Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 5. T 180 Standard Method of Test for Moisture Density Relations of Soils Using a 10 lb. (4.54 kg) Rammer and an 18 in (457 mm) Drop
 6. T 191 Standard Method of Test for Density of Soil-In-Place by the Sand Cone Method
 7. T 205 Density of Soil In-Place by the Rubber-Balloon Method
 8. T 238 Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 9. T 239 Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 10. T 310 Standard Specification for In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

C. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

1. C 131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
2. C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
3. D 422 Standard Test Method for Particle Size Analysis of Soils
4. D 698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³)
5. D 1556 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand Cone method
6. D 1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft³)
7. D 2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity -Flow Applications
8. D 2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
9. D 6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.4 DEFINITIONS

- A. Degree of Compaction: Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.
- B. Pipe Zone: That zone in an Excavation which supports, surrounds, and extends to 12 inches above the top of the pipe barrel. Specifically, 4 inches below the bottom (where rock, hard pan, boulders, etc. are encountered), 12 inches above the top of the pipe, and 1 foot laterally beyond both sides of the pipe, unless noted otherwise on the Drawings.
- C. Trench Zone Backfill: That zone in an Excavation which begins 12 inches above the top of the pipe barrel and extends to the natural surface level or the finished grade indicated on the Plans.
- D. Unyielding Material: Unyielding material shall consist of rock and gravelly soils with stones greater than 12 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.
- E. Unstable Material: Unstable material shall consist of materials too wet to allow backfill compaction or to properly support the utility pipe, conduit, or appurtenant structures.
- F. Rock: Solid mineral material which cannot be removed with equipment reasonably expected to be used in the Work without cutting, drilling or blasting. Minimum equipment size, in good running order, shall be similar to a Komatsu 300, Caterpillar 320 or 330, or equal.

1.5 SUBMITTALS

- A. The following shall be submitted in accordance with Section 01 33 00 - Submittal Procedures:

1. Copies of Field Density Test reports shall be submitted to ENGINEER or RPR at the beginning of each work day for the previous day's testing of subgrades, embankments and backfill Materials.
2. Copies of all Laboratory Test Reports shall be submitted to ENGINEER or RPR within 24 hours of the completion of the test.
3. Submit gradations and proctors for Pipe Zone Material and Trench Zone Backfill.
4. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

1.6 SITE CONDITIONS

- A. Unsuitable Weather Limitations: CONTRACTOR shall not place, spread, or roll any fill material during unsuitable weather conditions. CONTRACTOR shall not resume operations until moisture content of material is satisfactory.
- B. Weather Softened Subgrade: CONTRACTOR shall remove and replace at no additional cost to OWNER soft subgrade materials resulting from adverse weather conditions.
- C. Protection of Graded Areas: CONTRACTOR shall protect all graded areas from traffic and erosion and shall keep these areas free of trash and debris. Work required to repair and reestablish grades in settled, eroded, and rutted areas shall be completed to specified tolerances at CONTRACTOR's expense.
- D. Reconditioning Compacted Areas: All areas compacted to required specifications that become disturbed by subsequent construction operations or weather conditions shall be scarified, moisture conditioned and re-compacted to the required density prior to further construction.
- E. Grading: the final compacted surface of base course shall not vary more than 1/4 inch above or below design grade.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Stabilization Material: Stabilization material shall consist of hard, durable particles of stone or gravel, screened or crushed to the required size and gradation. The material shall be free from vegetation matter, lumps or balls of clay, or other deleterious matter and shall conform to the following gradation when tested in accordance with AASHTO T 27 or ASTM C 136.
 1. Coarse material shall be crushed or washed and fine material shall be wasted to meet the grading requirements set forth below. Note that if stabilization material is required, an 8 oz. non-woven filter fabric shall be placed between the stabilization material and the pipe zone material.
 2. Coarse aggregate, retained on the No. 4 sieve, shall have a percentage of wear not greater than 40 percent when tested by the Los Angeles Test, AASHTO T-96 or ASTM C 131.

| Sieve Size (Square Opening) | Percent By Weight Passing Screen |
|--------------------------------|-------------------------------------|
| 2-inch | 100 |
| 1-1/2 inch | 10 - 50 |
| 3/4-inch | 0 - 25 |
| No. 4 | 0 - 10 |
| No. 200 | 0 - 3 |

B. Pipe Zone Material: All material in the pipe zone shall be clean and free from alkali, salt, petroleum products, vegetative matter or other deleterious matter, slag, cinders, ashes and rubbish or other material that in the opinion of ENGINEER may be objectionable or deleterious. "Squeegee" or any other flowable material shall not be permitted. Pipe zone material shall conform to the following:

1. Pipelines other than water pipeline – Sand per the following gradation:

| U.S. Standard Sieve Size (Square Opening) | Percent By Weight Passing Screen |
|---|-------------------------------------|
| 1/2 - inch | 100 |
| No. 10 | 30-60 |
| No. 40 | 0-30 |
| No. 200 | 0-15 |

2. Waterline – Controlled Low Strength Material in accordance with Section 03 31 05.

C. Select Trench Backfill

1. Trench backfill shall consist of imported fill material meeting soils classification A-1a of AASHTO M 145, with a maximum particle size no greater than 3 inches in any dimension and shall be capable of meeting the compaction requirements. Trench backfill shall be non-plastic. Trench backfill shall be free from alkali, salt, petroleum products, vegetative matter or other deleterious matter, slag, cinders, ashes and rubbish or other material that in the opinion of ENGINEER may be objectionable or deleterious.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavation shall be performed to the lines and grades indicated. All excavated materials not intended for reuse shall be removed from the site and disposed of by the Contractor.

3.2 SAFETY

A. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State safety requirements and the latest requirements of OSHA Safety and

Health Standards for Construction (29 CFR 1926). CONTRACTOR is responsible for assessing safety needs to meet such requirements, arranging for proper equipment and/or construction methods, and maintaining such equipment, methods and construction practices so as to fully comply with all safety requirements.

- B. CONTRACTOR is responsible for assessing needs related to confined space entry, as defined by OSHA. CONTRACTOR shall meet all such requirements, arranging for proper equipment and/or construction methods, and maintaining such equipment, methods and construction practices so as to fully comply with all confined space safety requirements.

3.3 DEWATERING

- A. Water removal shall be in accordance with Section 31 23 19 - Dewatering.

3.4 TRENCH WIDTH

- A. The bottom of the trench shall have a minimum width equal to the outside diameter of the pipe plus 24-inches or as detailed on the drawings.
- B. The width and depth of the trench shall be ample to permit the pipe to be laid and jointed properly in accordance with the specifications and the drawings, and the backfill to be placed and compacted as specified. Trenches shall be of such extra width, when required, as will permit the convenient placing of timber supports, sheeting, and bracing, and the handling of special units as necessary.

3.5 TRENCH PREPARATION

- A. Each trench shall be excavated so that the pipe can be laid to the alignment and grade as required. The trench wall shall be so braced that the workmen may work safely and efficiently. All trenches shall be drained so the pipe laying may take place in dewatered conditions.
- B. Bottom Preparation
 1. Where rock, hard pan, boulders or other material which might damage the pipe are encountered, the bottom of the trench shall be over excavated 4 inches below the required grade and replaced with Stabilization Material. Otherwise, the bottom of the trench shall be over excavated 6 inches or 1/12 the outside diameter of the pipe, whichever is greater, below the required grade and replaced with Pipe Zone Backfill.
 2. The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 1 inch or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.
 3. The bottom of the waterline trench shall be accurately graded to provide a minimum of 6 inches between the bottom of the pipe and the bottom of the trench for placement of CLSM.
- C. Removal of Unstable Material

1. Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed by ENGINEER and replaced to the proper grade with Stabilization Material. When removal of unstable material is required due to the fault or neglect of CONTRACTOR in his performance of the work, the resulting material shall be excavated and replaced by CONTRACTOR without additional cost to OWNER.
- D. For pipelines other than the steel waterline, the trench bottom (at the level of the base of the pipe) shall be given a final trim using a string line, laser, or another method approved by ENGINEER for establishing grade, such that each pipe section when first laid will be continually in contact with the ground along the extreme bottom of the pipe. Bell holes shall be provided at each joint to permit the jointing to be made properly. The trench grade shall permit the pipe spigot to be accurately centered in the preceding laid pipe joint, without lifting the pipe above the grade, and without exceeding the permissible joint deflection.

3.6 SHEETING AND SHORING

- A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.
- B. Support trenches excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.
- C. Design sheeting and shoring to be removed at completion of excavation work.
- D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.
- E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.7 PIPELINE TRENCH BACKFILLING AND COMPACTION

- A. Pipe Zone:
 1. CLSM shall be placed in the pipe zone for the steel waterline.
 2. For other pipelines, pipe zone backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise approved or specified. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe. Each layer shall be compacted to at least 96 percent of the maximum Modified Proctor density (ASTM D-1557), unless otherwise specified.
 3. Replacement of Unyielding Material: Unyielding material removed from the bottom of the trench shall be replaced with Stabilization Material placed in layers not exceeding 6 inches loose thickness.
 4. Replacement of Unstable Material: Unstable material removed from the bottom of the trench or excavation shall be replaced with Stabilization Material placed in layers not exceeding 6 inches loose thickness.

5. Where the pipe grade exceeds 30%, cohesive material shall be used in lieu of pipe bedding. The cohesive material shall be moistened to within 2% of optimum moisture and compacted as noted.
6. The relative density of the compacted cohesionless material shall not be less than 60% as determined by the Bureau of Reclamation Relative Density of Cohesionless Soil Test (Designation E-12) of the "Earth Manual."

B. Trench Backfill: Trenches shall be backfilled to the grade shown with Trench Backfill material as specified.

1. Trench backfill in asphalted road shall consist of backfilling the trench from above the pipe zone up to underneath the noted recommended depth for untreated base course and asphalt or concrete of finished grade with Trench Backfill material compacted to 96 percent of maximum density (ASTM D-1557). Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise approved or specified.
2. Trench backfill in unimproved or landscaped areas shall consist of backfilling the trench from above the pipe zone to 8 inches below finished grade with Trench Backfill material compacted to 96 percent of maximum density (ASTM D-1557). Backfill from 8 inches below finished grade to finished grade shall consist of topsoil replacement in addition to replacement of all landscaped materials. Trench backfill shall be placed in layers not exceeding 8 inches loose thickness.
3. It shall be the responsibility of CONTRACTOR to be assured that the Trench Backfill material is capable of being compacted to the degree specified. It shall be CONTRACTOR's responsibility to remove and dispose of all excess excavated material.

C. Final Backfill:

1. Unimproved and Landscaped Areas: The top 8 inches of the trench shall be filled with topsoil. Topsoil may be native material stripped prior to excavation of the trench. Backfill shall be deposited in layers of a maximum of 12-inch loose thickness, and compacted to a minimum of 85 percent maximum density (ASTM D-1557). Compaction by water flooding or jetting will not be permitted. This requirement shall also apply to all other areas not specifically designated above.
2. Roadways shall be completed with the type and thickness of materials (i.e. Untreated Road Base, Asphalt, or Concrete) as indicated or shown on the drawings.

3.8 SPECIAL REQUIREMENTS

A. Special requirements for both excavation and backfill relating to the specific utilities from above the pipe zone to the natural surface level or the finished grade indicated on the Plans shall be placed and compacted as follows:

1. Where existing underground pipes or conduits larger than 3 inches in diameter and all sizes of sewer lines or sewer laterals cross the trench above the new work, the backfill from the bottom of the trench to 1 foot above the top of the intersecting pipe or conduit shall be pipe zone material compacted to 95 percent of maximum density (ASTM D-1557). The pipe zone material shall extend 2 feet on either side of the

intersecting pipe or conduit to ensure that the material will remain in place while other backfill is placed.

- B. The maximum trench length open at any given time shall not exceed 200 feet unless approved by ENGINEER, and must be backfilled in a timely manner.

3.9 MAINTENANCE OF BACKFILL

- A. All backfill shall be maintained in satisfactory condition, and all places showing signs of settlement shall be filled and maintained during the life of the Contract and for a period of one year following the day of final acceptance of all work performed under the Contract. When CONTRACTOR is notified by ENGINEER or OWNER that any backfill is hazardous, CONTRACTOR shall correct such hazardous condition at once. Any utility, road and/or parking surfacing damaged by such settlement shall be repaired by CONTRACTOR to the satisfaction of OWNER and ENGINEER. In addition, CONTRACTOR shall be responsible for the cost to OWNER of all claims for damage filed with the Court, actions brought against the said OWNER for, and on account of, such damage.

3.10 FINISH GRADING AND CLEANUP

- A. CONTRACTOR shall grade the trench line to a smooth grade to affect a neat and workmanlike appearance of the trench line.
- B. All tools, equipment and temporary structures shall be removed. All excess dirt and rubbish shall be removed from the site by CONTRACTOR.
- C. CONTRACTOR shall restore the site to at least as good as original condition, including but not limited to final trench grade and restoration of affected public and private facilities whether in the public right-of-way or on private property. Any exception to this requirement must be in writing from ENGINEER for the job specific conditions.

3.11 COMPACTION TESTS

- A. It shall be the responsibility of CONTRACTOR to accomplish the specified compaction for backfill, fill, and other earthwork. It shall be the responsibility of CONTRACTOR to control his operations by performing any additional tests necessary to verify and confirm that CONTRACTOR has complied, and is complying at all times, with the requirements of these Specifications concerning compaction, control, and testing.
 - 1. Testing of Backfill Materials
 - a. Characteristics of backfill materials shall be determined in accordance with the requirements of Section 01 45 00 - Quality Control & Materials Testing.
 - b. The CONTRACTOR shall demonstrate the adequacy of compaction equipment and procedures before exceeding any of the following amounts of earthwork quantities:
 - i) 50 linear feet of trench backfill.
 - c. Until the specified degree of compaction on the previously specified amounts of earthwork is achieved, no additional earthwork of the same kind shall be performed.

- d. After satisfactory conclusion of the initial compaction demonstration and at any time during construction, earthwork which does not comply with the specified degree of compaction shall not exceed the previously specified quantities.
 - e. Compliance tests may be made by ENGINEER to verify that compaction is meeting the requirements previously specified at no cost to CONTRACTOR.
 - f. ENGINEER may require retesting of backfill that has settled from water penetration in the trench. CONTRACTOR shall remove the overburden above the level at which ENGINEER wishes to test and shall backfill and recompact the excavation after the test is complete at no additional cost to the OWNER.
 - g. If compaction fails to meet the specified requirements, CONTRACTOR shall remove and replace the backfill at proper density or shall bring the density up to specified level by other means acceptable to ENGINEER. Subsequent tests required to confirm and verify that the reconstructed backfill has been brought up to specified density shall be paid by CONTRACTOR. CONTRACTOR's confirmation tests shall be performed in a manner acceptable to ENGINEER.
2. Field Density Tests
- a. Field density tests shall be made in accordance with ASTM D 1557.

- END OF SECTION -

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SECTION 31 23 19
DEWATERING

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section provides specifications for dewatering systems and appurtenances to be used during construction as required to keep the excavation free of water.

1.2 SUBMITTALS

- A. Before dewatering is commenced, CONTRACTOR shall provide information to ENGINEER outlining the method, installation and details of the proposed dewatering system. CONTRACTOR shall provide ENGINEER with plans setting forth details of the proposed dewatering systems. The dewatering system plans shall be of sufficient detail to indicate sizes of pumps, piping, appurtenances, the ultimate disposal point for water and to indicate the overall completeness and effectiveness of the proposed system.
- B. CONTRACTOR shall certify to OWNER that the design and implementation of the proposed dewatering system is sufficient to complete the Work.

PART 2 PRODUCTS

2.1 MATERIALS

- A. CONTRACTOR shall be responsible for selection of dewatering means, methods and materials.

PART 3 EXECUTION

3.1 DESIGN AND IMPLEMENTATION

- A. CONTRACTOR shall be responsible for complete design and implementation of the dewatering system.
- B. CONTRACTOR shall be responsible for the design and implementation of any modifications that may be required to the initial design of the dewatering system (at no additional cost to OWNER) to provide a dewatering system that operates adequately to complete the Work.
- C. CONTRACTOR shall furnish, install, operate and maintain all machinery, appliances, and equipment to maintain all excavations free from water during construction.
- D. CONTRACTOR shall dispose of water so as to not cause damage to public or private property, or to cause a nuisance or menace to the public or violate the law.
- E. CONTRACTOR shall be responsible to obtain groundwater discharge permits, if required.

- F. CONTRACTOR shall install and operate the dewatering system so as to not cause damage or endanger adjacent structures or property.
- G. The control of groundwater shall be such that softening of the bottom of excavations, or formation of "quick" conditions or "boils," does not occur. Dewatering systems shall be designed and operated so as to prevent removal and migration of the natural soils.
- H. CONTRACTOR shall have sufficient stand-by equipment at the project site at all times to continuously maintain the dewatering program until Work necessitating dewatering is complete.
- I. CONTRACTOR shall have on hand equipment and machinery in good working condition for emergencies and shall have personnel available for operation of such equipment and machinery.
- J. CONTRACTOR shall control surface water to prevent entry into excavations.

- END OF SECTION -

SECTION 31 23 23
EXCAVATION AND BACKFILL FOR STRUCTURES

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section covers excavating, backfilling, and compacting of disturbed areas for structures and roadways as directed by ENGINEER.

1.2 RELATED WORK

- A. Related work specified in other sections:
1. Section 01 33 00 Submittal Procedures
 2. Section 01 45 00 Quality Control and Materials Testing
 3. Section 01 45 23 Testing Agency Services
 4. Section 01 50 00 Temporary Construction Utilities and Environmental Controls
 5. Section 31 11 00 Clearing, Grubbing and Stripping
 6. Section 31 23 15 Excavation and Backfill for Buried Pipelines
 7. Section 31 23 19 Dewatering

1.3 REFERENCES

- A. The latest edition of the following publications form a part of this specification to the extent referred. The publications are referred to in the text by basic designation only.
- B. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
1. M 145 Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
 2. T 27 Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates
 3. T 88 Standard Method of Test for Particle Size Analysis of Soils
 4. T 180 Standard Method of Test for Moisture Density Relations of Soils Using a 10 lb. (4.54 kg) Rammer and an 18 in (457 mm) Drop
 5. T 191 Standard Method of Test for Density of Soil In Place by the Sand Cone Method
 6. T 310 Standard Specification for In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- C. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
1. D 422 Standard Test Method for Particle Size Analysis of Soils
 2. D 698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³)
 3. D 1556 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand Cone method
 4. D 1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft³)

5. D 2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
6. D 6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

D. The latest Edition of the Utah Department of Transportation Standard Specification for Road and Bridge Construction.

E. The latest Edition of the American Public Works Association (APWA) and Associated General Contractors of America Standard Plans and Standard Specifications.

1.4 SUBMITTALS

A. The following shall be submitted in accordance with Section 01 33 00 Submittal Procedures:

1. Submit gradations and proctors for structural fill materials and backfill materials.
2. Submit copies of Field Density Test reports.

PART 2 PRODUCTS

2.1 WALL BACKFILL MATERIAL

A. Wall backfill material shall consist of import fill material meeting the AASHTO A-1-A soils classifications of AASHTO M 145, with a maximum particle size no greater than 3 inches in any dimension and shall be capable of meeting the compaction requirements.

1. Wall backfill material shall be free from frozen lumps, rocks larger than 3 inches in the largest dimension, roots, trash, lumber and organic material.

2.2 STRUCTURAL FILL

A. Structural fill material, if required, shall meet the following requirements.

1. Material shall be non-expansive granular soil with less than 35 percent passing the No. 200 sieve, with a liquid limit less than 30%, and free from rocks larger than 3 inches in the largest dimension, frozen lumps, roots, trash, lumber and organic material. Structural fill shall be imported.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavation shall be performed to the lines and grades indicated. Excavated material not required or not satisfactory for backfill shall be removed from the site.

B. Excavations shall be braced and supported as needed to prevent the ground adjacent to the excavation from sliding or settling. Slides shall be promptly removed and corrected by CONTRACTOR.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with granular fill and compact to density equal to or greater than requirements for subsequent fill material.
- C. Scarify subgrade surface to depth of 6 inches.

3.3 DEWATERING

- A. Water removal shall be in accordance with Section 31 23 19 - Dewatering.

3.4 BACKFILL

- A. Backfill material shall not be placed against concrete structures that have not been properly cured. No backfill material shall be placed until concrete has cured for a minimum of 7 days or until the compressible strength is 3,400 psi, whichever is greater.
- B. Backfill material shall be placed in no more than 6-inch loose lifts for compaction by hand operated machine compactors, and 8 inches loose lifts for other than hand operated machines.
- C. Structural fill placed beneath foundations, footings or the floor slab shall be placed and compacted to at least 96% of maximum dry density at a moisture content within 2 percent of optimum moisture content in accordance with ASTM D 1557.
- D. Backfill material shall be placed and compacted to at least 96 percent of maximum dry density at a moisture content within 2 percent of optimum moisture content in accordance with ASTM D-1557.
- E. Where the moisture content is not suitable and/or sufficient compaction has not been obtained, the fill shall be reconditioned to an approved moisture content and re-compacted to the minimum required compaction prior to placing any additional fill material.
- F. CONTRACTOR shall be responsible for arranging for the placing and compacting of approved fill material in accordance with these Specifications. If it is determined that CONTRACTOR is failing to meet the minimum requirements, CONTRACTOR shall stop operations and make adjustments as necessary to produce a satisfactorily compacted fill at no additional cost to OWNER.
- G. Sufficient personnel, equipment, sumps or other means should be provided to maintain the site in an acceptable dry condition for the duration of this contract.
- H. Excavations shall be so braced and supported as needed to prevent the ground, adjacent to the excavation, from sliding or settling. Localized slides or settlements shall be promptly removed and corrected by CONTRACTOR.
- I. Final Backfill:
 - 1. Unimproved and Landscaped Areas: The top 8 inches of the trench shall be filled with topsoil and landscaped materials. Topsoil may be native material stripped prior to excavation of the trench. Backfill material shall be placed and compacted as specified above.

2. Roadways shall be completed with the type and thickness of materials as indicated or shown on the drawings.

3.5 FINISHED GRADE

- A. The finished subgrade and grade of the fill shall not vary more than 0.05 feet from the established grades and cross sections shown on the Drawings.

3.6 COMPACTION TESTS

- A. Compaction testing shall be the provided and paid for in accordance with Section 01 45 00 – Quality Control and Materials Testing.
- B. It shall be the responsibility of CONTRACTOR to accomplish the specified compaction for backfill, structural fill, Untreated Base Course and other earthwork. It shall be the responsibility of CONTRACTOR to control his operations by performing any additional tests necessary to verify and confirm that CONTRACTOR has complied, and is complying at all times, with the requirements of these Specifications concerning compaction, control, and testing.

1. Testing of Backfill Materials

- a. Characteristics of backfill materials shall be determined in accordance with the requirements of Section 01 45 00.
- b. Contractor shall demonstrate the adequacy of compaction equipment and procedures before exceeding any of the following amounts of earthwork quantities:
 - 1) One (1) test per 1.0 feet of backfill thickness placed per structure.
- c. Until the specified degree of compaction on the previously specified amounts of earthwork is achieved, no additional earthwork of the same kind shall be performed.
- d. After satisfactory conclusion of the initial compaction demonstration and at any time during construction, earthwork which does not comply with the specified degree of compaction shall not exceed the previously specified quantities.
- e. Quality Control tests may be made by ENGINEER to verify that compaction is meeting the requirements previously specified at no cost to Contractor. If ENGINEER requires retesting of backfill, CONTRACTOR shall remove the overburden above the level at which ENGINEER wishes to test and shall backfill and recompact the excavation after the test is complete at no additional cost to OWNER.
- f. If compaction fails to meet the specified requirements, Contractor shall remove and replace the backfill at proper density or shall bring the density up to specified level by other means acceptable to Engineer. Subsequent tests required to confirm and verify that the reconstructed backfill has been brought up to specified density shall be paid in accordance with Section 01 45 23 – Testing Agency Services. The confirmation tests shall be performed in a manner acceptable to ENGINEER. Frequency of confirmation tests for remedial work shall be double that amount specified for initial confirmation tests.

2. Field Density Tests

- a. Tests shall be performed in sufficient numbers to meet the requirements of Section 01 45 00 and to ensure that the specified density is being obtained.

C. Field density tests shall be made in accordance with ASTM D-1557 and ASTM D-6938.

- END OF SECTION -

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SECTION 32 11 23
ROAD BASE - UNTREATED BASE COURSE

PART 1 GENERAL

1.1 DESCRIPTION

- A. This work consists of the placement of Sub-Base and Untreated Base Course (UBC) material at designated areas and roadways and all driving surfaces as indicated on the Drawings.

1.2 RELATED SECTIONS

- A. Related work specified in other Sections:
1. Section 01 33 00 Submittal Procedures
 2. Section 01 45 00 Quality Control and Materials Testing

1.3 REFERENCES

- A. The latest edition of the following publication forms a part of this specification to the extent referenced. The publication is referred to in the text by basic designation only.
- B. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
1. AASHTO T 88 Standard Method of Test for Particle Size Analysis of Soils
 2. AASHTO T 180 Standard Method of Test for Moisture Density Relations of Soils Using a 10 lb. (4.54 kg) Rammer and an 18 in (457 mm) Drop
 3. AASHTO T 191 Standard Method of Test for Density of Soil In-Place by the Sand Cone Method
 4. AASHTO T 310 Standard Specification for In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods. (Shallow Depth)
- C. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
1. ASTM D 422 Standard Method for Particle Size Analysis of Soils
 2. ASTM D 698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)
 3. ASTM D 1556 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand Cone method
 4. ASTM D 1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³)
 5. ASTM D 2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
 6. ASTM D 6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- D. The latest edition of the Utah Department of Transportation Standard Specification for Road and Bridge Construction (UDOT).

1.4 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- B. Untreated Base Course (APWA Grade 1 or Grade 3/4).

1.5 MEASUREMENT AND PAYMENT

- A. Road Base shall not be measured or paid as a separate item, but shall be included as part of the various items to which it relates.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Untreated Base Course: Untreated Base Course Materials shall meet the APWA Specifications for Grade $\frac{3}{4}$ or 1 as shown in Table 1.

TABLE 1

| MASTER GRADING BANDS | | | |
|-----------------------------|--|--|--|
| SIEVE SIZE | GRADE 1-1/2 GRADATION (PERCENT PASSING) | GRADE 1 GRADATION (PERCENT PASSING) | GRADE 3/4 GRADATION (PERCENT PASSING) |
| 1 1/2 inch | 100 | - | - |
| 1 inch | 90-100 | 100 | - |
| 3/4 inch | 70-85 | - | 100 |
| 1/2 inch | 65-80 | 79 - 91 | - |
| 3/8 inch | 55-75 | - | 78 -92 |
| No. 4 | 40-65 | 49 - 61 | 55 - 67 |
| No. 16 | 25-40 | 27 - 35 | 28 - 38 |
| No. 200 | 7-11 | 7 - 11 | 7 - 11 |

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

- A. Prior to placement of untreated base course materials, the foundation area to receive untreated base course materials shall be scarified to a minimum depth of 8-inches and recompact to 96% minimum laboratory density as determined by ASTM D-1557.

3.2 UNTREATED BASE COURSE MATERIAL PLACEMENT

- A. No Untreated Base Course material shall be placed on sub-grade materials until the sub-grade has been checked and accepted by ENGINEER.
- B. Road base material placed on driving surfaces shall be compacted to a minimum density of 96% in accordance with ASTM D-1557 to provide a uniform graded

smooth surface.

- C. Untreated Base Course material shall be placed to a minimum thickness eight (8) inches or as shown on the drawings.

3.3 FIELD QUALITY CONTROL

- A. CONTRACTOR shall be responsible for directing proper placement of all road base materials. CONTRACTOR shall be responsible for the stability of the road base materials during placement and shall replace any portions which have become displaced due to careless or negligent work on the part of CONTRACTOR, or to damage resulting from natural causes, such as storms.
- B. Whenever the work areas to receive Sub-Base and/or Untreated Base Course material are covered with snow, the snow must be removed prior to placing the road base and/or Untreated Base Course, and deposited outside the immediate construction areas at CONTRACTOR's expense.

- END OF SECTION -

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SECTION 32 12 16
HOT-MIX ASPHALT CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

- A. This section addresses the requirements for installing hot-mix asphalt concrete, as outlined in Section 33 05 25 – Pavement Restoration of the APWA Specifications, and as modified herein.
- B. CONTRACTOR shall comply with City Standards for the asphalt concrete paving in the City in which the construction is performed. If there is a conflict between the specifications of this Section and the City Standard specifications, City Standards shall govern.

1.2 RELATED SECTIONS

- A. Related work specified in other sections includes but is not limited to:
 - 1. Section 01 33 00 Submittal Procedures
 - 2. Section 01 45 00 Quality Control and Materials Testing
 - 3. Section 01 50 00 Temporary Facilities and Environmental Controls
 - 4. Section 32 11 23 Road Base - Untreated Base Course
 - 5. Section 32 12 14 Tack Coat (APWA)
 - 6. Section 32 12 16 Plant-Mix – Asphalt Paving (APWA)
 - 7. Section 32 17 23 Pavement Marking (APWA)
 - 8. Section 33 05 25 Pavement Restoration (APWA)

1.3 REFERENCES

- A. The American Public Works Association General Conditions and Standard Specifications for Construction, latest edition
- B. The latest edition of the following publication forms a part of this specification to the extent referenced. The publication is referred to in the text by basic designation only.
- C. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - 1. ASTM D 2041 Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
 - 2. ASTM D 2950 Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Method
 - 3. ASTM D 3665 Standard Practice for Random Sampling of Construction Materials

1.4 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- B. Laboratory mix design for proposed hot-mix asphalt concrete paving.
- C. Means and methods for removal, reprocessing, and placement of existing asphalt surfaces as base course material.

- D. Laboratory mix design for proposed tack coat application.
- E. Quality assurance tests for asphalt and aggregate material sources.
- F. Copies of batch delivery tickets shall be submitted during progress of the work, and shall show the following information:
 - 1. Name of production facility
 - 2. Serial number of ticket
 - 3. Date and truck number
 - 4. Name of CONTRACTOR
 - 5. Job name and location
 - 6. Weight of asphalt concrete
 - 7. Loading temperature
 - 8. Signature or initial of plant representative
 - 9. Type and grade of asphalt cement
 - 10. Type and grade of aggregate
 - 11. Applicable mix design method
 - 12. Separate weights of aggregate and asphalt
- G. Submit type and number of rollers required for compacting asphalt concrete

1.5 SITE CONDITIONS

- A. Pave only when air and roadbed temperatures in the shade are greater than 40 deg. F and rising. The temperature restrictions may be waived only upon written authorization from ENGINEER.
- B. Do not pave during rain or unsuitable weather or when surface is wet.

1.6 ACCEPTANCE

- A. Acceptance of hot-mix asphalt concrete paving is based upon minimum density, minimum thickness, smoothness, and surface appearance. Smoothness and surface appearance shall be as defined by Section 32 12 16.13 of the APWA Specifications.

PART 2 PRODUCTS

2.1 BITUMINOUS MATERIAL

- A. The bituminous material shall be AC-10 or PG64-22, DM-1/2, 50 blow for the 1/2" mix design.
- B. Sampling and testing shall be the responsibility of CONTRACTOR, and shall be performed as required in Section 01 45 00 - Quality Control and Materials Testing.

2.2 TACK COAT

- A. Tack coat material shall conform to all requirements of Section 32 12 13.13 - Tack Coat (APWA).

PART 3 EXECUTION

3.1 PREPARATION

- A. Preparation shall conform to all requirements of Section 32 12 16 of the APWA specifications.
- B. CONTRACTOR shall map and mark all existing surface utilities within the line of work, and shall lower fixtures if pavement machine is not capable of passing over structure.
- C. All asphalt and concrete surfaces within the line of work are to be removed and disposed of properly by CONTRACTOR. CONTRACTOR may, upon written authorization of OWNER, use processed asphalt materials as base course material. Excess materials shall be removed and disposed by CONTRACTOR.
- D. Existing asphalt pavements and drive approach extensions to be removed shall be cut by a wheel cutter or other device capable of making a neat, reasonably straight and smooth cut without damaging adjacent pavement and/or concrete that is not to be removed. The cutting device operation shall be subject to the approval of ENGINEER.
- E. Any existing base, surfacing, or pavement shall be thoroughly cleaned immediately prior to receiving the plant-mixed surfacing. Where existing pavement is being widened or extended, it shall be cut to a straight vertical face prior to the paving operations and treated with asphalt paint binder.

3.2 BASE COURSE

- A. Base course material shall be placed in accordance with Section 32 11 23 of these specifications.
- B. Base course surfaces shall be maintained in an acceptable condition for both moisture and density, as defined by Section 32 11 23 - Road Base, until the overlying hot-mix asphalt cement materials have been placed, at no additional expense to OWNER.
- C. Processed asphalt materials may be used as base course provided that the resulting gradation for the $\frac{3}{4}$ " and -200 sieves comply with the requirements of Section 32 11 23 - Road Base. Processed asphalt which has been contaminated with clay or silt materials will not be accepted.

3.3 PLACEMENT OF TACK COAT

- A. Apply tack coat to all existing asphalt concrete surfaces preparatory to placing asphalt concrete pavement in accordance with Section 32 12 14 – Tack Coat of the APWA specifications.

3.4 PLACEMENT OF HOT-MIX ASPHALT CONCRETE

- A. For all excavations within twenty-four (24) inches of any structure, concrete, or edge of existing pavement surface; CONTRACTOR shall remove and replace existing pavement surface to the concrete, structure, or edge of existing pavement surface.
- B. Where a longitudinal trench is partly in pavement, the pavement shall be replaced to the original pavement edge, on a straight line, parallel to the center line of the roadway.

- C. Where no part of a longitudinal trench is in the pavement, surfacing replacement will only be required where existing surfacing materials have been removed.
- D. Spreading shall be as nearly continuous as possible.
- E. Placement shall also allow for line, grade, elevations, and thickness specified herein and as shown on the drawings.
- F. When asphalt concrete is laid against vertical surfaces such as gutters, the face of the vertical surface shall be roughened for proper bonding, cleaned, and then painted with a light coating of asphalt cement or emulsified asphalt.
- G. At terminations of new surface course, the asphalt concrete shall be feathered into the existing surface over such a distance as may be required to produce a smooth riding transition. Base course and single course construction shall be joined by vertical butt joints finished and rolled to a smooth surface.
- H. Asphaltic concrete shall not be placed when frozen materials are present in the base or sub-base.
- I. Asphaltic concrete shall not be placed during adverse conditions, i.e., rain or when a roadway surface is wet.
- J. Asphaltic concrete shall be placed between April 15 and October 15. Asphalt concrete shall not be placed after October 15 and before April 15 of the following year unless roadway surface temperatures are 40° F and rising in the shade. Approval to place the asphalt concrete after October 15 and before April 15 of the following year requires written approval from OWNER.
- K. Roadways not completed prior to October 15, and not meeting the requirements of this section, shall be repaired by placing a temporary 2-inch thick asphalt (or other ENGINEER approved surface) course over all exposed, earthen surfaces. These temporary surfaces shall be completely removed and repaired in accordance with these specifications at no additional expense to OWNER.
- L. Asphalt rolling shall be in accordance with Section 32 12 16 of the APWA specifications. CONTRACTOR shall establish and document a rolling pattern for obtaining densities. The test strip shall be no shorter than 300 feet. Establishment of rolling patterns are for the purpose of establishing minimum rolling patterns, and shall not release CONTRACTOR of meeting all requirements of these specifications and drawings.
- M. The target density for asphalt placement shall be 94 percent of laboratory density plus or minus two (2) percent. If an individual test result falls below 92 percent of maximum density, the material represented by that test will be considered defective, and shall be removed and replaced by CONTRACTOR at no additional cost to OWNER.
- N. The minimum acceptable thickness of asphalt for completed roadways shall be 2 inches, as verified by core samples. Areas found to contain less than the minimum thickness shall be removed and replaced at no additional expense to OWNER.
- O. The completed finish shall be as specified in Section 32 12 16 of the APWA specifications.

- P. CONTRACTOR shall adjust the height of all street fixtures to match final grade. If required, concrete collars shall be placed around all surface street fixtures (i.e. manholes, valve boxes, monuments, etc.).
- Q. CONTRACTOR shall complete all concrete collars within 2 weeks of completion of paving each roadway section.
- R. CONTRACTOR shall restripe streets, as required, in accordance with Section 32 17 23 - Pavement Markings of the APWA specifications.

3.5 SITE SAFETY AND TRAFFIC CONTROL

- A. Site safety and traffic control shall be the responsibility of CONTRACTOR.
- B. CONTRACTOR shall verify full compliance with all applicable local, county, state and/or federal regulations.

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SECTION 33 05 07.1
POLYVINYL CHLORIDE (PVC) PRESSURE PIPE
(ASTM D 1785, modified)

PART 1 GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall furnish and install all PVC pressure pipe and appurtenances as shown and specified, and as required for a complete and workable piping system.
- B. This Section includes PVC pressure pipe with solvent-welded, flanged, or threaded joints in accordance with ASTM D 1785 as modified herein. PVC pipe with bell and spigot joints is included in Section 33 05 07 - PVC Pressure Pipe, Rubber Joints (AWWA C900 and C905).

1.2 RELATED WORK

- A. Related work specified in other sections:
 - 1. Section 01 33 00 Submittal Procedures
 - 2. Section 05 45 00 Mechanical Metal Supports
 - 3. Section 31 23 15 Excavation and Backfill for Pipelines
 - 4. Section 33 05 07 PVC Pressure Pipe, Rubber Joints (AWWA C900 and C905)
 - 5. Section 33 12 00 Mechanical Appurtenances
 - 6. Section 33 13 00 Pipeline Disinfection

1.3 REFERENCES

- A. Work covered by this Specification shall meet or exceed the provisions of the latest editions of the following Codes and Standards in effect at the time of award of the Contract. The publication is referred to in the text by basic designation only.
- B. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
 - 1. ANSI B 16.5 Pipe Flanges and Flanged Fittings Class 150
- C. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - 1. ASTM D 1785 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
 - 2. ASTM D 2467 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
 - 3. ASTM F 1498 Standard Specification for Taper Pipe Threads 60 Degrees for Thermoplastic Pipe and Fittings
- D. AMERICAN WATER WORKS ASSOCIATION (AWWA)
 - 1. AWWA C 605 Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
 - 2. AWWA C 651 Standard for Disinfecting Water Mains

3. AWWA C 900 Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-Inch through 12-Inch for Water Transmission and Distribution
4. AWWA C 905 Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 14-Inch through 48-inch
5. AWWA M 23 Manual of Water Supply Practices - PVC Pipe - Design and Installation

1.4 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- B. Submit manufacturer's affidavit certifying product was manufactured, tested and supplied in accordance with applicable references in this section together with a report of the test results and the date each test was completed.
- C. Submit shop drawings of pipe, fittings, and appurtenances showing compliance with this Section; and manufacturer's literature on tracer wire and accessories.
- D. Submit plan for commissioning the waterline, including but not limited to cleaning, pressure testing, and disinfection.

PART 2 PRODUCTS

2.1 POLYVINYL CHLORIDE PIPE

- A. PVC pipe shall be made from new rigid unplasticized polyvinyl chloride and shall be normal impact Type 1, Grade 1, class 12454, listed as compliant with NSF Standard 61, unless otherwise indicated, in accordance with ASTM D 1785.
- B. Pipe sections shall be clearly marked to:
 1. Identify manufacturer's name or trademark
 2. Nominal pipe size and OD base
 3. ASTM material code designation
 4. Schedule
 5. Pressure class
 6. ASTM specification designation
 7. Product record code
- C. **PVC pipe shall be schedule 80 unless otherwise noted.**

2.2 PIPE JOINTS

- A. Pipe joints shall be solvent-welded type with solvent cement and primer as recommended by the pipe manufacturer for the chemical in the pipe.
- B. Threaded joints that are necessary to match up to threaded valves or fittings shall be made up with appropriate thread sealant, either paste or tape.
- C. Flanged joints shall be made with solvent-welded PVC flanges, drilled to ASME B 16.5 - Pipe Flanges and Flanged Fittings, Class 150, unless otherwise indicated. Gaskets shall

be ANSI 150 lb. full face, 1/8-inch thick Neoprene for water or wastewater service. Gasket material for chemicals shall be suitable for the chemical service.

2.3 FITTINGS

- A. Solvent-welded and threaded fittings shall be Schedule 80 PVC fittings in accordance with ASTM D 2467 - Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- B. Flanged fittings shall be Schedule 80 fabricated PVC fittings with 150 lb. flanges to ASME B 16.5.

2.4 TRACER WIRE

- A. All buried piping (including service lines) shall be installed with 12 gauge solid copper THHN tracer wire for pipeline location purposes by means of an electronic line tracer.
 - 1. The wires must be installed along the entire length of the pipe on the top of the pipe and be held in place with ties or hitches spaced not more than 12-feet apart.
 - 2. Sections of wire shall be spliced together using approved splice caps and waterproof seals or solder. Twisting the wires together is not acceptable.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Excavation and backfill of trenches and for appurtenances shall be in accordance with Section 31 23 15 - Excavation and Backfill for Buried Pipelines.
- B. PVC pipe shall be installed in a neat and workmanlike manner, properly aligned, and cut from measurements taken at the Site to avoid interferences with structural members, architectural features, openings, and equipment. Exposed pipe shall afford maximum headroom and access to equipment, and where necessary, piping shall be installed with sufficient slopes for venting or drainage of liquids and condensate to low points.
- C. Piping shall be firmly supported with fabricated or commercial hangers or supports in accordance with Section 05 45 00 – Mechanical Metal Supports (Pipe Supports). Where necessary to avoid stress on equipment or structural members, the pipe shall be anchored or harnessed. Expansion joints and guides shall compensate for pipe expansion due to temperature changes.
- D. Unless otherwise indicated, connections to fixtures, groups of fixtures, and equipment shall be provided with a shutoff valve and union, unless the valve has flanged ends. Unions shall be provided at threaded valves, equipment, and other devices requiring occasional removal or disconnection. Valves and flanges attached to PVC pipe shall be provided with adequate supports.

3.2 PIPE PREPARATION

- A. Prior to installation, each pipe length shall be carefully inspected, flushed clean of any debris or dust, and be straightened, if not true. Ends of threaded pipes shall be reamed and filed smooth. Pipe fittings shall be equally cleaned before assembly

3.3 PIPE JOINTS

- A. Pipe threads shall conform to ASTM F 1498 and shall be full and cleanly cut with sharp dies or molded. Joints shall be made with Teflon tape or thread sealant.
- B. Solvent-welded joints shall be made with fresh primer and solvent cement on clean, dry pipe ends. The primer and cement cans shall be kept closed at all times and the joints shall be made up at the recommended ambient temperatures, according to the pipe or cement manufacturer's written recommendations. Pipe ends shall be inserted to the full depth of the socket. Solvents used on potable water pipes shall be ANSI/NSF 61 certified.
- C. Flanged joints shall be made with gaskets and Type 316 stainless steel bolts and nuts, unless noted otherwise. Care shall be taken not to over-torque the bolts, in accordance with the manufacturer's written recommendations.

3.4 PRELIMINARY CLEANING AND FLUSHING

- A. CONTRACTOR shall flush the pipeline as the work progresses by a means in accordance with good practice to insure that sand, rocks, or other foreign material are not left in any of the pipeline. If possible the flushing shall be made with an open pipe end.
- B. CONTRACTOR shall provide to ENGINEER a proposed schedule and method of flushing for review before the flushing starts.

3.5 TRACER WIRE TESTING

- A. Upon completion of the pipe installation, CONTRACTOR shall demonstrate that the wire is continuous and unbroken through the entire run of the pipe.
 - 1. Demonstration shall include full signal conductivity (including splices) when energizing for the entire run in the presence of OWNER OR ENGINEER.
 - 2. If the wire is broken, CONTRACTOR shall repair or replace it. Pipeline installation will not be accepted until the wire passes a continuity test.

3.6 INSPECTION AND TESTING OF PIPELINE

- A. CONTRACTOR shall provide temporary blow-off valves and fittings as required to flush and disinfect new pipelines. Temporary blow-off valves and fittings shall be removed prior to placing pipeline into service.
- B. Source of Water
 - 1. CONTRACTOR shall assume all responsibility to obtain the necessary water supplies for disinfection and/or pressure testing of the pipeline.
- C. Testing Procedure
 - 1. CONTRACTOR shall allow adequate time for the solvent cement joints to cure. Curing time shall be per the solvent cement manufacturer's recommendation. Prior to enclosure or burying, piping systems shall be pressure tested as required on the Drawings, for a period of not less than one hour, without exceeding the tolerances listed on the Drawings. Caution - Do not use air or gas for testing PVC pipe. Where

no pressures are indicated, the pipes shall be subject to 1-1/2 times the maximum working pressure. CONTRACTOR shall furnish test equipment, labor, materials, and devices

2. In Leakage shall be determined by loss of pressure. Fixtures, devices, or other accessories that would be damaged if subjected to the test pressure shall be disconnected and ends of the branch lines shall be plugged or capped as appropriate during the testing procedures.
3. Leaks shall be repaired, and the piping shall be re-tested until no leaks are found.
4. ENGINEER shall be notified at least 48 hours before the pipeline is to be tested so that ENGINEER may be present during the test.

3.7 DISINFECTING

- A. Disinfection shall be in accordance with Section 33 13 00 - Pipeline Disinfection.

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SECTION 33 12 00
MECHANICAL APPURTENANCES

PART 1 GENERAL

1.1 SUMMARY

- A. CONTRACTOR shall furnish and install all valves, and equipment, complete and operable in accordance with the Specifications.
- B. Where two or more valves or equipment of the same type and size are required, the valves shall be furnished by the same manufacturer.
- C. CONTRACTOR shall verify that flanges on pipe match the bolt hole pattern of the flanges on the mechanical appurtenances.

1.2 RELATED WORK

- A. Related work specified in other sections:
 - 1. Section 01 33 00 Submittals
 - 2. Section 01 45 00 Quality Control & Materials Testing
 - 3. Section 01 50 00 Temporary Construction Utilities and Environmental Controls
 - 4. Section 33 05 05 Ductile Iron Pipe
 - 5. Section 33 05 07.1 Polyvinyl Chloride (PVC) Pressure Pipe (Modified)
 - 6. Section 33 13 00 Pipeline Testing and Disinfection
 - 7. Section 33 92 10 Steel Pipe, Specials, and Fittings (AWWA C200, modified)

1.3 REFERENCES

- A. The latest edition of the following publications form a part of these specifications to the extent referenced. The publications are referred to in the text to by basic designation only.
- B. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - 1. A 126 Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 - 2. A 216 Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
 - 3. B 584 Standard Specification for Copper Alloy Sand Castings for General Applications
 - 4. D-1763 Standard Specification for Epoxy Resins
- C. AMERICAN WATER WORKS ASSOCIATION (AWWA)
 - 1. C-504 Rubber-Seated Butterfly Valves, 3-inch through 72-inch
 - 2. C-509 Resilient-Seated Gate Valves for Water Supply Service
 - 3. C-512 Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service
 - 4. C-515 Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
 - 5. C-540 Standard for Power-Actuating Devices for Valves and Sluice Gates
 - 6. C 550 Protective Interior Coatings for Valves and Hydrants

D. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

1. B 16.1 Gray Iron Pipe Flanges and Flanged Fittings
2. B 16.34 Valves – Flanged, Threaded, and Welding End

1.4 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 – Submittals.
- B. Submit catalog cut sheets on all mechanical appurtenances including: fittings, valves, or other items shown on the Drawings referencing each item by mark number. Information shall indicate manufacturer specification compliance, Cv factor, pressure rating, and dimensional data.

PART 2 PRODUCTS

2.1 GATE VALVES

- A. Gate valves shall conform to the requirements of AWWA C-509 or AWWA C-515, and shall be NSF-61 Certified. Valves shall be of the resilient-seat type with non-rising stem, opening to the left, and provided with a 2-inch square operating nut for buried valves or handwheel for valves located in structures. Buried valves shall be of flange or mechanical joint design to match pipe joint system.
- B. Valves, valve-operating units, stem extensions and other accessories shall be installed by CONTRACTOR where shown, or where required in the opinion of ENGINEER, to provide for convenience in operation. Where buried valves are indicated, CONTRACTOR shall furnish and install valve boxes to 3-inches above grade in unimproved areas or at grade with concrete collar in improved areas. All valves and gates shall be new and of current manufacture.
- C. The valve shall have an FDA, EPA, AWWA C550 and ASTM D1763 approved two-part thermosetting epoxy protective coating (10 mil minimum inside and out) system that is non-toxic and imparts no taste to water and complies to NSF 61.
- D. The flanges of valves may be raised or plain faced. Flanged ends dimensions and drilling shall comply with ANSI B16.1 Class 125.
- E. All valves shall be furnished with pressure classes equal to or better than the pressure class of the pipe with which the valves are to be used. Unless otherwise specified, each valve body shall be tested under a test pressure equal to twice its design water-working pressure.
- F. Valves shall be manufactured by Mueller Co., Clow Valve Co., or approved equal.

2.2 BUTTERFLY VALVES

- A. Butterfly valves shall be High Performance: High Performance Butterfly valves shall meet MSS SP-68, for high pressure butterfly valves with a double offset seat, disc and stem design. The valve must meet the latest ASTM, ANSI and API standards for material, design and testing specifications. Stem bearings must be constructed of PTFE and stainless-steel material. The valve stem is to be a one-piece design. Packing must have an adjustable, two-bolt pull down design. Lugged valves must be capable of fully

rated double dead-end service. Valves shall be NSF 61 certified and have a Flange by Flange, Flange by Mechanical Joint, Mechanical Joint, or wafer body style, as indicated on the drawings, rated for 250 psi working pressure. The valves shall have a heavy-duty ductile iron body with flanges fully faced and drilled per ANSI B16.1 Class 150B. Shells shall be tested at a minimum of 400 psi. Maximum flow velocity shall be less than 16 fps for cold water service. The valve shall have a hand wheel operator, 2-inch Standard AWWA nut operator, or traveling nut actuators rated at 450 ft. lbs. torque and extensions as indicated on the Drawings. The valve shall have an FDA, EPA, AWWA C550 and ASTM D1763 approved two-part thermosetting epoxy protective coating (10 mil minimum inside and out) system that is non-toxic and imparts no taste to water. The epoxy shall be applied in accordance with AWWA C550 and be ANSI/NSF 61 certified. Valves shall be manufactured by **DeZURIK BHP, VAG, Av-Tek DEX** or approved equal.

2.3 BALL VALVES

- A. Valves shall be rated for the working pressure of the system.
- B. **Stainless Steel Ball Valves** shall be full port opening stainless steel and have adjustable stem packing gland. Body and ball shall be stainless steel in accordance with ASTM A351. Seats shall be reinforced PTFE and packing stem shall be PTFE. The handle shall be Type 304 stainless steel with vinyl insulator. The valves shall conform to MSS-SP-100 and be **Apollo 76F-100, NIBCO T-585-S6-R-66-LL, Watts Series S-FBV-1**, or approved equal.
- C. **Brass Ball Valves** shall feature brass body construction with NPT female threaded connections, brass non-rising stem and gland, PTFE packing, brass threaded bonnet, solid wedge disc, and cast iron cross-handle handwheel. Minimum Pressure shall be 200psi. Valves shall be Watts WGV-X, LFWGV or approved equal.

2.4 VALVE BOXES AND LIDS

- A. All buried valves shall be installed complete with 6-inch diameter slide type, two-piece cast iron valve box. Manufacturer be **Tyler 562 Series**, or approved equal. The valve box lid shall be designated "WATER" unless noted otherwise on the drawings.
- B. Concrete Collars shall be 10" thick x 2'- 6" in diameter centered on the valve box. They shall have two circumscribing #4 bars, one at three inches from the outside edge and a second bar nine inches from the outside edge each centered in the concrete. Concrete shall be 3000 psi.

2.5 COMBINATION AIR/VACUUM VALVES

- A. Combination Air/Vacuum valves shall be single body, double orifice valves conforming to the requirements of AWWA C 512. Valve float shall be stainless steel. Valves shall be the size indicated on the drawings and shall be **Val-Matic 201C.2**, no approved equal.

2.6 CHECK VALVES

- A. The 1 1/2-inch brass check valves shall be Watts LF 600 or approved equal. Check valves shall have a minimum rating of 200 psi.

2.7 HOSE BIBBS and SAMPLING TAPS

- A. Hose bibbs shall be as-manufactured by Watts, or approved equal, and shall include an integral vacuum breaker or built-in backflow protection devices and cast-iron wheel handle. Sampling Taps shall be smooth nose type. Valves shall be 316 stainless steel or brass as shown on the Drawings.

2.8 STEEL SPOOLS AND STEEL FITTINGS

- A. Steel Spools and Steel Fittings shall be sized to match the existing conditions of the piping. They shall meet the requirements of Section 33 92 10 – Steel Pipe, Specials and Fittings.

2.9 DISMANTLING JOINTS

- A. Dismantling Joints bodies shall be fabricated from steel, ASTM A512, without pipe stop. The body shall not be less than 1/4-inch thick or at least the same wall thickness as the pipe to which the coupling is connected. If the strength of the body material is less than the strength of the pipe material, the thickness of the middle ring shall be increased to have the same strength as the pipe. The follower ring shall be fabricated from steel, ASTM A576 or A36.
- B. For Dismantling Joints installed in piping systems rated for positive pressure, the coupling shall be restrained with harness bolts or tie rods. Other means of restraining the coupling such as set screws will not be accepted. Harnesses shall be designed in accordance with AWWA Manual 11, or as indicated. Harness sets shall be designed for the maximum test pressure of the pipe in which they are installed.
- C. Gaskets shall be composed of a rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions.
- D. Dismantling Joints shall be Model 975 by Smith-Blair, Model DJ400 by Romac, or approved equal.

2.10 GASKETS AND BOLTS

- A. Except as otherwise provided, gaskets for flanged joints shall be 1/8-inch thick rubber fabric. Class 250 or less flange gaskets shall be **Flange-Tyte by U.S. Pipe**, higher pressure joint gaskets shall be **Garlock BLUE-GARD Style 3000**, or approved equal. Wherever blind flanges are shown, the gaskets shall consist of 1/8-inch thick cloth-inserted rubber sheet which shall cover the entire inside surface of the blind flange and shall be cemented to the surface of the blind flange.
- B. All bolts and nuts shall be zinc plated. Bolts shall be rated for the system working pressure with a minimum safety factor of three.

2.11 BRASS PIPING

- A. Brass piping shall match iron pipe size standards and meet ASTM B 43 Standards for Seamless Red Brass Pipe.

2.12 UNIONS

- A. Furnish and install unions for each valve or piece of equipment to permit easy installation and removal of equipment.

2.13 EXHAUST FAN

- A. The exhaust fan shall be Fantech FR150 6-inch fan, 120 volt AC, or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Valves, valve-operating units, stem extensions and other accessories shall be installed by CONTRACTOR where shown, or where required in the opinion of ENGINEER, to provide for convenience in operation. Where buried valves are indicated, CONTRACTOR shall furnish and install valve boxes at grade with concrete collars. All valves and boxes shall be new and recently manufactured.
- B. Install mechanical appurtenances as indicated on the plans and in accordance with the manufacturer's written instructions.

- END OF SECTION -

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SECTION 33 13 00
PIPELINE TESTING AND DISINFECTION

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section covers testing and disinfection in order to remove bacteriological contamination of the pipeline. Disinfection is only required if the pipeline is used for potable water.
- B. CONTRACTOR shall be responsible for obtaining permits for discharging excess testing water and dechlorination of such water, if required.
 - 1. All pressure pipelines shall be tested.
 - 2. Working and testing pressures for the system are as shown on the Drawings.

1.2 RELATED SECTIONS

- A. Including but not limited to the following:
 - 1. Section 01 33 00 Submittal Procedures
 - 2. Section 33 12 00 Mechanical Appurtenances
 - 3. Section 33 92 10 Steel Pipe, Specials, and Fittings (AWWA C200, Modified)

1.3 REFERENCES

- A. The latest edition of the following publications form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
 - 1. AWWA C-651 - Disinfecting Water Mains
 - 2. Utah Public Drinking Water Regulations

1.4 SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 – Submittals.
- B. Furnish a written testing plan and schedule, including proposed chemicals, water source, methods for conveyance to the project, sequence, control, and disposal. District will take the bacteriological tests.
- C. Disinfection Report:
 - 1. Type and form of disinfectant used.
 - 2. Date and time of disinfectant injection start and time of completion.
 - 3. Test locations.
 - 4. Name of person collecting samples.
 - 5. Initial and 24-hour disinfectant residuals in treated water in parts per million (ppm) for each outlet tested.
 - 6. Date and time of start and completion for flushing.
 - 7. Disinfectant residual after flushing in ppm for each outlet tested.

PART 2 MATERIALS

2.1 DESCRIPTION

- A. All test equipment, temporary valves, bulkheads, and other water control equipment, shall be as determined and provided by CONTRACTOR. No materials shall be used which damage the project pipelines for future conveyance of potable water.
- B. Disinfecting materials shall consist of liquid chlorine, sodium hypochlorite solution, or calcium hypochlorite granules or tablets.
- C. Dechlorination agents may be sodium bisulfate, sodium sulfite, or sodium thiosulfate.

PART 3 EXECUTION

3.1 GENERAL

- A. Source of Water
 - 1. CONTRACTOR shall assume all responsibility to obtain the necessary water for testing and disinfection of the water line system. All testing water used in the pipeline shall be potable water from a State approved drinking water system.
 - 2. All pressure pipelines shall be tested.
 - 3. Disposal of flushing water and water containing chlorine shall be by methods acceptable to the State of Utah, Division of Water Quality.

3.2 HYDROSTATIC AND LEAKAGE TESTING OF PIPELINES PROCEDURE

- A. Prior to hydrostatic testing, pipelines 24-inches diameter and larger shall be swept free of debris and visually inspected that all debris has been removed prior to filling.
- B. Prior to hydrostatic testing, pipelines shall be flushed or blown out as appropriate. CONTRACTOR may test pipelines in sections. Sections to be tested shall be defined by isolation valves in the pipeline. Sections that have a zero leakage allowance may be tested as a unit. No section of the pipeline shall be tested until field-placed concrete or mortar has attained an age of 14 Days or paint lining has cured. The test shall be made by closing valves when available or by placing bulkheads and filling the line slowly with water (maximum filling velocity shall not exceed 0.25 foot per second, calculation based on the full area of the pipe). CONTRACTOR shall be responsible for ascertaining that test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to or movement of the pipe being tested or any other pipe that it connects to. Unharnessed sleeve-type couplings, expansion joints, or other sliding joints shall be restrained or suitably anchored prior to the test to avoid movement and damage to piping and equipment. Remove or protect any pipeline-mounted devices that may be damaged by the test pressure. Care shall be taken that air relief valves are open during filling.
- C. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the release valves at a reasonable velocity. The air within the pipeline shall be allowed to escape completely. The differential pressure across the orifices in the air release valves shall not be allowed to exceed 5 psi at any time during filling. After the pipeline or section thereof has been filled, it shall be allowed

to stand under a slight pressure for at least 24 hours to allow the concrete or mortar lining, as applicable, to absorb water and to allow the escape of air from air pockets. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to ENGINEER shall be taken. Additional water shall be added to the pipeline to replace any water absorbed by the cement mortar lining.

- D. The hydrostatic test shall consist of holding the designed test pressure (system pressure or as otherwise specified for the valve vaults) on the pipeline segment for a period of 2 hours. Visible leaks that appear during testing shall be repaired. Add water to restore the test pressure if the pressure decreases 5 psi below test pressure during the test period.
- E. Pipe with welded joints shall have no leakage.
- F. Exposed piping and valves shall show no visible leaks and no pressure loss during the test.
- G. In the case of pipelines that fail to pass the leakage test, CONTRACTOR shall determine the cause of the leakage, shall take corrective measures necessary to repair the leaks, and shall again test the pipeline, repeating as necessary until the pipeline passes.
- H. Blowoff isolation gate valves and plug valves (throttling valves) shall be operated and tested during a simulated blow down operation to demonstrate functionality of the valves to the satisfaction of ENGINEER. Isolation valves (gate valves or butterfly valves) shall not be used for throttling.

3.3 DISINFECTING OF PIPELINES PROCEDURE

- A. Leakage and pressure testing must be completed prior to disinfection procedures.
- B. All water and solution piping installed under this Contract shall be disinfected using an approved disinfection method in accordance with the "American Water Works Association Standard for Disinfecting Water Mains" (AWWA C651).
- C. CONTRACTOR may use one of the three chlorination methods – tablet, continuous feed, and slug, as outlined in AWWA C651 that is acceptable to OWNER. Care must be taken to prevent the strong chlorine solution in the line being disinfected from flowing back into the line supplying the water.
- D. Heavily chlorinated water shall not be discharged onto the ground or into surface drainage facilities. Upon completion of disinfection, Sodium Bisulfate (NaHSO_4), or other approved dechlorination agent, shall be applied to the heavily chlorinated water to neutralize thoroughly the chlorine residual remaining. Water shall be neutralized to less than 0.01 ppm total chlorine residual.
- E. After approval of disinfection, CONTRACTOR shall flush the new system until the chlorine residual is a maximum of 0.3 ppm.
- F. After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall

be collected from the pipeline being tested. Sampling and testing will be completed by CONTRACTOR. All samples shall be tested for bacteriological (chemical and physical) quality in accordance with "Standard Methods for Examination of Water and Wastewater" and shall show the absence of coliform organisms. If the initial disinfection fails to provide satisfactory bacteriological results, or shows the presence of coliform, then the line shall be re-chlorinated, flushed, and retested until satisfactory results are obtained at the expense of CONTRACTOR.

3.4 CONNECTIONS TO EXISTING SYSTEM

- A. Where connections are to be made to an existing potable water system, the interior surfaces of all pipe and fittings used in making the connections shall be swabbed or sprayed with a one percent hypochlorite solution before installation. Thorough flushing shall be started as soon as the connection is completed and shall be continued until discolored water is eliminated.
- B. Final Fill: After successful pressure and disinfection tests are completed, the pipeline(s) shall be filled with fresh potable water and shall remain filled.

- END OF SECTION -

SECTION 33 92 10
STEEL PIPE, SPECIALS, AND FITTINGS (AWWA C200, modified)

PART 1 GENERAL

1.1 DESCRIPTION

- A. CONTRACTOR shall provide fabrication and installation of steel pipe, specials, and fittings, complete and in place, in accordance with AWWA C200 and as modified herein.
- B. A single pipe manufacturer shall be made responsible for furnishing steel pipe, specials, fittings, and appurtenances such as bolts and gaskets.
- C. A special is defined as any piece of pipe other than a normal full length of straight pipe. This includes, but is not limited to, elbows, manhole sections, short pieces of straight pipe, reducers, tees, and bulk heads.

1.2 RELATED WORK

- A. Related work specified in other sections:
 - 1. Section 01 33 00 Submittals
 - 2. Section 09 91 00 Painting and Finishes
 - 3. Section 09 98 00 Pipeline Coatings and Linings
 - 4. Section 31 23 15 Excavation and Backfill for Buried Pipelines
 - 5. Section 33 12 00 Mechanical Appurtenances
 - 6. Section 33 13 00 Pipeline Testing and Disinfection

1.3 REFERENCES

- A. Work covered by this Specification shall meet or exceed the provisions of the latest editions of the following Codes and Standards in effect at the time of award of the Contract:
- B. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
 - 1. ANSI B16.1 Cast-Iron Pipe Flanges and Flanged Fittings Class 25, 125, and 250
 - 2. ANSI B16.5 Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard
 - 3. ANSI/AWS B2.1 Specification for Welding Procedure and Performance Qualification
- C. AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
 - 1. ASME B 16.3 Malleable Iron Threaded Fittings
 - 2. ASME B 16.5 Pipe Flanges and Flanged Fittings
- D. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - 1. ASTM A 20 Standard Specification for General Requirements for Steel Plates for Pressure Vessels

2. ASTM A 193 Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
3. ASTM A 194 Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
4. ASTM A 234 Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
5. ASTM A 283 Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
6. ASTM A 307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
7. ASTM A 370 Standard Test Methods and Definitions for Mechanical Testing of Steel Products
8. ASTM A 563 Standard Specification for Carbon and Alloy Steel Nuts
9. ASTM A 572 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
10. ASTM A 578 Standard Specification for Straight-Beam Ultrasonic Examination of Rolled Steel Plates for Special Applications
11. ASTM A 1011 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
12. ASTM A 1018 Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
13. ASTM E 165 Standard Practice for Liquid Penetrant Examination for General Industry

E. AMERICAN WATER WORKS ASSOCIATION (AWWA)

1. AWWA C 200 Steel Water Pipe 6-inch and Larger
2. AWWA C 205 Cement Mortar Protective Lining and Coating for Steel Water Pipe 4-inch and Larger – Shop Applied
3. AWWA C 206 Field Welding of Steel Water Pipe
4. AWWA C 207 Steel Pipe Flanges for Waterworks Service - Sizes 4-inch Through 144-inch
5. AWWA C 208 Dimensions for Fabricated Steel Water Pipe Fittings
6. AWWA C 210 Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
7. AWWA C 214 Tape Coating Systems for the Exterior of Steel Water Pipelines
8. AWWA C 215 Extruded Polyolefin Coatings for the Exterior of Steel Water Pipelines
9. AWWA C 216 Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings
10. AWWA C 219 Bolted, Sleeve-Type Couplings for Plain-End Pipe
11. AWWA C 222 Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings
12. AWWA C 606 Standard for Grooved and Shouldered Joints
13. AWWA C 651 Standard for Disinfecting Water Mains

1.4 SUBMITTALS

- A. Furnish submittals in accordance with Section 01 33 00 – Submittals.
- B. Shop Drawings
 - 1. Prepare and submit certified dimensional drawings consistent with the pipeline alignment and grade on the Drawings, including all fittings and appurtenances, and with the size, location, elevation and slope information of existing utilities, pipelines, and encasements obtained by CONTRACTOR in accordance with Section 01 76 30 - Protection of Existing Facilities.
 - 2. Joint and pipe/fitting wall construction details which indicate the type and thickness of cylinder; the position, type, size, and area of reinforcement; coating and lining holdbacks, manufacturing tolerances; and other pertinent information required for the manufacture of the product. Standard joint details shall be submitted where deep bell or butt strap joints are required for control of temperature stresses.
 - 3. Details for elbows, wyes, tees, outlets, connections, test bulkheads, and nozzles or other specials that indicate amount and position of reinforcement. Fittings and specials shall be properly reinforced to withstand the internal pressure, both circumferential and longitudinal, and the external loading conditions as indicated in the drawings. Provide design calculations for all fittings and specials, including all reinforcement requirements.
 - 4. Material lists and steel reinforcement schedules that describe materials to be utilized.
 - 5. Line layout and marking diagrams which indicate the specific number of each pipe and fitting, the location of each pipe, and the direction of each fitting in the completed line compatible with requirements of AWWA Manual 11 (M-11).
 - a. The pipe station and invert elevation at every change in grade or horizontal alignment.
 - b. The station and invert elevation to which the bell end of each pipe will be laid.
 - c. Elements of curves and bends, both in horizontal and vertical alignment.
 - d. Pipe joint type.
 - e. The limits within each reach of each type of field-welded joint and of concrete encasement.
 - f. Location of mitered pipe sections, beveled ends, butt straps and deep bell lap joints for temperature stress control.
 - g. Location and details for each valve, meter, pump, fitting, and other equipment as shown on the drawings used to determine pipe dimensions. Include location of closures, cut-off sections for length adjustment, temporary access manways, vents, and weld lead outlets for construction convenience.
 - h. Location of bulkheads, including those shown and as required, for hydrostatic testing of pipeline.
 - 6. Welding Information
 - a. The Shop Drawings shall define the weld type and distinguish between shop and field welds. Shop Drawings shall indicate by welding symbols or sketches the details of the welded joints and the preparation of parent metal required to make them.
 - b. Current (within the last 6 months) Welder Performance Qualifications (WPQ's) shall be submitted for each welder used prior to their performing any Work either

in the shop or field. Qualification testing shall be as specified in paragraph 1.3 – Quality Assurance.

- c. Submit the credentials of the CONTRACTOR's Certified Welding Inspectors (CWI's) and quality control specialist for review prior to starting any welding in the shop or field. The credentials shall include, but not be limited to, American Welding Society (AWS), QC-1 Certification. Other nondestructive testing (NDT) quality control personnel shall be certified as required by AWS D1.1.
 - d. Submit NDT data for each shop-welded and field-welded joint. This data shall include all testing on each weld joint, including re-examination of repaired welds, using radiographic testing (RT), magnetic particle testing (MT), dye penetrant testing (PT), ultrasonic testing (UT), or air test examination methods as specified. Test data shall be reviewed and signed by the CWI.
7. Manufacturer's written Quality Assurance/Control Program.
- C. **Certifications:** CONTRACTOR shall furnish a certified affidavit of compliance for pipe and other products or materials in AWWA C200, AWWA C205, AWWA C206, AWWA C207, AWWA C208, AWWA C209, AWWA C214, AWWA C216, AWWA C219, and the following supplemental requirements:
- 1. Certified copies of mill test reports on each heat from which steel is rolled. Test shall include physical and chemical properties. Submit certified copies of mill test reports for flanges.
 - 2. Hydrostatic test reports.
 - 3. Results of production weld tests.
 - 4. Sand, cement, and mortar tests.
 - 5. Records of coating application, including technical data sheets, manufacturer name, product name and thickness.
- D. Performing and paying for sampling and testing necessary for certification are CONTRACTOR's responsibility.
- E. **Manufacturer's Qualifications:** Furnish a copy of manufacturer's certification to ISO 9000, SPFA, or LRQA, and documentation of manufacturer's experience in fabricating AWWA C200 pipe. Credentials shall include reference names, telephone numbers, and descriptions of projects for pipe conforming to AWWA C200 that is of similar diameter, length, and wall thickness to the pipe for this project.
- F. **Design Calculations of Fittings and Specials:** Furnish a copy of design calculations for fittings and specials including miters, welds, and reinforcement, prior to manufacture of pipe, fittings, and specials.

1.5 QUALITY ASSURANCE

- A. **Pipe Manufacturer Qualifications:** The pipe manufacturer shall be certified to ISO 9000, the Steel Plate Fabricator's Association (SPFA), or Lloyd's Register Quality Assurance (LRQA) and shall be experienced in fabrication of AWWA C200 pipe of similar diameters, lengths, and wall thickness to this project. The manufacturer shall have the capability of meeting the schedule requirements of this project. Experience shall be in the production facilities and personnel, not the name of the company that owns the production facility or employs the personnel. Verification of experience and production capability will be conducted as part of the initial submittal review process for steel pipe and CONTRACTOR's progress schedule.

- B. **Inspection:** Pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of AWWA C200, C205, C206, C208 and C214 as supplemented by the requirements herein. CONTRACTOR shall notify ENGINEER in writing of the manufacturing start date not less than 14 Days prior to the start of any phase of the pipe manufacture.
- C. **Tests:** Except as modified herein, materials used in the manufacture of the pipe shall be tested in accordance with the requirements of AWWA C200, C205, C206, C208, and C214 as applicable.
1. After the joint configuration is completed and prior to lining with cement mortar, each length of pipe of each diameter and pressure class shall be shop-tested and certified to a pressure of at least 75 percent of the yield strength of the steel. The test pressure shall be held for 2 minutes and the pipe visually inspected to confirm that welds are sound and leak-free.
 2. In addition to the tests required in AWWA C200, weld tests shall be conducted on each 5,000-feet of production welds and at any other times there is a change in the grade of steel, welding procedure, or welding equipment. One set of tests per operator per work shift shall be performed.
 3. Fittings fabricated from straight pipe previously passing a hydrostatic test need not have an additional hydrostatic test provided welds are tested by nondestructive means and demonstrated to be sound.
 4. Material tests shall be performed at no additional cost to OWNER. ENGINEER and OWNER shall have the right to witness testing conducted by CONTRACTOR or pipe manufacturer/fabricator; provided that CONTRACTOR's schedule is not delayed for the convenience of ENGINEER or OWNER.
- D. **Welding Procedure Specifications:** Welding procedures used to fabricate and install pipe shall be in accordance with the ASME Boiler and Pressure Vessel Code (BPVC) for shop welds and ANSI/AWS D1.1 for field welds. Written welding procedures shall be required for welds in the shop or the field. Welds qualified per the ASME BPVC shall include supplementary Essential Variables for notch-tough welding. Provisions of ANSI/AWS D1.1 qualified welds pertaining to notch-tough welding shall apply.
- E. **Welder Performance Qualifications:** Welding shall be performed by skilled welders, welding operators, and tackers who have had experience in the methods and materials to be used. Welders shall be qualified per the provisions of ASME BPVC for shop welds and ANSI/AWS D1.1 for field welds.
- F. Shop Testing of Steel Plate Specials:
1. If any special has been fabricated from straight pipe not previously tested and is of the type listed below, the special shall be hydrostatically tested with a pressure equal to 1-1/2 times the design working pressure: This applies to bends, wyes, crosses, tees with side outlet diameter greater than 30 percent of the main pipe diameter, and manifolds.
 2. Specials not required to be hydrostatically tested shall be tested by liquid dye penetrant inspection method in accordance with ASTM E 165, Method A or the magnetic particle method in ASME Section VIII, Division 1, Appendix VI.
 3. Reinforcing plates shall be tested by the solution method using approximately 40 psi air pressure introduced between the plates through a threaded test hole. Test hole shall be properly plugged following successful testing.

4. Any weld defects, cracks, leaks, distortion, or signs of distress during testing shall require corrective measures. Weld defects shall be gouged out and re-welded. After corrections, the special shall be retested.
5. Where welded test heads or bulkheads are used, extra length shall be provided to each opening of the special. After removal of each test head, the special shall be trimmed back to the design points with finished plate edges ground smooth, straight, and prepared for the field joint.
6. Testing shall be performed before joints have been coated or lined.
7. Ultrasonic examination shall be performed in accordance with the following:
 - a. Steel plate that will be in welded joints or welded stiffener elements shall be examined ultrasonically for laminar discontinuities where both of the following conditions exist:
 - 1) Any plate in the welded joint has a thickness exceeding 1/2-inch.
 - 2) Any plate in the welded joint is subject to transverse tensile stress through its thickness during the welding or service.
 - b. Ultrasonic examination may be waived where joints are designated to minimize potential laminar tearing.
 - c. The ultrasonic examination shall be in accordance with ASTM A578 with a Level I acceptance standard.
8. Plates that are not in conformance with the acceptance criteria in ASTM A578 may be used in the WORK if the areas that contain the discontinuities are a distance at least 4 times the greatest dimension of the discontinuity away from the weld joint.

G. Shop Nondestructive Testing: Nondestructive testing shall be performed for various weld categories as indicated below. Testing shall include submitting written documentation of procedures per Section V of the ASME Boiler and Pressure Vessel Code, and acceptance criteria shall be in accordance with Section VIII of the ASME BPVC.

1. Field Butt Joint Welds: Spot radiographically examine pipe in accordance with Paragraph UW-52 of the ASME BPVC Section VIII Division 1. If in the opinion of ENGINEER, the welds cannot readily be radiographed, they shall be 100 percent ultrasonically examined.
2. Fillet Welds: 100 percent examine every fillet weld using the magnetic particle inspection method.
3. Groove Welds: 100 percent ultrasonically examine groove welds that cannot be readily radiographically spot examined.
4. CONTRACTOR's certified welding inspector (CWI) shall 100 percent visually examine every weld as a minimum.
5. In addition to weld tests indicated, doubler pads shall be air tested as stated in AWWA C206.
6. CONTRACTOR shall be responsible for performing and paying for said tests and ENGINEER has the right to witness testing conducted by CONTRACTOR.

H. Onsite Observation: SUPPLIER shall provide an experienced staff member if requested by CONTRACTOR to be onsite while the pipe and fittings are being installed. The staff member's duties shall include, but not be limited to the following:

1. Observe the installation and welding of the pipe and fittings.
2. Report any concerns to OWNER'S on-site observer.
3. Answer questions and provide assistance to OWNER and CONTRACTOR.

- I. **Certified Welding Inspector:** Furnish the services of a certified welding inspector(s) (CWI) for the shop and field welding as specified in AWWA C200 and C206. After receiving CWI qualification, the CWI shall have at least 3 years of professional work experience similar to the work being performed for the project. The CWI's shall be directed by a CWI supervisor with at least 5 years of professional work experience similar to the work being performed for the project. The certified welding inspector(s) shall submit written certification that all welds were performed in conformance with these documents. Shop weld tests shall be reviewed and signed by the certified welding inspector(s).
- J. **Field Testing:** Field testing shall conform to the requirements of Section 33 13 00 - Pipeline Testing and Disinfection.
- K. **Welding Requirements:** Welding procedures used to fabricate and install pipe shall be prequalified under the provisions of ANSI/AWS D1.1 - Structural Welding Code-Steel or the ASME Boiler and Pressure Vessel Code, Section 9. Welding procedures shall be required for longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.
- L. **Welder Qualifications:** Welding shall be done by skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 or the ASME Boiler and Pressure Vessel Code, Section 9 by an independent local, approved testing agency not more than 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the project shall be used in qualification tests.

1.6 WARRANTY

- A. A one-year warranty for the pipe shall be included from CONTRACTOR, and shall cover the cost of replacement pipe and freight to the project site, should the pipe have any defects in material or workmanship.
- B. In addition to the standard pipe warranty, the welding contractor shall provide in writing a warranty for a period of one year for all welded joints, including formation, installation, and pressure testing.
- C. Unless otherwise noted, the warranty periods shall begin when Substantial Completion is issued for the contract.

PART 2 PRODUCTS

2.1 GENERAL

- A. Manufacturers of steel pipe and steel fittings or specials shall be under the direction and management of one steel pipe manufacturer only. This does not prevent a separate fabricator from fabricating specials or fittings; however, WORK shall be directed by the Main Pipe Manufacturer. The responsibility of the Main Pipe Manufacturer shall include at a minimum:
 - 1. Verify pipe, fittings, and specials are being manufactured in full accordance with the drawings and specifications and applicable codes and standards.

2. Manage the design, fabrication, testing and delivery of the pipe, fittings, and specials. Provide field support if requested to CONTRACTOR during installation and testing.
 3. Prepare and submit submittal information and Shop Drawings.
 4. Make any corrections that may be required to the submittal information and Shop Drawings.
 5. Certify that the pipe and specials have been manufactured in accordance with the Drawings and Specifications.
- B. Lined and coated steel pipe and specials shall conform to AWWA C200, C205, C209, C214, and C216 (C210, C215, C222) subject to the following supplemental requirements. The pipe, specials, and fittings shall be of the diameter and class indicated and shall be provided complete with welded joints as indicated on the Drawings. For pipe, specials, and fittings 14-inches diameter and larger, the nominal inside diameter after lining shall not be less than the diameter indicated on the Drawings, allowing for tolerances according to AWWA C200 and C205. Pipe, specials, and fittings smaller than 14-inches diameter may be furnished in standard outside diameters. When indicated as a minimum, wall thickness tolerance shall be as allowed by AWWA C200 or the ASTM nominal sheet or plate tolerance, whichever is less.
- C. **Markings:** The manufacturer shall legibly mark pipe, specials, and fittings in accordance with the laying schedule and marking diagram. Each pipe, special, and fitting shall be numbered in sequence and said number shall appear on the laying schedule and marking diagram in its proper location for installation. Each pipe, special, and fitting number shall be located on the inside and outside area of pipe, special, and fitting. Interior marking shall be in full conformance with NSF 61. Each pipe, fitting and special shall be marked at each end with top field centerline. The word "Top" shall be painted or marked on the outside top spigot of each pipe section or fitting. Mark "Top Match Point" for compound bends per AWWA C208.
- D. **Handling and Storage:** The pipe, specials, and fittings shall be handled by use of wide slings, padded cradles, or other devices designed and constructed to prevent damage to the pipe coating/exterior. The use of chains, hooks, or other equipment that might injure the pipe coating/exterior will not be permitted. Stockpiled pipe, specials, and fittings shall be supported on padded skids, sand or earth berms free of rock exceeding 2-inches diameter, sand bags, or suitable means so that the pipe including coating and lining coating will not be damaged. Pipe, specials, and fittings shall not be rolled and shall be secured to prevent accidental rolling. The ends of pipes shall be securely bulkheaded or otherwise sealed during transportation and shall remain sealed until installation.
- E. CONTRACTOR shall replace or repair any pipe, specials, and fittings damaged at no additional cost to OWNER.
- F. **Strutting:** Adequate strutting shall be provided on specials, fittings, and straight pipe so as to avoid damage to the pipe, specials, and fittings during handling, storage, hauling, and installation. For mortar-lined steel pipe, specials, or fittings the following requirements shall apply:
1. The strutting shall be placed as soon as practicable after the mortar lining has been applied and shall remain in place while the pipe, special, or fitting is loaded, transported, unloaded, installed, and backfilled at the Site.

2. The strutting materials, size, and spacing shall be the responsibility of CONTRACTOR and shall be adequate to support the earth backfill plus any greater loads that may be imposed by the backfilling and compaction equipment.
 3. Strutting on shop lined pipe shall consist of wood stulls and wedges. Strutting shall be installed in a manner that will not harm the lining.
 4. Any pipe, special, or fitting damaged during handling, hauling, storage, or installation due to improper strutting shall be repaired or replaced at no additional cost to OWNER.
- G. Laying Lengths: Maximum pipe laying lengths shall be 48-feet with shorter lengths provided as required to accommodate CONTRACTOR's operation.
- H. Lining: The pipe, specials, and fittings shall have smooth, dense interior surfaces and shall be free from fractures, excessive interior surface crazing, and roughness.
- I. Closures and Correction Pieces: Closures and correction pieces shall be provided as required so that closures may be made due to different headings in the pipe laying operation and so that correction may be made to adjust the pipe laying to conform to pipe stationing indicated. The locations of the correction pieces and closure assemblies shall be shown on the pipe layout diagrams.
- J. Backfill with CLSM: Where required, backfill with Controlled Low Strength Material (CLSM) shall be the full depth of the pipe zone from 6 inches below to 6 inches above the pipe as a minimum.

2.2 MATERIALS

- A. **Mortar:** Materials for mortar when specified shall conform to the requirements of AWWA C205; provided, that cement for mortar coating shall be Type II modified or Type V and mortar lining shall be Type II modified or Type V. Cement in mortar lining and coating shall not originate from kilns that burn metal-rich hazardous waste fuel, nor shall a fly ash or pozzolan be used as a cement replacement. Admixtures shall contain no calcium chloride.
- B. **Steel for Cylinder and Fittings:** Pipe, specials, and fittings manufactured under AWWA C200 shall satisfy the following requirements:
1. Minimum yield strength of steel is 42,000 psi.
 2. Be manufactured by a continuous casting process.
 3. Be fully killed.
 4. Be fine grain practice.
 5. Maximum carbon content of 0.25 percent.
 6. Maximum sulfur content of 0.015 percent.
 7. Minimum elongation of 22 percent in a 2-inch gauge length.
 8. Be in accordance with one of the following, ASTM A1011, ASTM A283, ASTM A572, or ASTM A1018.
 9. Maximum carbon equivalent of 0.45, calculated as follows:

$$CE = C + \frac{(Mn+Si)}{6} + \frac{(Cr+Mo+V)}{5} + \frac{(Ni+Cu)}{15}$$

- C. Pipe shall be manufactured as fabricated pipe per AWWA C200 as modified herein. ASTM pipe manufacturing standards referenced in AWWA C200 shall not be used. Pipe sections shall be fabricated by either of the following methods:
 - 1. Pipe sections may be fabricated by spirally welded short cylindrical coils of steel, joined circumferentially by complete penetration butt joint welds.
 - 2. Pipe sections may be rolled or pressed from no more than three (3) sheets the full length of the pipe and welded with no more than three (3) longitudinal seams.
- D. Steel equal to or greater than 1/2-inch thick used in fabricating pipe shall be tested for notch toughness using the Charpy V-Notch test in accordance with ASTM A370. Test each heat of steel by taking one specimen from any two coils per heat number. The steel shall withstand a minimum impact of 25 ft-lb at a temperature of 30 deg F.
 - 1. Plate: Charpy tests shall be conducted on each plate as required in ASTM A20.
 - 2. Coils: Charpy tests shall be conducted on the first 500 tons of steel by testing each coil as follows:
 - a. Tests shall include representative sampling of steel thicknesses required for the Work.
 - b. Each coil shall be tested by taking coupons from the outer, middle, and inner wrap of the coil. Middle coil coupons may be taken from the ends of full-length pipes that are closest to the middle of the coil.
 - c. Coils that do not meet the above Charpy acceptance criteria shall not be used in the production of the pipe.
- E. **External and Internal Pipeline Coating:** In accordance with Section 09 91 00 – Painting and Finishes and Section 09 98 10.

2.3 DESIGN OF PIPE

- A. **General:** The pipe shall be suitable to transmit potable water under the conditions indicated on the Drawings. The steel pipe shall have field welded joints as indicated. The pipe shall be cement mortar lined or epoxy lined, polyurethane lined as per Section 09 98 10 as indicated. Field lining will only be allowed where specifically approved in advance by ENGINEER.
- B. The pipe shall be designed, manufactured, tested, inspected, and marked according to applicable requirements previously stated and, except as hereinafter modified, shall conform to AWWA C200.
- C. **Pipe Dimensions:** Pipe shall be of the diameter and minimum wall thickness indicated on the Drawings.
- D. **Fitting Dimensions:** Fittings shall be of the diameter and class to match the adjacent piping.
- E. **Joint Design:** Joints shall be flanged, lap welded slip joint, or butt strap unless otherwise indicated.
- F. **Shop Fit Test:** Make certain that joints are correctly field assembled and that excessive annular space between spigots and bells and that the pipe meets the requirements of AWWA C200. The pipe fabricator shall perform dimensional measurements for all pipe

joints to verify joints are within manufacturing tolerances prior to shipment. The pipe ends shall be match marked after shop assembly.

1. The shop fit test shall join the pipe ends in the shop with proposed adjacent pipe end.
2. Record the actual annular space with the data to include as a minimum:
 - a. Maximum/minimum space at any point.
 - b. Space at 90-degree intervals top, bottom, and at springline.

G. Flanges

1. Flanges shall be in accordance with AWWA C 207 Class D for operating pressures up to 175 psi on 4-inch through 12-inch diameter, and operating pressures to 150 psi on diameters over 12-inches.
2. Flanges shall be AWWA C 207 Class E for operating pressures over 150 psi to 275 psi or shall be Class F for pressures to 300 psi (drilling matches ANSI B 16.5 Class 250).
3. Shop lining and coating shall be continuous to the end of the pipe or back of the flange. Flanges shall be shop coated with a soluble rust preventive compound which is NSF 61 certified if used on potable water pipelines.
4. Gaskets shall be full-face, 1/8-inch thick, cloth-inserted rubber, **Garlock 3000, John Crane Co. Style 777**, or approved equal.

H. Bolts and Nuts for Flanges

1. Bolts for flanges shall be carbon steel, ASTM A 307, Grade B for Class B and D flanges and nuts shall be ASTM A 563, Grade A heavy hex. Bolts for Class E and F flanges shall be ASTM A 193, Grade B7 and nuts shall be ASTM A 194, Grade 2H heavy hex.

2.4 SPECIALS AND FITTINGS

- A. **Design:** Except as otherwise indicated, materials, fabrication and shop testing of specials and fittings shall conform to the requirements stated above for pipe and shall conform to the dimensions of AWWA C208. (Specials consisting of access manways, outlets for air valves, blow-off valves, etc. are excluded from the criteria as follows and collar plates, wrapper plates or crotch plates shall be required for reinforcing the outlet connections in accordance with AWWA M-11 and AWWA C208 requirements.) The minimum thickness of plate for pipe from which specials are to be fabricated shall be the greatest of those determined by the following 3 criteria:

1. Working and Transient Pressure Design

$$T = \frac{P_w D / 2}{Y / S_w} \qquad T = \frac{P_t D / 2}{Y / S_t}$$

Where:

| | | |
|----------------|---|---|
| T | = | Steel cylinder thickness in inches |
| D | = | Outside diameter of steel cylinder in inches |
| P _w | = | Design working pressure in psi |
| P _t | = | Design transient pressure in psi |
| Y | = | Specified minimum yield point of steel in psi |

- Sw = Safety factor of 2.5 at design working pressure
 St = Safety factor at design transient pressure; for elbows 1.875 and 2.0 for other specials

2. Mainline Pipe Thickness: Plate thickness for specials shall not be less than for the adjacent mainline pipe.
3. Thickness Based on Pipe Diameter unless otherwise specified on the Drawings:

| Nominal Pipe Diameter, in | Pipe Manifolds Piping Above Ground Piping Structures |
|---------------------------|--|
| 24 and under | 3/16-in |
| 25 to 48 | 1/4-in |
| over 48 | 5/16-in |

- a. Minimum plate thickness shall be the greater of the adjacent mainline pipe, the thickness on the Drawings, the thickness calculated as indicated herein or as shown on the table above indicating the minimum thickness based on pipe diameter.
 - b. Refer to ASME B36.10M for dimensions of wall thickness for standard weight pipe and nominal pipe size.
- B. Specials installed on saddle supports shall be designed to limit the longitudinal bending stress to a maximum of 10,000 psi. Design shall be in accordance with the provisions of Chapter 7 of AWWA Manual M11.
- C. Reinforcement for wyes, tees, outlets, and nozzles shall be designed in accordance with AWWA Manual M11. Reinforcement shall be designed for the design and test pressures indicated and shall be in accordance with the Drawings. Specials and fittings shall be equal in pressure design strength and shall have the same lining and coating as the adjoining pipe. Unless otherwise indicated, the minimum radius of elbows shall be 2.5 times the pipe diameter and the maximum miter angle on each section of the elbow shall not exceed 11-1/4 degrees.
- D. Moderate deflections and long radius curves may be made by means of beveled joint rings, by pulling standard joints, by using short lengths or pipe, or a combination of these methods; provided that pulled joints shall not be used in combination with bevels. The maximum total allowable angle for beveled joints shall be 5 degrees per pipe joint. Bevels shall be provided on the bell ends. Mitering of the spigot ends will not be permitted. The maximum allowable angle for pulled joints shall be in accordance with the manufacturer's recommendations or the angle which results from a 3/4-inch pull out from normal joint closure, whichever is less. Horizontal deflections or fabricated angles shall fall on the alignment. In congested city streets or at other locations where underground obstructions may be encountered, the chord produced by deflecting the pipe shall be no further than 6-inches from the alignment indicated.

- E. Vertical deflections shall fall on the alignment and be at locations adjacent to underground obstructions, points of minimum earth cover, and pipeline outlets and structures. The pipe angle points shall match the angle points indicated.
- F. Outlets, Tees, Wyes, and Crosses
1. Outlets 12-inches and smaller may be fabricated from Schedule 30 or heavier steel pipe in the standard outside diameters. Minimum plate thickness for reinforcements shall be 10-gauge.
 2. The design of outlet reinforcement shall be in accordance with the procedures given in Chapter 13 of AWWA Manual M -11 and the design pressures and factors of safety above.
 3. In lieu of saddle or wrapper reinforcement as provided by the design procedure in Manual M -11, pipe or specials with outlets may be fabricated entirely of steel plate having a thickness equal to the sum of the pipe wall plus the required reinforcement.
 4. Where Manual M-11 requires the design procedure for crotch plate reinforcement, such reinforcement shall be provided.
 5. Outlets shall be fabricated so that there is always at least a 12-inch distance between the outer edge of the reinforcing plate and any field welded joints. For outlets without reinforcing plates, outlets shall penetrate the steel cylinders so that there is at least a 12-inch clearance between the outlet and any field-welded joints.
 6. Tees, wyes, crosses, elbows, and manifolds shall be fabricated so that the outlet clearances and reinforcing plates from any weld joints are a minimum of 5 times cylinder thickness or 2-inches, whichever is greater. Longitudinal weld joints in adjacent cylinder sections shall be oriented so that there is a minimum offset of 5 times cylinder thickness or 2-inches, whichever is greater.
- G. **Steel Welding Fittings:** Steel welding fittings shall conform to ASTM A 234.

2.5 CEMENT-MORTAR LINING

- A. Cement-Mortar Lining for Shop Application: Unless indicated otherwise, interior surfaces of pipe, specials, and fittings shall be cleaned and lined in the shop with cement mortar lining applied centrifugally in conformity with AWWA C205. Lining for all mitered fittings produced by cutting, rolling and re-welding such as elbows from 5 to 90 degrees up to 72-inches in diameter shall be centrifugally applied in the shop. Fabricated tees, manifolds or elbows greater than 72-inches or tees with crotch plates where heat treating or normalization is required may be lined in accordance with AWWA C205. During the lining operation and thereafter, the pipe, specials, and fittings shall be maintained in a round condition by suitable bracing or strutting. The lining machines shall be of a type that has been used successfully for similar work. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found defective at the Site, the damaged or unsatisfactory portions shall be replaced with lining conforming to these Specifications at no additional cost to OWNER.
- B. The minimum lining thickness and tolerance shall be in accordance with Section 09 98 10 – Pipeline Coatings and Linings and AWWA C-205.
- C. The pipe shall be left bare as indicated where field joints occur. Ends of the linings shall be left square and uniform. Feathered or uneven edges will not be permitted.

- D. Defective linings shall be removed from the pipe wall and shall be replaced to the full thickness required. Defective linings shall be cut back to a square shoulder in order to avoid feather edged joints. Temperature and shrinkage cracks in the mortar less than 1/16-inch wide need not be repaired. Pipe specials or fittings with cracks wider than 1/16-inch shall be removed and patched.
- E. The progress of the application of mortar lining shall be regulated in order that handwork, including the repair of defective areas, is cured in accordance with the provisions of AWWA C205. Cement mortar for patching shall be the same materials as the mortar for machine lining, except that a finer grading of sand and mortar richer in cement shall be used when field inspection indicates that such mix will improve the finished lining of the pipe.
- F. Specials and fittings that cannot be mechanically lined and coated shall be lined and coated by hand-application using the same materials as used for the pipe and in accordance with the applicable AWWA or ASTM standards and this Section. Coating and lining applied in this manner shall provide protection equal to that for the pipe. Fittings may be fabricated from pipe that has been mechanically lined and/or coated. Areas of lining and coating that have been damaged by such fabrication shall be repaired by hand-application.
- G. Cement-Mortar Lining for Field Application at joints: Unless otherwise indicated, all steel pipe joints shall be mortar lined. The materials and design of in-place cement mortar lining shall be in accordance with Section 09 98 10 – Pipeline Coatings and Linings and AWWA C-205, and the following supplementary requirements:
 - 1. Pozzolanic material shall not be used in the mortar mix.
 - 2. Admixtures shall contain no calcium chloride.
 - 3. The minimum lining thickness shall be as indicated for shop-applied cement mortar lining, and finished inside diameter after lining shall be as indicated.
 - 4. Temperature and shrinkage cracks in the mortar less than 1/16-inch wide need not be repaired. Pipe, specials, or fittings with mortar cracks wider than 1/16-inch shall be removed and repaired.
- H. Protection of Pipe Lining/Interior: All pipe, specials, and fittings with plant-applied cement-mortar linings, shall be supplied with a 12-mil polyethylene sheet or other suitable bulkhead on the ends of the pipe and on each opening to prevent drying out of the lining. Bulkheads shall be substantial enough to remain intact during shipping and storage until the pipe is installed.

2.6 EXTERIOR COATING OF PIPE

- A. Exterior Coating of Exposed Piping: The exterior surfaces of pipe, specials, and fittings that will be exposed to the atmosphere inside structures or above ground shall be thoroughly cleaned and then given a shop coat of primer compatible with the finish coating required by Section 09 98 10 - Pipeline Coatings and Linings.
- B. Exterior Coating of Buried Piping: Pipe for buried service, including bumped heads, shall be coated per Section 09 98 10 – Pipeline Coatings and Linings.

2.7 INTERIOR COATING OF PIPE – Liquid Applied Epoxy Lining

- A. **Interior Coating of Exposed Piping:** The interior surface of pipe, specials, and fittings that will be exposed to the atmosphere inside structures or above ground shall be thoroughly cleaned and then given a shop coat of primer compatible with the finish coating required by Section 09 98 01 – Pipeline Coatings and Linings.

2.8 PIPE APPURTENANCES

- A. Pipe appurtenances shall be in accordance with the requirements of the Specifications and Drawings. Access manholes with covers shall be as indicated, installed during fabrication, not in the field. Threaded outlets shall be forged steel suitable for 3000 psi service.

2.9 SAFETY TAPE

- A. Safety tape shall be a minimum of 3-inch wide by 5.0 mil overall thickness, with no less than a 0.35-gauge solid aluminum foil core. It shall be Safety Blue in color per American Public Works Association (APWA) National Color Code and shall be clearly labeled with the words “CAUTION WATER LINE BELOW” or similar wording approved by ENGINEER. Safety tape shall be **MagnaTec by Empire Level Mfg Corp**, or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Excavation and backfill of trenches and for appurtenances shall be in accordance with Section 31 23 15 - Excavation and Backfill for Buried Pipelines.
- B. Safety tape shall be installed above pipe as required by the Drawings.
- C. **Handling and Storage:** Pipe, specials, and fittings shall be carefully handled and protected against damage to lining and coating/interior and exterior surfaces, and impact shocks and free fall. Pipe, specials, and fittings shall not be placed directly on rough ground but shall be supported in a manner that will protect the pipe against injury whenever stored at the Site or elsewhere. Pipe, specials, and fittings shall be handled and stored at the Site in accordance with the requirements stated in Part 2, above. No pipe shall be installed when the lining or coating/interior or exterior surfaces show cracks that may be harmful as determined by ENGINEER. Such damaged lining and coating/interior and exterior surfaces shall be repaired or a new undamaged pipe, special, or fitting shall be provided at no additional cost to OWNER.
- D. Pipe damaged prior to Substantial Completion shall be repaired or replaced at no additional cost to OWNER.
- E. Repair of Defects: Patching inserts, overlays, or pounding out defects shall not be permitted. Repair of notches or laminations on second ends shall not be permitted. Deformation of pipe ends through mechanical means or other methods to achieve pipe fit up of defective pipe shall not be permitted. Damaged ends shall be removed to a point of uniform, non-damaged cylinder end and properly prepared. Distorted or flattened lengths shall be rejected. Buckled sections shall be removed and replaced

with a full pipe cylinder. CONTRACTOR shall submit a written repair plan and receive favorable review from OWNER prior to the start of any repair work.

- F. CONTRACTOR shall inspect each pipe, special, and fitting for damage. CONTRACTOR shall remove or smooth out any burrs, gouges, weld splatter, or other small defects prior to laying the pipe, special, or fitting.
- G. Before placement of pipe, specials, or fittings in the trench, each shall be thoroughly cleaned of any foreign substance that may have collected thereon and shall be kept clean thereafter. For this purpose, the openings of pipes, specials, and fittings in the trench shall be closed during any interruption to the project.
- H. Pipe, specials, and fittings backfilled with CLSM shall be laid directly on moist sandbags or other suitable supports in preparation for the CLSM pipe zone material. Sandbags shall be placed to provide at least 6-inches of CLSM below the bottom of the pipe. Sandbags shall be spaced at a maximum interval of 8-feet and one set shall be placed within 3-feet on both sides of each joint. CONTRACTOR shall provide additional sandbags as needed to support the pipe on line and grade. Excavation outside the normal trench section shall be made at field joints as needed to permit adequate access to the joints for field connection operations and for application of coating on field joints.
- I. Installation Tolerances: Each section of pipe, special, or fitting shall be laid in the order and position on the laying diagram and in accordance with the following:
 - 1. Each section of pipe, special, or fitting having a nominal diameter less than 48-inches shall be laid to line and grade, within plus or minus 2-inches horizontal deviation and plus or minus 1-inch vertical deviation.
 - 2. Each section of pipe, special, or fitting having nominal diameter 48-inches and larger shall be laid to line and grade, within plus or minus 5 percent of diameter horizontal deviation and plus or minus 2.5 percent of diameter vertical deviation.
 - 3. In addition to the horizontal and vertical tolerances above, lay the pipe so that no high or low points other than those on the laying diagram are introduced.
 - 4. After installation, pipe, specials, and fittings shall not show deflection greater than 1.5 percent for mortar-lined and mortar-coated pipe, specials, and fittings; 2.25 percent for mortar-lined and flexible-coated pipe, specials, and fittings; and 3.75 percent for flexible-lined and flexible-coated or bare pipe, specials, and fittings. The allowable deflection shall be based on the design inside diameter.
 - 5. CONTRACTOR shall not permit the pipeline to experience a differential settlement after welding of more than 1.5" over 300 feet.
- J. Where necessary to raise or lower the pipe, specials, or fittings due to unforeseen obstructions or other causes, CONTRACTOR may change the alignment and/or the grades in accordance with the requirements of the Specifications and Drawings. Such change shall be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in a joint exceed 75 percent of the maximum deflection recommended by the pipe manufacturer without prior approval from ENGINEER. No joint shall be misfit any amount that will be detrimental to the strength and water tightness of the finished joint. In all cases the joint opening, before finishing with the protective mortar inside the pipe, shall be the controlling factor.
- K. Except for short runs, pipes shall be laid uphill if on grades exceeding 10 percent. Pipe that is laid on a downhill grade shall be blocked and held in place until sufficient support

is furnished by the following pipe to prevent movement. Bends shall be installed as indicated.

- L. Struts in pipe 42-inches diameter and larger shall be left in place until backfilling operations have been completed. Struts in pipe smaller than 42-inches may be removed immediately after laying. CONTRACTOR shall monitor pipe deflection by measuring pipe inside diameter before struts are removed and 24 hours after struts are removed. Pipe deflection shall not exceed 3 percent 24 hours after the struts are removed. After the backfill has been placed, the struts shall be removed and shall remain the property of CONTRACTOR. For pipe backfilled with CLSM, struts shall be left in place until the CLSM backfill has obtained a minimum 7-day cure.
- M. Cold Weather Protection: No pipe, special, or fitting shall be installed upon a foundation into which frost has penetrated or at any time that there is a danger of the formation of ice or penetration of frost at the bottom of the excavation. No pipe, special, or fitting shall be laid unless it can be established that the trench will be backfilled before the formation of ice and frost occurs.
- N. Pipe, Specials, and Fitting Protection: The openings of pipe, specials, and fittings with shop-applied mortar lining shall be protected with suitable bulkheads to maintain a moist atmosphere and to prevent unauthorized access by persons, animals, water, or any undesirable substance. The bulkheads shall be so designed to prevent drying out of the interior of the pipe, specials, and fittings. CONTRACTOR shall introduce water into the pipe to keep the mortar moist if moisture has been lost due to damaged bulkheads.
- O. Flotation: At all times, means shall be provided to prevent the pipe from floating. Take necessary precautions to prevent the pipe from floating due to water entering the trench or from backfilling with CLSM. CONTRACTOR shall assume full responsibility for any damage due to this cause and shall at its own expense restore and replace the pipe to its specified condition and grade if it is displaced due to floating. Maintain the inside of the pipe free from materials and in a clean and sanitary condition.
- P. **Pipe Cleanup:** As pipe laying progresses, CONTRACTOR shall keep the pipe interior free of debris. CONTRACTOR shall completely clean the interior of the pipe of sand, dirt, mortar splatter, and any other debris following completion of pipe laying, pointing of joints, and any necessary interior repairs prior to testing and disinfecting the completed pipeline. When pipe laying is not in progress and at the end of each day, CONTRACTOR shall cover the exposed ends of all pipes to prevent animals, dust, dirt and other debris from entering the pipe.

3.2 WELDED JOINTS

- A. **General:** Field welded joints shall be in accordance with AWWA C206.
- B. Welding Procedures, Welding Qualifications and Testing:
 - 1. Field welding procedures, welders, welding operators, and tackers shall be qualified in accordance with AWS D1.1 and as defined in Section 3 of ANSI/AWWA C206 or ANSI/AWWA C200, as applicable. Qualifications shall be in accordance with all position pipe tests as defined in Section 5 of AWS D1.1.
 - 2. For field welding, the welder qualification testing shall be performed at the Site. Previous qualifications will not be accepted. CONTRACTOR shall obtain the

- services of an independent testing laboratory to perform the welder qualification on-Site. Copies of test data and certifications shall be provided to ENGINEER. Costs for welder qualification testing shall be paid by CONTRACTOR at no increased cost to OWNER.
3. Upon completion of each field-welded joint CONTRACTOR shall provide a record system that traces a welder's work completion to a specific joint as it relates to the pipeline stationing.
 4. Field lap welds shall be inspected by magnetic particle or dye penetration methods. Field butt welds shall be inspected in accordance with the requirements of API 1104 by the radiographic method and the acceptance criteria of API 1104. Magnetic particle testing is not required for seal welds.
 5. Double welded lap joints and butt strap joints shall be air tested. Repairs and retesting shall be required if any loss of pressure occurs and shall be at no increased cost to OWNER.
 6. Personnel performing the visual inspection of welds shall be qualified and currently certified as Certified Welding Inspector (CWI) in accordance with AWS QC1, Standard for Qualification and Certification of Welding Inspectors. Personnel performing nondestructive tests shall be qualified and certified to meet the requirements of SNT-TC-1A.
- C. Where exterior welds are performed, adequate space shall be provided for welding and inspection of the joints.
 - D. Butt straps shall be as indicated. When fitting up the ends of pipe to be welded or fitting butt-strap pieces, jacking or clamping shall not be allowed. Cold working the metal with sledges or localized application of heat and working the metal with sledges shall not be allowed. If field displacement of joints, where butt strap joints are indicated, does not allow proper fit up with the tolerances indicated, special closure butt straps or mitered pieces shall be shop fabricated and installed.
 - E. A heat resistant shield shall be draped over at least 24-inches of coating beyond the holdback on both sides of the weld during welding to avoid damage to the coating by hot weld splatter. Welding grounds shall not be attached to the coated part of the pipe.
 - F. Care shall be exercised during the initial backfilling to prevent movement of the pipe and to prevent any backfill material from being deposited on the joint.
 - G. To control temperature stresses, the unbackfilled joint areas of the pipe shall be shaded from the direct rays of the sun by the use of properly supported awnings, umbrellas, tarpaulins, or other suitable materials for a minimum period of 2 hours prior to the beginning of the welding operation and until the weld has been completed. Shading materials at the joint area shall not rest directly on the pipe but shall be supported to allow air circulation around the pipe. Shading of the pipe joints need not be performed when the ambient air temperature is below 50 deg F as measured in the trench.
 - H. Temperature Control Joints: At intervals not exceeding 250-feet along welded reaches of the pipeline and at the first regular lap-welded field joints outside concrete encasements and structures, the pipe shall be laid with an initial lap of not less than 1-inch greater than the typical lap dimension. The welding of each such temperature control joint shall be performed when the temperature is approximately the lowest during the 24 hour day, after at least 250-feet of pipe have been laid and the joints have been welded ahead of and in back of the shrinkage control joint, and after backfill has been

completed to at least 1-foot above the top of the pipe ahead of and in back of the shrinkage control joint. Where temperature control joints occur in a traveled roadway or other inconvenient location, the location of the temperature control joint may be adjusted, as necessary.

- I. Prior to the beginning of the welding procedure, any tack welds used to position the pipe during laying shall be removed. Any annular space between the faying surfaces of the bell and spigot shall be equally distributed around the circumference of the joint by shimming, jacking, or other suitable means. The weld shall then be made in accordance with AWWA C206. Where more than one pass is required, each pass except the first and final ones shall be peened to relieve temperature stresses, and dirt, slag, and flux shall be removed before the succeeding bead is applied.
- J. Prior to butt welding, the pipe and joint shall be properly positioned in the trench using line up clamps so that, in the finished joint, the abutting pipe sections shall not be misaligned more than 1/16-inch.
- K. Unless double fillet welds are indicated, field welded lap joints may, at the CONTRACTOR'S option, be made on either the inside or the outside of the pipe.
- L. **Inspection of Field Welded Joints:** An independent testing laboratory shall inspect the joints. Inspection shall be as soon as practicable after the welds are completed.
 - 1. Fillet welds shall be tested by the Magnetic Particle Inspection Method in accordance with ASME Section VIII, Division 1, Appendix VI.
 - 2. In addition, double fillet welds on butt strap joints or double welded lap joints shall be air tested by shop drilling and tapping for 1/4-inch national pipe thread in the lap or bell end of the pipe. Apply 40 psi of air or other satisfactory gas into the connection between the 2 fillet welds. Test pressure shall be measured with a 4-inch diameter, minimum, pressure gauge with a range no greater than 0 to 100 psi. The air test shall consist of holding the test pressure undiminished for 5 minutes. If the air test fails, paint the welds with a soap solution and mark any leaks indicated by the escaping gas bubbles. Leaking portions of the welds or defective welds shall be removed and rewelded. The amount of material removed shall be limited to that required to correct the defect. After the repair is made, the joint shall be checked by repeating the original test procedure to verify that there is no leakage at the inside weld. Close the threaded openings with pipe plugs or by welding them.
 - 3. Butt welds shall be inspected by radiographic methods in accordance with API Standard 1104.
- M. Following tests of the joint, the exterior joint spaces shall be coated in accordance with these specifications after which backfilling may be completed.
- N. **Repair of Welds:** Welds that are defective shall be repaired by CONTRACTOR to meet the requirements of this Specification. Defects in welds or defective welds shall be removed, and that section of the joint shall then be re-welded. Only sufficient removal of defective material that is necessary to correct the defect is required. After the repair is made, the joint shall be checked by repeating the original test procedure. Welds deficient in size shall be repaired by adding weld metal.

3.3 JOINT COATING AND LINING

- A. General: The interior and exterior joint recesses shall be thoroughly wiped clean and water, loose scale, dirt, and other foreign material shall be removed from the inside surface of the pipe.
- B. Joint Coating of Shop-Applied Tape-Coated, Cement Mortar, Epoxy, or Polyurethane Pipe: Joints shall be coated in accordance with Section 09 98 10 – Pipeline Coatings and Linings.
- C. Every joint will be tested by CONTRACTOR with an electrical detector capable of at least a 12,000-volt output, furnished by the SUPPLIER. Holiday tests will be conducted in accordance with NACE RP0274. Holidays shall be repaired by CONTRACTOR at no additional cost to OWNER.
- D. Coating Repair: Coating repair shall be in accordance with Section 09 98 10 – Pipeline Coatings and Linings.
- E. Coating of Fittings and Specials: Fittings and specials shall be coated in accordance with Section 09 98 10 – Pipeline Coatings and Linings.
- F. Mortar Joint Lining: After the backfill has been completed to final grade, the interior joint recess shall be filled with grout. The grout shall be tightly packed into the joint recess and troweled flush with the interior surface. Excess shall be removed. At no point shall there be an indentation or projection of the mortar exceeding 1/16-inch. With pipe smaller than 24-inches in diameter, before the spigot is inserted into the bell, the bell shall be daubed with grout. The joint shall be completed and excess mortar on the inside of the joint shall be swabbed out.
- G. Epoxy or polyurethane Joint lining: After the backfill has been completed to final grade, the interior joint recess shall be recoated with the specified epoxy or polyurethane.

3.4 INSTALLATION OF PIPE APPURTENANCES

- A. **Installation of Valves:** Valves shall be handled in a manner to prevent any injury or damage to the valve or any part of it. Joints shall be thoroughly cleaned and prepared prior to installation. CONTRACTOR shall adjust stem packing and operate each valve prior to installation to verify proper operation. Valves shall be installed so that the valve stems are plumb and, in the location, indicated.
- B. **Installation of Flanged Joints:** Before the joint is assembled, the flange faces shall be thoroughly cleaned of foreign material with a power wire brush. The gasket shall be centered and the connecting flanges drawn up watertight without unnecessarily stressing the flanges. Bolts shall be tightened in a progressive diametrically opposite sequence and torqued with a suitable calibrated torque wrench. Clamping torque shall be applied to the nuts only. Full face reinforced rubber gaskets shall be applied to the inside face of blind flanges with adhesive.
- C. **Insulated Joints:** Insulated joints and appurtenant features shall be provided as required. CONTRACTOR shall exercise special care when installing these joints to prevent electrical conductivity across the joint. After the insulated joint is completed, an electrical resistance test shall be performed by CONTRACTOR. If the resistance test

indicates a short circuit, CONTRACTOR shall remove the insulating units to inspect for damage, replace all damaged portions, and reassemble the insulating joint. The insulated joint shall then be retested to assure proper insulation.

- D. **Flexible Coupled Joints:** When installing flexible couplings, care shall be taken that the connecting pipe ends, couplings, and gaskets are clean and free of dirt and foreign matter with special attention given to the contact surfaces of the pipe, gaskets, and couplings. The couplings shall be assembled and installed in conformity with the recommendation and instruction of the coupling manufacturer.
- E. Wrenches used in bolting couplings shall be of a type and size recommended by the coupling manufacturer. Coupling bolts shall be tightened so as to secure a uniform annular space between the follower rings and the body of the pipe. Bolts shall be tightened approximately the same amount. Diametrically opposite bolts shall be tightened progressively and evenly. Final tightening shall be done with a suitable calibrated torque wrench set for the torque recommended by the coupling manufacturer. Clamping torque shall be applied to the nut only.

3.5 PRESSURE TESTING

- A. Pressure testing and disposal of test water shall be in accordance with Section 33 13 00 – Pipeline Testing and Disinfection.

- END OF SECTION -

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