**SECTION 01 11 00**
**GENERAL REQUIREMENTS**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. This section describes the project and the work to be performed under this contract. Detailed requirements and extent of work are stated in the applicable Specification sections and shown on the Drawings.

B. Construct work as described in the Contract Documents and as specified herein.

1. Provide the materials, equipment, and incidentals required to make the project fully functional and operational.
2. Provide the labor, equipment, tools, and consumable supplies required for a complete project.
3. Test and place the completed project in operation.
4. Provide the special tools, spare parts, lubricants, supplies, or other materials as required.
5. Drawings and specifications do not indicate or describe all of the work required to complete the project. Any additional details required for the correct installation of selected products are to be provided by the Contractor and coordinated with the Engineer.

### 1.02 ORGANIZATION AND INTERPRETATION OF CONTRACT DOCUMENTS

A. Specifications included in these Contract Documents establish the performance, quality requirements, location and general arrangement of materials and equipment, and establish the minimum standards of quality of workmanship and appearance.

B. Specification sections have not been divided into groups for work of subcontractors or various trades.

C. A part of the work that is necessary or required to make each installation satisfactory and operable for its intended purpose, even though it is not specifically included in the Specifications or shown on the Drawings, shall be performed as incidental work as if it were described in the Contract Documents.

D. Whenever in the Technical Specifications, requirements are expressed with active verbs and no subjects, the words, "The Contractor shall," have been omitted as a matter of style, and it is intended that the Contractor is the party responsible for taking the action required.

### 1.03 DESCRIPTION OF PROJECT

A. Work under this contract document consists of the following primary tasks:

1. Installation of one (1) fully operational impressed current deep anode groundbed, test stations, new pipeline negative lead, and new electrical power equipment as shown on the Drawings and provided in the specifications.

2. Site and surface restoration for Work activities in all areas including, but not limited to asphalt, sidewalks, lawns, and unimproved areas.

B. Jordan Valley Water Conservancy District shall coordinate and pay all costs to the power company associated with service connection of new electrical power service. Contractor shall be responsible for providing all materials and equipment to route and connect electrical power service between the existing electrical pad mounted sectionalizer to the new power meter pedestal.

C. All electrical work shall be performed in accordance with the project specifications, Drawings, and Rocky Mountain Power requirements. Contractor shall coordinate electrical inspections with power company and local agencies as required to provide a fully functional system, meeting all applicable requirements.

1.04 SPECIFIC WORK REQUIRED

A. CONTRACTOR shall provide labor, equipment, and materials to complete the installations and work as defined in the Contract Documents and shown on the Drawings.

B. CONTRACTOR shall obtain all permits from local, county, and State entities, as required, before beginning work. Submit all permits at least 10 business days in advance of beginning work.

C. CONTRACTOR shall coordinate with the Engineer and Jordan Valley Water Conservancy District personnel before beginning work to identify temporary work easements and permanent easements.

D. Where required, Contractor shall coordinate with local Power Company.

E. Completion of all work shall result in fully functioning equipment and systems.

F. The following specific work is included in the project:

1. Installation of one (1) impressed current deep anode groundbed at Site JA 27S, located near 3800 West 2700 South, West Valley City, UT, GPS Lat. 40.711226°, Long. -111.979783°. on JVWCD's JA3 Pipeline, as shown on the Drawings,
   a. Deep well anode system.
   b. Equipment includes, but is not limited to, anode junction boxes, electrical conduit, and associated wire/cables.
   c. New Negative lead to pipe with pipe test leads and reference cell
   d. New Positive lead to new deep well anode system
   e. Ancillary equipment and materials associated with well drilling and not specifically identified as provided by Jordan Valley Water Conservancy District.
2. Installation of Test Stations as shown on Drawings.
3. Installation of Electrical Power Pedestal to provide electrical service (120-240 VAC / 40 amp) from Rocky Mountain Power electrical sectionalizer located on site to rectifier.

1.05 SCHEDULE OF WORK

A. Work will be performed under the following schedule:

1. Anticipated Notice to Proceed: January 31, 2022
2. Substantial Completion: 120 days from Notice to Proceed
3. Final Completion: 45 days from Substantial Completion.

B. Contractor shall prepare and submit a project schedule along with a list of proposed personnel and equipment which indicate the ability to meet the project schedule.

1.06 ACTUAL DAMAGES

A. Actual damages will be assessed in accordance with the Agreement, General Conditions, and Supplemental Conditions of Owner's Contract Document.

1.08 PROJECT MEETINGS

A. Preconstruction Conference:

1. Prior to the commencement of WORK at the site, a preconstruction conference will be held at a mutually agreed time and place and shall be attended by the CONTRACTOR's Project Manager, CONTRACTOR's superintendent, and Subcontractors as the CONTRACTOR deems appropriate. Other attendees will be:
   a. ENGINEER and the Project Representative.
   b. Representatives of the OWNER.
   c. Government representatives as appropriate.
   d. Others as requested by CONTRACTOR, OWNER, or ENGINEER.

2. 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 complete agenda will be furnished to the CONTRACTOR prior to the meeting date. The CONTRACTOR should be prepared to discuss all of the items listed below.
   a. CONTRACTOR's tentative schedules.
   b. Discussion of CONTRACTOR's submittals provided prior to meeting.
   c. Maintaining record drawings.
   d. Field decisions and change orders.
   e. Use of project site, office and storage areas, security, housekeeping, and OWNER's needs.
   f. Major equipment deliveries and priorities.
   g. CONTRACTOR's assignments for safety and first aid. Progress Meetings

3. The OWNER's REPRESENTATIVE shall schedule weekly on-site progress meetings with the CONTRACTOR and OWNER as requested or as required by progress of the WORK. The CONTRACTOR, ENGINEER, and all Subcontractors active on the site must attend each meeting. CONTRACTOR may at its discretion request attendance by representatives of its Suppliers, manufacturers, and other Subcontractors.

4. The OWNER's REPRESENTATIVE shall conduct the meetings and will arrange for keeping and distributing 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. During each meeting, the CONTRACTOR is required to present any issues which may impact his work, with a view to resolve these issues expeditiously.

**PART 2 PRODUCTS** - (Not Used)

**PART 3 EXECUTION** - (Not Used)

**END OF SECTION**

**SECTION 01 25 00**
**MEASUREMENT AND PAYMENT**

## PART 1 GENERAL

1.01 ADMINISTRATIVE SUBMITTALS

A. Application for Payment: In accordance with the General Conditions and as specified herein.

B. Final Application for Payment: As specified herein.

1.02 APPLICATION FOR PAYMENT

A. Reference applicable paragraphs in General Conditions.

B. Preparation:

1. Round values to nearest dollar.
2. List each Change Order and Written Amendment executed prior to date of submission as separate line item. Totals to equal those shown on the Summary Sheet for each schedule as applicable.
3. Submit Application for Payment, including a Transmittal Summary Form and detailed Application for Payment Form for each schedule as applicable, a listing of materials on hand for each schedule as applicable, and such supporting data as may be requested by ENGINEER.

1.03 MEASUREMENT - GENERAL

A. Weighing, measuring, and metering devices used to measure quantity of materials for Work shall be suitable for purpose intended and conform to tolerances and specifications as specified in National Institute of Standards and Technology, Handbook 44.

B. All materials which are specified for measurement by the cubic yard "measured in the vehicle" shall be hauled in vehicles of such type and size that the actual contents may be readily and accurately determined. Unless all vehicles are of uniform capacity, each vehicle must bear a plainly legible identification mark indicating its water level capacity. All vehicles shall be loaded to at least their water level capacity. Loads hauled in vehicles not meeting the above requirements or loads of a quantity less than the capacity of the vehicle, measured after being leveled off as above provided, will be subject to rejection, and no compensation will be allowed for such material.

C. Unit of measure shown on the Bid Form shall be as follows unless specified otherwise.

| Item | Method of Measurement |
|---|---|
| CY | Cubic Yard-Field Measure by ENGINEER within the limits specified or shown |
| CY-VM | Cubic Yard-Measured in the Vehicle by Volume |
| EA | Each-Field Count by ENGINEER |
| GAL | Gallon-Field Measured by ENGINEER |

| Item | Method of Measurement |
|---|---|
| HR | Hour, Crew |
| HR-MAN | Hour, per Man |
| LB | Pound(s)-Weight Measure by Scale |
| LF | Linear Foot-Field Measure by ENGINEER |
| LS | Lump Sum-Unit is one; no measurement will be made |
| SF | Square Foot |
| SY | Square Yard |
| T | Ton-Weight Measure by Scale (2,000 pounds) |

1.04 PAYMENT

A. General: Progress payments will be made monthly on the date established at the preconstruction meeting.

B. Following description of the Work included in the Payment of Unit Price items is not inclusive. When there is no separate Unit Price item in Bid Form for work necessary to complete a unit of Work shown or specified, such Work shall be furnished and installed. Full compensation for furnishing and installing such Work shall be considered as included in Contract Price and no additional compensation will be allowed therefore.

C. Payment for work performed will be based on bid costs from Bid Schedules A through F.

D. Bid Items:

**1. Bid Schedule**

| No. | Bid Item | Description of Work Included |
|---|---|---|
| 1 | Mobilization | Includes all transportation, fuel, labor, and material costs for mobilization of equipment and materials to the project sites and as required for setup. |
| 2 | Test Stations (Test Leads Already Connected to Pipe) | Includes materials, equipment, and labor required for furnishing and installing test stations and reference cells, utilizing existing test wires connected to the pipe, including all excavation, backfill, and surface restoration, complete |
| 3 | Test Stations | Includes materials, equipment, and labor required for furnishing and installing test stations, test wire connections to buried pipe, reference cells, including all excavation, backfill, and surface restoration, complete |
| 4 | **Cathodic Protection System JA-27S** – Deep Well Anode System, Rectifier, and Associated Equipment | Includes materials, equipment, and labor required for furnishing and installing a fully functional impressed current deep well anode cathodic protection system as shown on the Drawings, including all excavation, backfill, trenching, electrical connections, and surface restoration, complete. |
| 5 | **Cathodic Protection System JA-27S** – Electrical Service | Includes materials, equipment, and labor required for furnishing and installing the components to provide electrical power from the existing sectionalizer to the rectifier unit, electrical connections, and surface restoration, complete. |

| No. | Bid Item | Description of Work Included |
|---|---|---|
| 6 | Demobilization | Includes all transportation, fuel, labor, and material costs for demobilization of equipment and materials to the project sites and as required for setup. |

1.05 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

A. Payment will not be made for following:

1. Loading, hauling, and disposing of rejected material.
2. Quantities of material wasted or disposed of in manner not called for under Contract Documents.
3. Rejected loads of material, including material rejected after it has been placed by reason of failure of CONTRACTOR to conform to provisions of Contract Documents.
4. Material not unloaded from transporting vehicle.
5. Defective Work not accepted by OWNER.
6. Material remaining on hand after completion of Work.

1.06 PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT

A. Partial Payment: Reference the General Conditions. No partial payments will be made for materials and equipment delivered or stored unless Shop Drawings are acceptable to ENGINEER.

B. Final Payment: Will be made only for materials incorporated in Work; remaining materials, for which partial payments have been made, shall revert to CONTRACTOR unless otherwise agreed, and partial payments made for those items will be deducted from final payment.

1.07 FINAL APPLICATION FOR PAYMENT

A. Reference applicable paragraphs in the General Conditions, Section 01 70 00, CONTRACT CLOSEOUT, and as may otherwise be required in Contract Documents.

B. Prior to submitting final application, make acceptable delivery of required documents, including but not limited to:

1. Final Inventory of Materials Utilized at Each Project Site / Structure

2. Contractor's Daily Quality Control and Inspection Reports
   a. Organized by Site / Structure and Date

**PART 2 PRODUCTS (Not Used)**

**PART 3 EXECUTION (Not Used)**

**END OF SECTION**

**SECTION 01 30 00**
**SUBMITTALS**

## PART 1 GENERAL

1.01 GENERAL

A. Reference applicable paragraphs of General Conditions.

B. Inquiries: Direct to ENGINEER regarding procedure, purpose, or extent of Submittal.

C. As provided in General Conditions, as specified herein, unless specified otherwise in Division 2 through Division 16, and as may otherwise be established during the preconstruction conference.

D. OWNER's Authorization: At any time, OWNER may authorize changes to procedures and requirements for Submittals, as necessary to accomplish specific purpose of each Submittal. Such authorization will be by Field Order or Work Change Directive.

E. Timeliness: Schedule and make submissions in accordance with requirements of individual Specification sections and in such sequence as to cause no delay in Work or in work of other contractors.

F. Identification of Submittals:

1. Complete, sign, and transmit with each Submittal package, one Transmittal of Contractor's Submittal Form attached at the end of this section.

2. Identify each Submittal with numbering and tracking system approved by ENGINEER:
   a. Sequentially number each Submittal.
   b. Resubmission of a Submittal will have original number with sequential alphabetic suffix.

3. Submittal Number Format: SSSSS_NN_V.
   a. SSSSS: Representing section number.
   b. NN: Submittal number (01 through 99).
   c. V: Resubmission version with sequential alphabetic suffix.

4. Show date of submission and dates of previous submissions.

5. Show Project title and OWNER's contract identification and contract number.

6. Show names of CONTRACTOR, Subcontractor or Supplier, and manufacturer as appropriate.

G. Identify, as applicable, Contract Document section and paragraph to which Submittal applies.

H. Incomplete Submittal Submissions:

1. At Engineer's sole discretion, ENGINEER will either (i) return the entire Submittal for CONTRACTOR's revision/correction and resubmission, or (ii) retain portions of the Submittal and request submission/resubmission of specified items or as noted thereon.

2. Submittals which do not clearly bear CONTRACTOR's specific written indication of CONTRACTOR review and approval of Submittal or which are transmitted with an unsigned or uncertified submission form or as may otherwise be required under Contract Documents, will be returned to CONTRACTOR without reviewed for resubmission in accordance with Contract Documents.

3. Delays, resequencing, or other impact to Work resulting from CONTRACTOR's submission of unchecked or unreviewed, incomplete, inaccurate or erroneous, or nonconforming Submittals, which will require CONTRACTOR's resubmission of a Submittal for Engineer's review, shall not constitute a basis of claim for adjustment in Contract Price or Contract Times.

I. Nonspecified Submissions: Submissions not required under these Contract Documents and not shown on submissions will not be reviewed and will be returned to CONTRACTOR.

J. Submittals to ENGINEER:

Infinity Corrosion Group, Inc.
Attn: Erik Llewellyn, P.E., Corrosion Engineer
1987 Kidd Circle
Park City, UT 84098
ellewellyn@infinitycorrosion.com

K. Disposition of Submittals, Except Shop Drawings and Samples: ENGINEER will review, stamp, and indicate requirements for resubmission or acceptance on Submittal as follows:

1. No Exceptions Taken:
   a. Reference General Conditions for intent regarding schedules. Acceptance of other Submittals will indicate that Submittal conforms to intent of Contract Documents as to form and substance.
   b. CONTRACTOR may proceed to perform Submittal related Work.
   c. One copy furnished OWNER.
   d. Two copies for Engineer's file.
   e. Two copies returned to CONTRACTOR, one for onsite records.

2. Rejected as Noted (Revise/Correct or Develop Replacement and Resubmit):
   a. Revise/correct in accordance with Engineer's comments and resubmit.
   b. One copy to Engineer's file.
   c. One copy returned to CONTRACTOR appropriately annotated.
   d. Remaining copy will be destroyed.

L. Engineer's Review: ENGINEER will act upon CONTRACTOR's Submittal and transmit response to CONTRACTOR not later than 10 days after receipt, unless: (i) specified otherwise or (ii) accepted by ENGINEER as set forth in Paragraph Engineer's Duties below and identified on current

accepted submissions. Resubmittals will be subject to the same review time.

M. Engineer's Duties:

1. Review Submittals with reasonable promptness and in accordance with current accepted submissions.
   a. No adjustment of Contract Times or Price will be allowed due to Engineer's review of Submittals, unless all of following criteria are met:
      (1) CONTRACTOR has notified ENGINEER in writing that timely review of Submittal in question is critical to progress of Work, and has received Engineer's written acceptance to reflect such on current accepted submissions and progress schedule. Written agreement by the ENGINEER to reduce the above Submittal review time will be made only for unusual and CONTRACTOR-justified reasons. Acceptance of a progress schedule containing Submittal review times less than specified above or less than agreed to in writing by ENGINEER will not constitute Engineer's acceptance of the review times.
      (2) ENGINEER has failed to review and return first submission of a Submittal within agreed time indicated on current accepted schedule of submissions or, if no time is indicated thereon, within 30 days.
      (3) CONTRACTOR demonstrates that delay in progress of Work is directly attributable to Engineer's failure to return Submittal within time indicated and accepted by ENGINEER.
   b. No adjustment of Contract Times or Price will be allowed due to delays in progress of Work caused by rejection and subsequent resubmission of Submittals, including multiple resubmissions.
2. Review, return for correction, reject, or accept or approve Submittals submissions only as set forth in applicable paragraphs of General Conditions.
3. Stamp and indicate requirements for resubmission and acceptance or approval of Submittal submission.
4. Return Submittals to CONTRACTOR for distribution or revision and resubmission.
5. Transmit to CONTRACTOR without review Submittal submissions received directly from Subcontractors, Suppliers, manufacturers, and nonrequired submissions from CONTRACTOR.

1.02 ADMINISTRATIVE SUBMITTALS

A. Description: Submittals required by Contract Documents that are not Shop Drawings or Samples, or that do not reflect quality of product or method of construction. Administrative Submittals may include, but will not be limited to those Submittals identified below.

B. Copies: Submit 1 digital copy as PDF.

C. Applications for Payment (and Cash Allowance Data and Values): Meet requirements of Section 01 25 00, MEASUREMENT AND PAYMENT.

D. Schedules :

1. General: Meet the requirements of applicable paragraphs of the General Conditions.

2. Submissions:
    a. Prepare and submit, preliminary list of submissions grouped by Contract Document article/paragraph number or Specification section number, with identification, numbering and tracking system as specified under Paragraph Identification of Submittals and as approved by ENGINEER.
    b. Include only the following required submissions:
        (1) Shop Drawings and Samples.
        (2) Training plans.
        (3) Test procedures.
        (4) Record documents.
        (5) Specifically required certificates, warranties, and service agreements.

1.03 SHOP DRAWINGS

A. Copies: Submit 1 digital copy as PDF.

B. Submit Shop Drawings to ENGINEER in accordance with the General Conditions and as specifically required by individual Specification sections for equipment and materials to be furnished under these Contract Documents.

C. Identify and Indicate:

1. Pertinent Drawing sheet(s) and detail number(s), products, units and assemblies, and system or equipment identification or tag numbers.
2. Critical field dimensions and relationships to other critical features of Work.

D. Resubmissions: Clearly identify each correction or change made.

E. Preparation:

1. Present in a clear and thorough manner and of sufficient detail to show kind, size, arrangement, and function of components, materials, and devices and compliance with Contract Documents. Identify details by reference to sheet and detail, and schedule or room numbers shown on Drawings.
2. Product Data: Clearly mark each copy to identify pertinent products or models and show performance characteristics and capacities, dimensions and clearances required, wiring or piping diagrams and controls, and external connections, anchorages, and supports required.

F. Design Data:

1. Provide an appropriately licensed professional engineer to perform design, oversee preparation of Shop Drawings, manufacturing, and installation, as appropriate, and to stamp and certify Shop Drawings conform to design requirements and requirements of Laws and Regulations and governing agencies.
2. When specified, provide Project-specific information as required and as necessary to clearly show calculations, dimensions, logic and assumptions, and referenced standards and codes upon which design is based.

G. Disposition: ENGINEER will review, mark, and stamp Shop Drawings as appropriate and distribute marked-up copies as noted.

1. No Exceptions Taken (for incorporation in Work):
   a. One copy furnished OWNER.
   b. Two copies retained in Engineer's file.
   c. Remaining copies will be returned to CONTRACTOR appropriately annotated.
      (1) One copy to be kept on file as record document at CONTRACTOR's office at site.
      (2) Remaining copies for CONTRACTOR's office file, Subcontractors, or Suppliers.
   d. CONTRACTOR may begin to implement (i) activities to incorporate specific product(s) or (ii) Work covered by Shop Drawing as shown on approved Shop Drawing.
2. Make corrections Noted (for incorporation in Work):
   a. One copy furnished OWNER.
   b. Two copies retained in Engineer's file.
   c. Remaining copies will be returned to CONTRACTOR appropriately annotated.
      (1) One copy to be kept on file as a record document at CONTRACTOR's office at the site.
      (2) Remaining copies for CONTRACTOR's office file, Subcontractors, or Suppliers.
   d. CONTRACTOR may begin to implement (i) activities to incorporate product(s) or (ii) Work covered by Shop Drawing and in accordance with Engineer's notations on Shop Drawing.
   e. Revise copies of Submittal data in operation and maintenance manuals according to exceptions as noted.
3. Revise/Correct and Resubmit or Develop Replacement and Submit:
   a. One copy retained in Engineer's file.
   b. One copy will be returned to CONTRACTOR appropriately annotated.
   c. Remaining copies, if any, will be destroyed.
   d. CONTRACTOR is responsible to revise, correct, and to resubmit Shop Drawing (in same manner and quantity as specified for original submission).
   e. Shop Drawing is not approved.
4. Rejected/Incomplete:
   a. Complete and Submit or Resubmit Missing Portion(s):
      (1) ENGINEER will retain copies of incomplete Submittal and transmit a written list of deficiencies.
      (2) CONTRACTOR shall submit specified item(s) to correct the incomplete Submittal.
   b. Shop Drawing is not approved.

## 1.04 QUALITY CONTROL SUBMITTALS

A. Certificates:

1. Manufacturer's Certificate of Compliance:
   a. When specified in individual Specification sections or where products are specified to a recognized standard or code, submit prior to shipment of product or material to the site.
   b. ENGINEER may permit use of certain materials or assemblies prior to sampling and testing if accompanied by accepted certification of compliance.
   c. Signed by product manufacturer certifying that materials, manufacture, and product specified conforms to or exceeds specified requirements and intent for which product

will be used. Submit supporting reference data, affidavits, and certifications as appropriate.

d. May reflect recent or previous test results on material or product, but must be acceptable to ENGINEER.

2. Certificates of Successful Testing or Inspection: Submit when testing or inspection is required by Laws and Regulations or governing agency or specified in the individual Specification sections.

B. Field Samples: Provide as required by individual Specifications and as may be required by ENGINEER during progress of Work.

C. Written Test Reports of Each Test and Inspection : As a minimum, include the following:

1. Date of test and date issued, Project title and number, testing laboratory name, address, and telephone number, and name and signature of laboratory inspector.
2. Date and time of sampling or inspection and record of temperature and weather conditions.
3. Identification of product and Specification section, location of Sample, test or inspection in the Project, type of inspection or test with referenced standard or code, certified results of test.
4. Compliance with Contract Documents and identifying corrective action necessary to bring materials and equipment into compliance.
5. Provide an interpretation of test results, when requested by ENGINEER.

1.05 CONTRACT CLOSEOUT SUBMITTALS

A. In accordance with Section 01 70 00, CONTRACT CLOSEOUT.

**PART 2 PRODUCTS - (Not Used)**

**PART 3 EXECUTION - (Not Used)**

**END OF SECTION**

Infinity Corrosion GROUP, INC.

# TRANSMITTAL OF CONTRACTOR'S SUBMITTAL

(ATTACH TO EACH SUBMITTAL)

Date:_____

**TO**:_____

_____

_____

_____

_____

Submittal No.:_____

□ New Submittal □ Resubmittal

Previous Submittal No.:_____

Project:_____

Project No.:_____

Specification Section No.:_____

**(Cover only one section with each transmittal)**

Schedule Date of Submittal:

_____

**FROM**:_____

Contractor

_____

_____

_____

**SUBMITTAL TYPE:** □ Shop Drawing □ Sample □ Informational

The following items are hereby submitted:

| Number of Copies | Description of Item Submitted (Type, Size, Model Number, Etc.) | Spec. and Para. No. | Drawing or Brochure Number | Contains Variation to Contract | |
|---|---|---|---|---|---|
| | | | | No | Yes |
| | | | | | |
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CONTRACTOR hereby certifies that (i) CONTRACTOR has complied with the requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and requirements of laws and regulations and governing agencies.

By:_____

CONTRACTOR (Authorized Signature)

**SECTION 01 40 00**
**COORDINATION AND SITE CONDITIONS**

## PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for coordinating and sequencing the work under the Contract, and requirements regarding existing site conditions.

1.02 JOB SITE COORDINATION

A. The project shall be coordinated with the normal Operation and Maintenance of the water facilities per the Owner's direction.

B. CONTRACTOR shall coordinate and schedule project work to be completed on or before the specified completion date as to not adversely impact operations or cause damage to completed work.

C. CONTRACTOR shall coordinate and schedule project work and implement required project controls to maintain safe and efficient traffic flow during Work.

1.03 SUBMITTALS

A. CONTRACTOR shall submit the following information as applicable to coordinate activities:

1. Work Plan and Schedule for completing all Work,
2. Work Plan for electrical power service to rectifier,
3. Work Plan for installation of deep well anode groundbed,
4. Work Plan for installation of test stations.

1.04 SITE CONDITIONS

A. Information of Site Conditions: Available information regarding site conditions, topography, existing construction of site facilities as applicable, and similar data are not available.

B. CONTRACTOR is encouraged to inspect the project site to acquire such information as needed to complete the work under this Contract.

C. Existing Utilities:

1. CONTRACTOR shall exercise reasonable care to verify locations of utilities and facilities that may be affected by the work.
4. Contractor Responsibilities:
   a. Where CONTRACTOR's operations could cause damage or inconvenience to railway, telephone, television, power, oil, gas, water, sewer, storm drains, or irrigation systems, the CONTRACTOR shall make arrangements necessary for the protection of these utilities and services. Replace existing utilities removed or damaged during construction, unless otherwise provided for in these Contract Documents.

b. CONTRACTOR shall be solely and directly responsible to owner and operator of such properties for damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of injuries or damage which may result from construction operations under this Contract.
c. Neither OWNER nor its officers or agents shall be responsible to CONTRACTOR for damages as a result of CONTRACTOR's failure to protect utilities encountered in the work.

C. Interfering Structures:

1. Take necessary precautions to prevent damage to existing structures whether on the surface, aboveground, or underground.

2. CONTRACTOR may remove and replace in equal or better than original condition, small structures such as fences that interfere with CONTRACTOR's operations only after approval by the OWNER.

D. Salvage of Materials:

1. Materials and equipment removed as part of the Work under this Contract shall become the property of the CONTRACTOR, unless specifically stated otherwise.
2. CONTRACTOR will remove materials and equipment with extreme care so as not to damage adjacent equipment or surfaces.
3. Salvaged material and equipment shall be removed from the project site by the CONTRACTOR in a timely manner and before final completion of the project.

1.05 PROJECT MEETINGS

A. Preconstruction Conference: A preconstruction conference will be held at the site of work or where requested by the OWNER or ENGINEER following award of a construction contract.

B. Progress Meetings: OWNER or ENGINEER will schedule regular progress meetings at least weekly to review work progress, schedules, and other matters needing discussion and resolution.

1.06 SEQUENCE OF WORK

A. Operation and Shutdown of Existing Facilities:

1. Schedule and conduct activities to enable other facilities on the project site to operate continuously, unless otherwise specified.
2. Conduct work outside normal work hours as may be necessary to meet project schedule and avoid undesirable conditions as approved by the OWNER.
3. Provide 7 days advance notice to Project Representative of need to shut down a process or facility. Do not proceed with work affecting a facility's operation without obtaining OWNER's advance approval of the need for, and duration of, such work.

B. Time of Work:

1. Normal working hours are between 7:00 AM and 8:00 PM, six days per week.
2. No work will be done between 8:00 PM or 7:00 AM, without prior approval.
3. Requests to work outside specified periods must be submitted at least 72 hours in advance and are subject to Owner approval.
4. Work may be allowed on Sundays or legal holidays, upon request by Contractor and with the written permission of the OWNER.

**PART 2 PRODUCTS (Not Used)**

**PART 3 EXECUTION**

3.01 CUTTING AND FITTING

A. General:

1. Execute cutting and fitting of work, required to:
   a. Removal of equipment or materials as required under this Contract.

2. CONTRACTOR shall not, without written consent of OWNER:
   a. Cut or alter work of another Contractor.
   b. Cut structural or reinforcing steel.
   c. Endanger existing or new structures or facilities.
   d. Shut down or disrupt existing operations.

3. Materials for replacement of work removed shall comply with applicable sections of these Specifications for corresponding type of work to be done.

4. Provide all tools and equipment required to accomplish cutting and patching.

B. Inspection and Preparation

1. Inspect existing conditions of work, including elements subject to movement or damage during disassembly and reassembly.

2. Provide appropriate safety protection before all Work.

C. Procedures:

1. Restore work, which has been cut or removed; install new products to provide competed work in accordance with specified requirements.

2. Refinish entire surfaces as necessary to provide an even finish.
   a. Refinish continuous surfaces to nearest intersection.
   b. Refinish entire assemblies.

3. Restore structures and surfaces damaged that are to remain in the completed work including piping, conduit, and other utilities.

4. Make restorations with new materials and appropriate methods as specified for new work of similar nature; if not specified, use best recommended practice of manufacturer or appropriate trade association.

5. Restore damaged work so there is a secure and intimate bond or fastening between new and old work. Finish restored surfaces to such planes, shapes, and textures that no transition between new and old work is evident in finished surfaces.

**END OF SECTION**

**SECTION 01 45 00**
**QUALITY CONTROL**

## PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contractor's quality control program procedures in executing the work.

B. Applicable dates of reference standards.

C. Product standardization and installation.

D. Protection of finished work.

E. Cleaning during construction.

1.02 SUBMITTALS

A. Submit the following information associated with the quality control:

B. Statement and description of Contractor's overall quality control (QC) program, which shall include field supervision, inspection hold points, inspection process, inspection documentation, shop drawing coordination and checking, and equipment installation procedures.

C. Name, qualifications, and prior experience of Contractor's designated Quality Control person responsible for the Work for the proposes for OWNER's consideration.

D. Name, qualifications, and prior experience of inspection and testing laboratories that Contractor proposes for OWNER's consideration.

1.03 QUALITY CONTROL (QC) PROGRAM

A. Contractor's QC program shall include the following activities, as a minimum:

1. Field supervision and inspection practices.

2. Quality control over subcontractors, suppliers and other services engaged in the project.

3. Procedures for correcting non-compliant work.

4. Shop drawing coordination and checking procedures, including submittals from product manufacturers and subcontractors.

1.04 REFERENCE STANDARDS

A. Where referenced to an industry standard does not include a date of issue, conform to issue current as of Contract execution date.

B. Where reference to an industry standard includes a date of issue, conform to issue current as of the date specified.

1.05 PRODUCT STANDARDIZATION AND INSTALLATION

A. Like items of products furnished and installed throughout the project shall be end products of one manufacturer to achieve standardization for appearance, operation and maintenance, spare parts and replacement, and manufacturers services.

B. Installation of materials and equipment: In conformance with manufacturer's written instructions.

1.06 PROTECTION OF WORK

A. Included in Section 01 50 00 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.

**PART 2 PRODUCTS - (Not Used)**

**PART 3 EXECUTION**

3.01 QUALITY CONTROL FOR SPECIFIC WORK ACTIVITIES

A. Contractor shall provide quality control as specified in this section and as specified in the sections related to specific work activities.

B. CLEANING DURING CONSTRUCTION

1. Contractor shall keep Owner's property clean at all times and maintain a clean work site. Contractor shall properly dispose of waste materials, debris, and rubbish (i.e., cigarettes, wrappers, drink containers, etc.) in approved containers to assure that buildings, grounds, roads, and public properties are maintained free from accumulations of waste materials on a daily basis and as identified by Owner or Owner's representative. Contractor shall assure that site is free of all uncontained garbage at the end of each workday.

2. Provide appropriate containment of dust, debris, and over spray.

3. Remove grease, dust, stains, labels, fingerprints, and other foreign materials from exposed and partially exposed surfaces.

4. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

5. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

6. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned. Use cleaning material only on surfaces recommended by cleaning manufacturer.

C. COMPLETION INSPECTION

1. Contractor shall conduct an inspection of their work near the end of the work, or any increment of the work established by Owner, Engineer, Completion of Work, or by the specifications. Document a punch list of items which do not conform to the approved drawings and specification. Include within the list of deficiencies the estimated date by which the deficiencies will be corrected.
2. Final Acceptance Inspection shall be scheduled upon Contractor's assurance that all specific items previously identified as being unacceptable, along with all remaining work performed under the Contract, will be complete and acceptable by the date scheduled for the final acceptance inspection.
3. Final Acceptance Inspection shall include the Contractor's Quality Control Inspection personnel, superintendent or other primary management person, Owner, and Engineer. Failure of the Contractor to have all contract work acceptably complete for the Final Acceptance Inspection may be cause for the Owner to bill the Contractor for the additional inspection costs.

D. NOTIFICATION OF NONCOMPLIANCE

1. The Owner / Engineer will notify the Contractor of any detected noncompliance with the foregoing requirements. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, will be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Owner or engineer can issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

**END OF SECTION**

**SECTION 01 50 00**
**CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

## PART 1 GENERAL

### 1.01 SUBMITTALS

A. Meet requirements of Section 01 30 00, SUBMITTALS, as applicable. Provide Submittals required below before starting Work at the site or in accordance with accepted schedule of Submittals submissions.

B. Shop Drawings:

1. Temporary Construction Submittals:
   a. Equipment and Materials Staging area location plan.
   b. Work Schedule for the following:
      (1) Deep Well Anode Groundbed Installation
      (2) Electrical Power Service Connection
      (3) Cathodic Protection Station Site Restoration
      (4) Test Station Installation
   c. Contractor Coordination Plan.
   d. Well Drill Plan.
   e. Waste Collection, Storage, and Disposal Plan.
   f. Electrical Work Plan.

### 1.02 MOBILIZATION

A. Reference applicable paragraphs of the General Conditions.

B. Mobilization shall include, but not be limited to, these principal items:

1. Obtaining required permits.
2. Moving CONTRACTOR's equipment required for first month operations onto site.
3. Installing temporary construction power, wiring, and lighting facilities.
4. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.
5. Arranging for and erection of CONTRACTOR's work and storage yard.
6. Posting OSHA required notices and establishing safety programs and procedures.
7. Having the CONTRACTOR's superintendent at the site full time.
8. Submitting of initially acceptable schedules as required in Section 01 00 00, General Requirements.

### 1.03 CONTRACTOR'S USE OF PREMISES

A. Reference applicable paragraphs of the General Conditions.

B. Should additional lands and access thereto for temporary construction facilities or storage of materials and equipment be required, reference requirements provided in the General Conditions.

1.04 PERMITS

A. Permits, Licenses, or Approvals: Obtain in accordance with the General Conditions and as otherwise may be provided in the Supplementary Conditions and retain onsite.

1.05 PROTECTION OF WORK AND PROPERTY

A. Reference the General Conditions.

B. Comply with OWNER's safety rules while on OWNER's property.

C. Keep OWNER informed of accidents on the site and related claims.

D. Use of Explosives: No blasting or use of explosives will be allowed on the site.

E. During the performance of the Work, CONTRACTOR is responsible for adapting its means, methods, techniques, sequences and procedures of construction to allow OWNER to maintain operation as described in Section 01 00 00, General Requirements, at the existing level of facility production and consistent with applicable permit requirements, and Laws and Regulations. In performing such Work and in cooperating with the OWNER to maintain operations, it may be necessary for the CONTRACTOR to plan, design, and provide various temporary services, utilities, connections, temporary piping and heating, access, and similar items which will be included within the Contract Price.

**PART 2 PRODUCTS - (Not Used)**

**PART 3 EXECUTION**

3.01 TEMPORARY UTILITIES

A. Power: Electric power is not available at the site(s) for use by Contractor. Determine the type and amount available and make arrangements for obtaining temporary electric power service.

B. Lighting: Provide temporary lighting to meet all applicable safety requirements to allow erection, application or installation of materials and equipment, and observation or inspection of the Work.

C. Water: Construction water is not available from the Owner at the project site(s). Contractor to provide a separate drinking water source at Contractor’s own expense.

D. Sanitary and Personnel Facilities: Provide and maintain facilities for CONTRACTOR's employees, Subcontractors, and all other onsite employer's employees. Service, clean, and maintain facilities and enclosures.

E. Telephone Service: Telephone Service is not available from the Owner at the project site(s).

F. Fire Protection: Furnish and maintain on the site adequate firefighting equipment capable of extinguishing incipient fires. Comply with applicable parts of the National Fire Prevention Standard for Safeguarding Building Construction Operations (NFPA No. 241).

3.02 PROTECTION OF WORK AND PROPERTY

A. General:

1. Perform Work within rights-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
2. No residence or business shall be cut off from vehicular traffic for a period exceeding 4 hours unless special arrangements have been made.
3. Maintain in continuous service all existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and all other utilities encountered along the line of work, unless other arrangements satisfactory to owners of said utilities have been made.
4. Where completion of Work requires temporary or permanent removal and/or relocation of an existing utility, coordinate all activities with owner of said utility and perform all work to their satisfaction.
5. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
6. In areas where the CONTRACTOR's operations are adjacent to or near a utility such as gas, telephone, television, electric power, water, or sewer and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection thereof have been made by the CONTRACTOR.
7. Notify property owners and utility offices that may be affected by the construction operation at least 2 days in advance.
8. Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to the CONTRACTOR's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.
9. Do not impair operation of existing sewer systems. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures. Maintain original site drainage wherever possible.

B. Site Security: Not Used.

C. Barricades and Lights:

1. Provide as necessary to prevent unauthorized entry to construction areas and affected roads, streets, and alleyways, inside and outside of fenced area, and as required to ensure public safety and the safety of CONTRACTOR's employees, other employer's employees, and others who may be affected by the Work.
2. Provide to protect existing facilities and adjacent properties from potential damage.
3. Locate to enable access by facility operators and property owners.
4. Protect streets, roads, highways, and other public thoroughfares that are closed to traffic by effective barricades with acceptable warning signs.
5. Locate barricades at the nearest intersecting public thoroughfare on each side of the blocked section.

D. Existing Structures: Where CONTRACTOR considers removal of small structures such as fences, mailboxes, signposts, and culverts that interfere with CONTRACTOR's operations, obtain approval of property owner and ENGINEER. Replace those removed in a condition equal to or better than original.

E. Waterways:

1. Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.

F. Dewatering: Construct, maintain, and operate channels, sumps, pumps, or other temporary diversion and protection works. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally safe removal and disposal of water from the various parts of the Work. Maintain the foundations and parts of the Work free from water.

3.03 TEMPORARY CONTROLS

A. Air Pollution Control:

1. Minimize air pollution from construction operations.
2. Burning of waste materials, rubbish, or other debris will not be permitted on or adjacent to the site.
3. Provide and maintain temporary dust-tight partitions, bulkheads, or other protective devices during construction to permit normal operation of existing facilities. Construct partitions of plywood, insulating board, plastic sheets, or similar material. Construct partitions in such a manner that dust and dirt from demolition and cutting will not enter other parts of existing building or facilities. Remove temporary partitions as soon as the need no longer exists.

B. Noise Control:

1. Provide acoustical barriers so noise emanating from tools or equipment will not exceed legal noise levels.
2. Noise Control Plans: Proposed plan to mitigate construction noise impacts and to comply with noise control ordinances including method of construction, equipment to be used, and acoustical treatments.
3. The project site is located near businesses; unnecessary loud noises such as radios, foul or objectionable language, yelling, etc. will not be permitted. Contractor's employees shall employ only orderly and competent people and upon notice from the OWNER that any of the Contractor's employees are, in the opinion of the OWNER, objectionable or disorderly, such employees shall be dismissed.

C. Water Pollution Control:

1. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or solvents on the project site or in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited.
2. Provide acceptable containers for onsite collection and storage and offsite disposal of waste materials, debris, and rubbish.
3. Waste solvents are the property of the CONTRACTOR and as such, the CONTRACTOR shall be responsible for recycling or proper disposal at an approved facility.

D. Traffic Control:

1. Provide barriers and protective measures necessary to protect the public and Work areas in or adjacent to roadways and prevent unauthorized access to Work areas in or adjacent to roadways.
2. Provide barriers and protective measures necessary to prevent unauthorized access to Work areas in or adjacent to roadways.

E. Construction hoists, elevators, scaffolds, stages, shoring, and similar temporary facilities shall be of ample size and capacity to adequately support and move the loads to which they will be subjected. Railings, enclosures, safety devices, and controls required by law or for adequate protection of life and property shall be provided. All facilities shall meet OSHA requirements and all applicable federal, state, county, and local requirements.

3.04 STORAGE YARDS AND BUILDINGS

A. Temporary Storage Yards: Construct temporary storage yards for storage of products that are not subject to damage by weather conditions.

B. Temporary Storage Buildings:

1. Provide environmental control systems that meet recommendations of manufacturers of equipment and materials stored.
2. Arrange or partition to provide security of contents and ready access for inspection and inventory.
3. Store combustible materials (paints, solvents, fuels, etc.) in a well-ventilated and remote building, meeting safety standards.

3.05 PARKING AREAS

A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, OWNER's operations, or construction operations.

B. Provide parking facilities for personnel working on the Project. No employee or equipment parking will be permitted on OWNER's existing paved areas, except as specifically designated for CONTRACTOR's use.

3.06 VEHICULAR TRAFFIC

A. Comply with Laws and Regulations regarding closing or restricting the use of public streets or highways. No public or private road shall be closed, except by written permission of the proper authority. Assure the least possible obstruction to traffic and normal commercial pursuits.

B. Conduct Work to interfere as little as possible with public travel, whether vehicular or pedestrian.

C. Contractor shall not obstruct, block, or impede the flow of traffic along the fire lane along the north or east sides of the parking garage without prior approval of the OWNER.

3.07 SAFETY

A. Safety Responsibilities:

1. CONTRACTOR shall do whatever is necessary of safety and be solely and completely responsible for conditions of the jobsite, including safety of all persons (including employees) and property during the Contract period. This requirement shall apply continuously and not be limited to normal working hours.
2. ENGINEER's duty to conduct construction review of the CONTRACTOR's performance is not intended to include a review or approval of the adequacy of CONTRACTOR's safety supervisor, safety program, or safety measures taken in, on, or near the construction site.

B. Safety Requirements:

1. Safety provisions shall conform to Federal and State Department of Labor Occupational Safety and Health Act (OSHA), and other applicable federal, state, county, and local laws, ordinances, codes, requirements set forth herein, and regulations that may be specified in other parts of these Contract Documents. Where these are in conflict, the more stringent requirement shall be followed.

3.08 CLEANING DURING CONSTRUCTION

A. General:

1. In accordance with the General Conditions and as may be specified in specific Specification sections, and as required herein.
2. Wet down exterior surfaces prior to sweeping to prevent blowing of dust and debris. Daily, sweep all floors, and pick up all debris and dispose.
3. Provide approved containers for collection and disposal of waste materials, debris, and rubbish. At least at weekly intervals, dispose of such waste materials, debris, and rubbish offsite.
4. Daily, brush sweep the entry drive and roadways, and all other streets and walkways affected by Work and where adjacent to Work.
5. Remove snow and ice from access roads and construction areas as necessary to maintain access by OWNER and ENGINEER and to maintain progress of work.

**END OF SECTION**

**SECTION 01 70 00**
**CONTRACT CLOSEOUT**

## PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedure to be followed in closing out the Contract, including final cleaning, preparation, and submittal of closeout documents, warranties and bonds, and final completion certification.

1.02 CONTRACT CLOSEOUT SUBMITTALS

A. Reference: In accordance with the General Conditions and as may be otherwise required in the Contract Documents.

B. Contractor's daily inspection logs.

C. All hazardous and non-hazardous waste transport and waste disposal manifests, laboratory reports, associated receipts, and all applicable records documenting compliance with applicable State and Federal waste disposal rules and regulations.

D. Approved Shop Drawings and Samples: As required in the General Conditions.

E. Certificates of Testing and Inspection: As required in the General Conditions, these General Requirements sections, and the individual Specification sections.

F. As-built Drawings: Record drawings of the Contractor's representation of as-built conditions, including all revisions made necessary by addenda and change orders shall be maintained up-to-date during the progress of the Work and submitted upon completion of Work.

G. Certificate of Substantial Completion.

H. Certificates or Evidence of Insurance: As required in the General Conditions.

I. Releases or Waivers of Liens and Claims: As required in the General Conditions.

J. Written Releases from Agreements with Others:

1. Before final payment will be authorized, CONTRACTOR shall furnish the OWNER written releases from property owners or public agencies where side agreements or special easements have been made, or where CONTRACTOR's operations have not been kept within the OWNER's construction right-of-way.

2. In the event CONTRACTOR is unable to secure written releases, inform the OWNER of the reasons.
   a. OWNER or its representatives will examine the site, and OWNER will direct CONTRACTOR to complete Work that may be necessary to satisfy terms of the easement.
   b. Should CONTRACTOR refuse to perform this Work, OWNER reserves the right to have it done by separate contract and deduct the cost of same from the Contract Price, or

require the CONTRACTOR to furnish a satisfactory Bond in a sum to cover legal claims for damages.

c. When OWNER is satisfied that Work has been completed in agreement with the Contract Documents and terms of easements, the right is reserved to waive the requirement for written release if: (i) CONTRACTOR's failure to obtain such statement is due to the grantor's refusal to sign, and this refusal is not based upon any legitimate claims that CONTRACTOR has failed to fulfill the terms of the easement, or (ii) CONTRACTOR is unable to contact or has had undue hardship in contacting the grantor.

1.03 FINAL APPLICATION FOR PAYMENT

A. Submit the final Application for Payment in accordance with procedures and requirements stated in the General Conditions, Section 01025, MEASUREMENT AND PAYMENT, and as may otherwise be specified herein.

B. No Contract will be finalized until satisfactory evidence of release of liens has been submitted to OWNER.

1.04 FINAL INSPECTION

A. Reference applicable paragraphs of the General Conditions and Supplementary Conditions.

**PART 2 PRODUCTS - (Not Used)**

**PART 3 EXECUTION**

3.01 FINAL CLEANING

A. Reference applicable paragraphs of the General Conditions. At completion of Work or of a part thereof and immediately prior to CONTRACTOR's request for certificate of Substantial Completion; or if no certificate is issued, immediately prior to CONTRACTOR's notice of completion, clean entire site or parts thereof, as applicable.

1. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to OWNER.

2. Remove grease, dirt, dust, paint or plaster splatter, stains, labels, fingerprints, and other foreign materials from exposed surfaces.

3. Repair, patch, and touch up marred surfaces to match adjacent surfaces.

4. Broom clean exterior paved driveways and parking areas.

5. Hose clean sidewalks, loading areas, and others contiguous with principal structures.

6. Rake clean all other surfaces.

7. Remove snow and ice from access to buildings.

8. Leave water courses, gutters, and ditches open and in condition satisfactory to ENGINEER.

9. Return sites to original or better condition.

B. Should CONTRACTOR not remove rubbish or debris or not clean the facilities and site as specified, the OWNER reserves the right to have the final cleaning done at the sole expense of the CONTRACTOR.

C. Abrasive blast debris classified as hazardous waste shall be packaged in EPA approved containers for disposal by the CONTRACTOR.

D. Non-hazardous debris shall be disposed of by the CONTRACTOR.

E. No hazardous or non-hazardous waste generated from the work site shall be permitted to be transported offsite without notification and approval by Owner.

F. Remove from the OWNER's property temporary structures and materials, equipment, and appurtenances not required as part of or appurtenant to, the completed work. See Section 01 50 00 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.

G. Leave water courses, gutters, catch basins, and ditches open and in a condition satisfactory to ENGINEER.

3.02 TOUCH-UP AND REPAIR

A. Touch up or repair finished surfaces on structures, equipment, fixtures, and installations that have been damaged prior to inspection for final acceptance.

B. Refinish or replace entire surfaces that cannot be touched-up or repaired satisfactorily.

3.03 DEMOBILIZATION

A. Demobilization shall include moving materials and equipment, field trailers, construction materials, debris, and so forth from the Site as well as performing final cleanup.

1. Disturbed areas shall be restored to their original state or better.

2. Permanent improvements damaged during construction operations shall be repaired or replaced at no additional cost to Owner.

3. Remove all equipment, materials, waste, and debris from the site and restore site to original condition upon completion of construction.

4. The work area shall be restored to its original or better condition and shall be inspected and approved by Engineer.

**END OF SECTION**

**SECTION 26 42 00**
**IMPRESSED CURRENT CATHODIC PROTECTION**

## PART 1 GENERAL

1.01 WORK INCLUDED:

A. This Section covers the work necessary to furnish all equipment, labor, and materials to construct a fully operational impressed current, deep well anode groundbed system on the Jordan Aqueduct – Reach 3 at Site JA 27S, located near 3800 West 2700 South, West Valley City, Utah at GPS Lat. 40.711226°, Long. -111.979783° on Jordan Valley Water Conservancy District's JA3 Pipeline, as shown on the Drawings and specified herein, complete.

B. This section covers the work necessary to furnish all equipment, labor, and materials to a new impressed cathodic protection deep well, new anode and pipeline header cables inside rigid PVC conduit, and new associated electrical equipment (rectifier, junction box, disconnect, and remote monitor).

C. Ancillary Work to be completed by the Contractor includes leveling of site as needed for equipment access, removal, and disposal of drill cuttings per state regulations, construction of reinforced concrete equipment pad, general site cleanup, and connecting electrical equipment.

D. This section covers the work necessary to furnish all equipment, labor, and materials to install cathodic protection test stations as shown on the Drawings and specified herein, complete.

E. It is the Contractor's responsibility to determine the best construction method for the site conditions and to meet the project requirements. The Owner shall not be liable for any additional costs the Contractor may incur associated with constructing the anode groundbed specified.

1.02 PROJECT REFERENCES

A. It is the Contractor's responsibility to confirm the information provided and conduct an independent investigation of subsurface soil conditions in the area.

1.03 STANDARDS

A. The following standards are included by reference:
   1. NACE SP-0169
   2. NACE SP-0177

1.04 SUBMITTALS PRIOR TO CONSTRUCTION:

A. Submittals prior to construction shall be made in accordance JVWCD's requirements and as follows:
   1. Project Controls
      a. Project Schedule
      b. Containment Plan

c. Overall System Wiring Diagram: Identify location of connections, label marking, wire size, color, and products.
d. Procedures and equipment to be utilized for electrical logging of deep anode groundbeds.
e. Traffic Control Plan, if applicable

2. Product Data catalog cuts for the following items, if applicable:
a. Anodes and Lead Wires
b. Anode Header Cable
c. Anode Centralizers
d. Coke Breeze
e. Anode Junction Box
f. Rectifier
g. Remote Monitor
h. Stationary Copper-Copper Sulfate Reference Cell
i. Stand Pipe
j. Slotted Vent Pipe
k. Reference Electrode
l. Test Stations

3. Quality Assurance Submittals
a. Corrosion Control Person-In-Charge credentials.
b. Driller's experience statement. Include name of individual(s) who will operate the drilling equipment and a copy of their current driller's license.
c. Description of similar jobs completed by the Contractor in the past five years.
d. A copy of the Driller's logs used for deep anode installations.
e. Operator Qualification verification.

B. Manufacturer information shall be submitted for all cathodic protection system equipment to be used and shall include manufacturer's name, Model No., and rated electrical capacity of equipment, installation instructions, and detailed descriptions of the construction.

1.05 PROJECT CONTROLS:

A. Within 30 days of the receipt of the JVWCD's Notice to Proceed a detailed project schedule must be submitted to the Engineer for approval. Once the schedule has been approved by the Engineer, any additional changes to the schedule must be submitted in writing for approval.

B. All project scope changes must be approved prior to the work being performed. Written requests for changes must be received prior to the performance of any work not previously authorized by the Owner.

1.06 SUBMITTALS FOLLOWING CONSTRUCTION:

A. Submittals following construction shall include the following items:

- Material Submittals
- NACE Cathodic Protection Credentials
- Subcontractor Submittals
- Current Driller's License

- Driller's Start Card/Well Permit
- Copies of any type of permit required during the work period
- Daily work reports including daily safety meeting documentation
- Completed job hazard analysis form
- Job site safety plan
- Well logs, consistent with State requirements must be kept and submitted to the Owner. Information that must be included in the log are date, depth, and thickness of all formations penetrated, tools used, depth to water in water bearing zones, and cause for any delays.
- Documentation of any disposed material
- Photos of the work site
    - Prior to commencement of work
    - During the work phase including drilling/digging and installation of anodes
    - At completion of work and site has been restored to original condition
- Copy of all testing performed by contractor with accompanying photos
- Detailed construction as-built drawing
- Photographs with a detailed diagram of all pertinent information including the location of (example included):
    - Rectifier and power pole
    - Ground bed (deep well or surface)
    - Header cable
    - Junction Boxes
    - Other pipeline(s) or utilities close by (within 100')
    - GPS coordinates

1.07 DEFINITIONS:

A. Ferrous Metal Pipe: Ferrous metal pipe shall be defined as any pipe made of steel or iron alloys and pipe containing steel or iron as a principle structural material, except ASTM C361 reinforced concrete pipe.

B. Foreign-Owned: Any buried pipe or cable not specifically owned or operated by the Owner.

C. Active column: Active column of a deep anode groundbed shall be that portion of the groundbed which discharges current and shall consist of the anodes and coke breeze.

D. Inactive column: Inactive column of a deep anode groundbed shall be that portion of the groundbed which does not discharge current, and shall consist of the Bentonite fill, casing, and grout or concrete seal which is above the active column.

E. Lead, Lead Wire, Joint Bond, Pipe Bond Wire, Cable: Insulated copper conductor; the same as wire.

1.08 QUALITY ASSURANCE

A. Licensed State of Utah Well Driller: Qualifications and Relevant Work Experience on at least three (3) deep well cathodic protection projects in the last five years.

B. Contractor's Superintendent Qualifications and Work Experience: Minimum of five (5) successfully completed deep well cathodic protection systems in the past five years.

C. Corrosion Control Person-In-Charge.
   1. Provide the services of a NACE International Cathodic Protection Technician (CP2), minimum. The Corrosion Control Person-In-Charge must have overseen the installation of a minimum of five (5) cathodic protection systems in the past 5 years. The Corrosion Control Person-In-Charge shall provide field observation, start-up, and testing services during the installation of the deep anode groundbed and installation of cathodic protection system components.
   2. The Corrosion Control Person-In-Charge can be the same person as designated to be the Contractor's Superintendent.
   3. The Corrosion Control Person-In-Charge shall be on site during the installation of the anodes in the groundbed and will be required to:
      a. Oversee installation of the deep anode groundbed.
      b. Verify proper operation of the deep anode groundbed and anode junction box.
      c. Determine compliance with these Specifications.
      d. Provide cathodic protection testing as specified.
      e. Resolve field problems.
      f. Submit a field report documenting the cathodic protection system installation and daily reports.

D. JVWCD or their representative has full authority to stop work for non-conformance with these specifications.

E. Perform work only in the presence of JVWCD or their representative, unless JVWCD or their representative grants prior approval to perform such work in their absence. Approval to perform work in JVWCD's or their representative's absence is limited to the current day unless specifically noted to extend beyond the completion of the workday.

F. Inspection by JVWCD or their representative, or the waiver of inspection of any particular portion of the work, shall not be construed to relieve the Contractor of responsibility to perform the work in accordance with these specifications.

## PART 2 MATERIALS

2.01 GENERAL:

A. The use of a manufacturer's name and model or catalog number is for establishing the standard of quality and general configuration desired only. Products of other manufacturers will be considered at the discretion of JVWCD and their Engineer.

B. Like items of materials provided hereunder shall be the product of one manufacturer to achieve standardization for appearance, maintenance, and replacement.

C. Unless otherwise stated, Contractor to provide all materials and equipment.

2.02 MATERIAL SUPPLIERS:

A. Alternate suppliers will be considered, subject to approval of the Engineer. Address given is that of the general office; contact these offices for information regarding the location of their representative nearest the project site.
   1. MESA Products, Tulsa, OK
   2. Farwest Corrosion Control, Gardena, CA

3. Corrpro, Inc., Medina, OH
4. Or Equal.

2.03 DEEP ANODE CONSTRUCTION MATERIALS

A. IMPRESSED CURRENT ANODE

1. Impressed current anodes for deep well groundbeds shall be Chromium High Silicon Tubular Anodes, and have center tapped anode wire connections.
2. Chromium High Silicon Tubular Anode Specifications
   a. Size 2.66 in x 84 in
   b. Weight: 63 lb.
   c. Surface Area 4.9 $ft^2$
   d. Center Connected
   e. Urethane Cap Seals

3. Lead Wire:
   a. Lead wire connections shall be made with a zinc connection hydraulically pressed into the core of the anode material.
   b. The connection shall withstand a minimum pull-out strength of 300 lbs. with a wire connection resistance under 0.004 ohm.
   c. No. 8 AWG stranded copper with insulation as specified under WIRE, this section. Connection of lead wire to the anode shall be by the manufacturer's standard center tapped connection. The anode connection shall be stronger than the wire.
   d. Each lead wire shall be ordered with a minimum of 50 feet of extra length to enable field positioning of anodes and above ground anode junction box.
   e. Anode Lead Wire Make:
      (1) Single-conductor, No. 8 AWG stranded copper.
      (2) 20-mil thick cross-linked HALAR primary insulation and 65 mil HMWPE outer insulation.
      (3) Acceptable anode wire is Permarad, as manufactured by Raychem Corp., Menlo Park, CA, or equal.
      (4) Furnish with sufficient length to extend splice-free from the anode connection to the anode junction box terminals.
4. Packaging: Lead wire shall be coiled on spools and bound in such a manner as necessary to protect the insulation from damage during shipment. Anodes shall be protected from breakage. Damaged anodes or lead wire will be cause for replacement of the lead wire and anode.
5. Wire Labels: Label the end of each anode lead wire with the anode number and wire length stamped onto the brass tags. Number anodes sequentially from bottom to top.

B. ANODE CENTRALIZERS

1. Metal Assemblies that can be securely attached to the anodes to center them in the drilled hole.
2. No sharp edges or bolts will be permitted on the centralizers.
3. Centralizers shall not block the hole or impair installation of the anode, anode wires, or coke breeze.

C. INACTIVE ZONE WELL SEAL

1. Powdered Natural Sodium Bentonite Grout for bottom load pumping to seal well inactive zone

D. COKE BREEZE:

1. Coke breeze shall be lubricated calcined petroleum of the following composition:

| | |
|---|---|
| Volatile Matter | 0.7 to 1.8 percent |
| Ash | 1.3 percent maximum |
| Sulfur | 1.9 percent maximum |
| Fixed Carbon | 95.0 percent minimum |
| Particle Size | 100 percent less than 16-mesh |
| Density | 74 pounds per cubic foot, minimum |

2. Acceptable coke breeze shall be Loresco SC-3 as manufactured by Cathodic Protection Equipment Company, Hattiesburg, MS.

E. CASING SANITARY SEAL AND FILL MATERIAL

1. General
   a. Sealing materials for wells shall conform to the State of Utah water well regulations.
2. Sanitary Seal (annulus area between the surface casing and soil):
   a. Cement Grout:
      (1) Mix shall be equal parts by weight of sand and cement with not more than 6 gallons of clean water (per 94-pound bag of cement).
      (2) Quick setting cement, retardants to setting, and other additives, including hydrated lime (up to 10 percent of the volume of cement), and bentonite (up to 5 percent) to make the mix more fluid and/or to reduce shrinkage, may be used.
   b. Bentonite Slurry:
      (1) Mixture of bentonite and water in a ratio of not less than 8 pounds of bentonite or expansive clay per gallon of water.
      (2) Slurry shall not be less than 50 percent expansive clay with the grain size of the remainder to be not greater than coarse sand.
      (3) Bentonite shall be commercially produced product specifically designed for well sealing. Acceptable products are Aquaguard, Quick-Grout, Plug-Gel, Shur-Gel, Enviro-Plug, or equivalent material.
   c. Bentonite Chips:
      (1) Bentonite shall be commercially produced product specifically designed for well sealing.
      (2) Size: -3/8” +1/4”
      (3) Bulk Density: 68 lb./$ft^3$
      (4) Moisture Content: 15% ± 2
      (5) Permeability: 1 x 10-9 cm/sec
      (6) Acceptable products are Aquaguard, Quick-Grout, Plug-Gel, Shur-Gel, EnviroPlug, or equivalent material.

F. SURFACE CASING

1. PVC well casing, conforming to ASTM F-480, Schedule 40 or required by State water well drilling regulations.

G. SURFACE CASING COVER

1. Schedule 40 PVC cap for 8" Casing
2. 20" diameter cover ring x 12" ID x 10" deep cast iron hatch

H. STAND PIPE

1. Use a 1-1/4-inch diameter steel standpipe with threaded connections capable of supporting the entire anode string during hole loading.
2. Equip the standpipe with a six-inch diameter, ¼-inch thick steel end plate. Make vertical slots (2-inch x ¼-inch) in a staggered pattern around the circumference on the lower 30 inches to facilitate pumping coke breeze through the standpipe. Alternatively, the Contractor can elect to use a Tee type fitting at the end of the standpipe to distribute the coke breeze slurry.
3. After the loading operation is complete, remove the standpipe located above the coke breeze column from the hole. Use a reverse threaded connection or non-welded joint connection for this purpose.

I. VENT PIPE

1. Active Column Vent
   a. Loresco "Allvent," 1-inch diameter, solvent welded joints, slotted PVC vent pipe as manufactured by Cathodic Protection Equipment Company, Hattiesburg, MS.
   b. Slotted vent pipe shall be installed in the active anode column area and extend 15 feet into the inactive column.
2. Inactive Column Vent
   a. Inactive column vent pipe shall be 1-inch, schedule 40 PVC with solvent welded joints.
3. Surface Vent:
   a. ASTM A53-90b standard hot dipped galvanized steel pipe, 1-inch diameter with 180-degree gooseneck at the top.
   b. Coat threads and any damage to the galvanized coating with one coat of inorganic zinc rich primer.

J. ANODE JUNCTION BOX

1. Terminal Box: NEMA 250-85, Type 4 or 4X, 11-gauge steel with minimum inside dimensions of 24 inches by 18 inches by 6 inches deep or as required to house and terminate the specified number of anodes lead wires. Hinged door to be provided with padlock hasp and one-piece oil-resistant gasket mounted inside the door to form oil tight and dust free seal.
2. Hardware: Secure door with stainless steel latches and hinges. Screw or bolt mounted or secured doors will not be acceptable.
3. Coating for Box: Hot dipped galvanized in accordance with ASTM A153.
4. Terminals and Connectors: Furnish a separate panel board, buss bar, and terminal strip or terminal block connectors, and necessary fasteners for connecting the anode lead

terminals to the rectifier positive lead. Provide separate terminal for each anode lead. Quantity of anodes shall be 12 or as shown on the Drawings.

5. Shunts: Holloway Type RS or Type SW, 0.01 ohm.
6. Equipment Tags: Provide each junction box with original manufacturer's equipment tag that identifies the original equipment manufacturer, model number, serial number, and any applicable electrical ratings. Equipment tags with vendor or distributor name will not be acceptable.
7. Manufacturer: Anode junction box shall be Universal Model ATB or ATB-S as manufactured by Universal Rectifiers Inc., Rosenberg, TX.

K. CATHODIC PROTECTION TEST STATIONS

1. Standard 3" diameter galvanized steel post with Testox series 700 test head and cover, 5 terminals minimum.

L. STATIONARY REFERENCE ELECTRODES

1. Prepackaged Copper-Copper Sulfate Reference Electrodes:
2. Material: High impact ABS, ceramic with Moisture Retention Membrane.
3. Dimensions: 1.5" by 10.5" or 1" by 8".
4. Wire: Minimum 14 AWG stranded copper wire with yellow, 600-volt TW, THWN, or THHN insulation. The wire shall be attached to the electrode and insulated with the manufacturer's standard connection. Connection shall be stronger than the wire.
5. Packaging: Furnish electrode packaged in a plastic or heavy paper bag of sufficient thickness to protect the electrode, backfill, and cloth bag during normal shipping and handling.
6. Manufacturers:
   a. Borin Manufacturing, Stelth 2 Series
   b. MC Miller, IonX Permanent Reference Electrode

M. CONDUIT, LOCKNUTS, AND STRAPS:

1. Exposed Conduit
   a. Rigid conduit shall be galvanized steel.
   b. Fittings, junction boxes, pull boxes, and outlet bodies shall be hot-dipped galvanized iron.
   c. Buried surfaces of metallic conduit shall be coated with two layers of corrosion protection tape.
   d. Locknuts, two-hole straps, and other miscellaneous hardware shall be galvanized steel. Galvanized items shall be hot-dipped galvanized in accordance with ASTM A153.
2. Buried Conduit:
   a. Conduit shall be rigid PVC.
   b. Locknuts, two-hole straps, and other miscellaneous hardware shall be galvanized steel. Galvanized items shall be hot-dipped galvanized in accordance with ASTM A153.
   c. Conduit Bushings shall be threaded plastic or plastic coated galvanized steel fittings.
3. Flexible conduit:
   a. Flexible conduit for ac power from the entrance switch to the rectifier shall be PVC coated, waterproof flexible conduit.

4. Conduit Seal
    a. Foam duct sealant shall be a two-part urethane foam with 98% closed cell content.
    b. The foam duct sealant shall have a compressive strength of 300 pounds (ASTM D1691) and shall have a tensile strength of 250 pounds (ASTM D1623).
    c. The foam duct sealant shall have a flexural strength of 450 pounds (ASTM D790), and shall withstand temperatures from -20° F to 200° F.
    d. The foam duct sealant shall be chemically resistant to gasoline, oils, dilute acids, and bases.
    e. The product shall foam and react in five to ten minutes at 70° F.
    f. When installed, the sealant shall be capable of holding 10 psi water pressure continuously (equivalent of 22 feet water-head pressure)
5. Conduit Seal
    a. Foam duct sealant shall be a two-part urethane foam with 98% closed cell content.
    b. The foam duct sealant shall have a compressive strength of 300 pounds (ASTM D1691) and shall have a tensile strength of 250 pounds (ASTM D1623).
    c. The foam duct sealant shall have a flexural strength of 450 pounds (ASTM D790), and shall withstand temperatures from -20° F to 200° F.
    d. The foam duct sealant shall be chemically resistant to gasoline, oils, dilute acids, and bases.
    e. The product shall foam and react in five to ten minutes at 70° F.
    f. When installed, the sealant shall be capable of holding 10 psi water pressure continuously (equivalent of 22 feet water-head pressure)

N. WIRE:

1. Electrical 120/240 VAC Power Wire:
    a. No. 2 AWG wire from electrical transformer to rectifier disconnect and meter shall be single conductor copper wire with 600-volt with high molecular weight polyethylene (HMWPE) and HALAR insulation.
2. Pipeline Test Lead Wire:
    a. No. 10 AWG wire from pipeline to rectifier remote monitoring equipment shall be stranded copper wire with 600-volt, THHN insulation.
    b. Furnish with sufficient length to extend splice-free from the anode junction box to the rectifier positive terminal.
3. Anode Header Wire (Anode Junction Box to Rectifier):
    a. No. 4 AWG wire from the rectifier to the anode junction box shall be stranded copper wire with 600-volt, high molecular weight polyethylene (HMWPE) insulation.
    b. Furnish with sufficient length to extend splice-free from the anode junction box to the rectifier positive terminal.
4. Pipeline Negative Wire:
    a. No. 4 AWG wire from the rectifier to the pipelines shall be stranded copper wire with 600-volt, high molecular weight polyethylene (HMWPE) insulation.
    b. Furnish with sufficient length to extend splice-free from the pipeline to the rectifier negative terminal.
5. Insulation Color/Identification: Wire insulation color shall indicate the function of each wire and shall be as follows:
    a. Electrical Power cable: Black
    b. Anodes/Header cable: Black
    c. Pipeline test lead cable: White
    d. Reference Cell cable: Yellow

(1) Provide identification of Pipeline on cable inside rectifier unit.

2.04 POWER SERVICE:

A. Electrical Service per local power company, code enforcement, and Rocky Mountain Power's "Requirements for 1-Ø Underground Service, DFE 047 1-Ø" and as outlined herein.
   1. All work and equipment provided shall conform to Power Company's Electric Service Requirements and as shown on Drawings.
   2. Electrical Subpanel:
      a. Heavy-duty, outdoor, NEMA 3R rainproof rated at 240 volts, single phase, 50 amperes, and six single pole circuit capacity, minimum.
      b. Supply with thermal break circuit breakers sized for electrical loads and voltages as follows:
         (1) Rectifier Circuit: Two Pole, 40 ampere or as required.
         (2) Convenience Outlet: Single pole, 20 amperes.

B. Grounding
   1. Ground Rod: Copper-clad steel, 5/8-inch diameter, 8-feet long.

C. Ground Wire and Clamp: No. 6 AWG solid copper wire with a high copper content alloy or bronze bolt-on ground rod clamp.

2.05 PANELBOARDS

A. Branch circuit panelboards shall be NEMA 3R Service Entrance rated circuit breaker type. Circuit breakers shall be as specified under CIRCUIT BREAKERS, this section. Adjacent double-pole breakers shall be opposite potential.

B. The panels shall be provided with door locks and two keys. The panels shall be provided with a typewritten sheet installed on door, identifying the use of each branch circuits. Panels shall be furnished with ground bus when bond wires are required.

2.06 DISCONNECT SWITCHES

A. Disconnect switches shall be visible blade type, non-fusible, heavy-duty class in NEMA 3R enclosures for outdoor installations. Electrical rating of switches shall be 110 percent of the circuit ratings, minimum.

2.07 CIRCUIT BREAKERS

A. Furnish indicating type circuit breakers providing ON/OFF and TRIPPED positions of the operating handle. Furnish bolt-on thermal-magnetic, quick-make, quick-break circuit breakers which are non-interchangeable in accordance with the NEC. Do not use tandem or dual circuit breakers in normal single-pole spaces. Do not use single-pole circuit breakers with handle ties where multipole circuit breakers are indicated. Use multipole circuit breakers designed so that an overload on one-pole automatically causes all poles to open. Provide circuit breakers meeting requirements of UL and NEMA AB 1.

2.08 RECTIFIER:

A. NEMA MR-20-1958 standards. The rectifier shall be designed to operate continuously at full rated output at an ambient temperature of 45 degrees C with an ac input of 115/230 volts, single phase, 60-Hz. The rectifier shall be capable of operation at 110 percent of rated input without damage to the rectifier components.

B. The rectifying elements shall be a full wave bridge, silicon diode stack. The rectifier stack shall be protected from over voltage surge with selenium surge plates and over current with current-limiting devices. Lightning protection devices shall be provided on the ac input and dc output of rectifier. The stack shall provide a minimum continuous D.C. voltage and current output as shown on the Drawings. Output shall be controlled with a minimum of 24 evenly divided transformer tap settings.

C. Supply the rectifier with separate D.C. voltage and current meters and external panel mounted shunt in series with the ammeter. The meters shall be accurate to within 2 percent of the actual voltage and current output and shall be either d'Arsonval jeweled movement or digital electronic meters. Meters shall be tested and calibrated at the factory. Meters will be tested in the field for accuracy. Inaccurate meters shall be replaced by the manufacturer.

D. Transformer, ac circuit breaker, rectifier stacks, constant current control circuit boards, lightning arresters, D.C. output meters, and all wiring connections shall be housed in an 11 -gauge, steel, hot-dipped galvanized cabinet suitable for pole mounting. The cabinet shall be provided with hinge doors on the front and both sides or the front and one side with tip-out rack assembly. Cabinet shall be provided with hasp for padlocking and shall be sealed to protect the interior components from weather, vandalism, and nest building insects.

E. Rectifier shall be manufactured to include remote monitoring equipment connections and internal solid state relay switch for current interruption as specified, this section. Remote monitoring provisions included with rectifier shall include:
   1. Solid state relay switch with current capacity of 120 percent of the rated DC output, minimum, and input switching voltage of 10 to 14 volts DC, 500 mA maximum, or as specified for remote monitoring equipment this section.
   2. Terminal strips with individual terminals for pipe test wire, reference electrodes, and power supply to remote monitoring equipment.
   3. Power terminals shall be 2-ampere, minimum, 12 to 24-volt ac, supply power for remote monitoring unit, as specified this section.
   4. AC power to remote monitoring unit shall be protected with an independent overload circuit breaker.

F. Remote monitoring connection terminals shall be provided by the rectifier manufacturer with enclosed terminal block mounted on the panel board for connection of remote monitoring equipment. Terminal block shall have all rectifier connections completed and terminated with engraved identification or approved equivalent for the following connections:
   1. DC Volts, Positive
   2. DC Volts, Negative
   3. DC Shunt Millivolts, Positive
   4. DC Shunt Millivolts, Negative
   5. Pipe Potential, positive

6. Pipe Potential, negative
7. Relay Switch, Positive, 10 to 14 volts DC
8. Relay Switch, Negative, 10 to 14 volts DC
9. Power Terminal #1, 10 to 25 volts ac
10. AC Detect, positive
11. AC Detect, negative

G. Supply rectifier with integrated 115 VAC convenience outlet.

H. Supply rectifier with an operation and maintenance manual that includes an electrical schematic of the rectifier, parts list with replacement part numbers, and troubleshooting procedures. Provide two complete sets of spare fuses packaged in a sealed, waterproof bag in each rectifier. Other spares parts to be provided shall include:
1. 1 ea. AC. Input lightning arrester
2. 1 ea. DC. Output lightning arrester

I. Rectifier will be labeled with the Manufacturers equipment tag. No vendor or distributor tags will be accepted.

J. Rectifier manufacturer shall be Universal Rectifiers, Inc., Rosenburg, Texas. (www.universalrectifiers.com)

## 2.09 RECTIFIER REMOTE MONITORING EQUIPMENT

A. Provide Watchdog Model Scout, cellular, remote monitoring unit (RMU) manufactured by Elecsys, Olathe, Kansas.

B. Supply one RMU per rectifier and provide all mounting hardware needed for external mounting as required.

C. RMU shall have interruption capabilities compatible with the relay supplied with new rectifier. Contractor shall coordinate RMU supply power and relay electrical requirements with the new rectifier manufacturer.

D. RMU shall provide channels to monitor the following values:
1. Rectifier output voltage, ±200 volts DC range
2. Rectifier output amperage, ±100 millivolts DC range
3. Pipe to Soil Potential 1, ±10 volts DC range
4. Pipe to Soil Potential 2, ±10 volts DC range
5. AC voltage detection
6. Control of interrupter relay switching using GPS time for cycle synchronization.

## 2.10 THERMITE WELD MATERIALS

A. General:
1. Thermite weld materials consist of wire sleeves, welders, and weld cartridges according to the weld manufacturer's recommendations for each wire size and pipe or fitting size and material.
2. Welding materials and equipment shall be the product of a single manufacturer. Interchanging materials of different manufacturers is not acceptable.

B. Molds: Graphite. Ceramic "One Shot" molds not acceptable.

C. Adapter Sleeves:
   1. For No. 12 AWG and No. 2 AWG wires.
   2. Prefabricated factory sleeve joint bonds or bond wires with formed sleeves made in the field are acceptable. Attach field-formed joint bonds sleeves with the appropriate size and type of hammer die furnished by the thermite weld manufacturer.
   3. Extend wire conductor 1/8 inch beyond the end of the adapter sleeve.

D. Cartridges:
   1. Steel: 32 grams, maximum.

2.11 COATING REPAIR MATERIAL FOR PIPE AND FITTINGS

A. General:
   1. Spot repair damage at thermite weld connections on coated steel pipe with fast cure epoxy coating.
   2. Where connections to bare pipe are made, thermite welds shall be coated to protect the weld from corrosion.

B. Epoxy Coating:
   1. 100 percent solids, fast curing epoxy suitable for submerged or buried conditions.
   2. Manufacturers and Products:
      (1) Denso; Protal 7125 (low temperature) or Protal 7300.
      (2) Tapecoat; TC 7010.
      (3) 3M; ScotchKote 323.
      (4) “Or-equal.”

2.12 CONCRETE

A. Mix:
   1. Cement: ASTM C150-89, type II with minimum cement content of 564 pounds per cubic yard.
   2. Coarse Aggregate Size: ¾ inches
   3. Minimum Compressive Strength: 3,000 psi at 28 days with maximum water-cement ratio of 0.45.

B. Air Entrainment:
   1. ASTM C260, nontoxic after 30 days and containing no chlorides.
   2. Not less than 5 percent entrained air at the project site.

2.13 ANCILLARY MATERIALS

A. Test Station Wire Terminations: One-piece, tin-plated crimp-on ring tongue connector:
   1. Manufacturers:
      (1) Burndy Co.
      (2) Thomas and Betts.

B. Shunts: Shunts shall be 0.01-ohm Holloway Type RS.

C. Compression Connectors:

(1) For in-line, tap, and multi-splice, furnish "C" taps made of conductive wrought copper, sized to fit the wires being spliced.
(2) Provide crimp tool and dies as recommended by the manufacturer for the wire and connector size.
(3) Manufacturer and Product:
(a) Burndy; Type YC.
(b) “Or-equal.”

D. Electrical Tape:
1. Linerless rubber high-voltage splicing tape and vinyl electrical tape suitable for moist and wet environments.
2. Manufacturer and Product: 3M Products; Scotch 130C and Scotch 88.

2.14 OTHER MISCELLANEOUS MATERIALS

A. Anode Junction Box Supports
1. Material: A500 Hot Rolled Mild Steel Square Tube
(1) 4” square x 0.25” Wall, A500/A513 Hot Rolled Mild Steel Square Tubes
(2) Cold formed and seamlessly welded hot rolled steel.
2. Coating: Hot-dip galvanized after fabrication in accordance with ASTM A153.

B. Equipment Guard: Bollards
1. Material: Steel, 6-inch diameter Schedule 40 pipe, as shown on drawings.
2. Coating:
(1) Hot-dip galvanized after fabrication in accordance with ASTM A153.
(2) If required by Owner or site location, apply polyurethane or polysiloxane ultraviolet (UV) light resistant coating over galvanized steel. Coating shall be of the color specified by the Owner and applied with one or more coats to achieve a total dry film thickness of 8-12 mils.

**PART 3 WORKMANSHIP**

3.01 GENERAL:

A. The installation of the facilities herein specified and described shall conform to the latest applicable rules as set forth herein and on the Drawings. The workmanship shall be of the highest grade and shall be in strict accordance with material manufacturer's instructions. Equipment or materials damaged in shipment or in the course of installation shall be replaced. The Drawings indicate the extent and general arrangement of the anode beds, rectifiers, generator, wires, conduits, and associated items. If departures from the Drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Engineer for review as soon as practical, but not later than 30 days before installation.

B. The Contractor shall examine all Drawings and coordinate work to avoid conflicts, errors, delays, and unnecessary interference with the construction of the facilities and to avoid duplication of the work such as excavation, filling, etc. In the event of any conflicts in the Specifications, the Engineer shall be consulted.

3.02 STORAGE AND HANDLING:

A. Contractor shall be responsible for all equipment and materials. The Contractor shall inspect the condition of the materials and immediately report items that are identified as defective, or a condition that may affect the performance of the system, to JVWCD or their Representative.

B. Store all anodes off the ground and keep them dry at all times. Protect against weather, condensation, and mechanical damage.

C. Immediately remove from the project site all damaged anodes. Anodes shall not be lifted or held by the lead wire.

D. Anode backfill material that has become wet will not be acceptable.

3.03 DEEP ANODE GROUNDBED INSTALLATION:

A. General:

1. The new anode deep well shall be connected to the positive terminal of the new rectifier. Drilling, electrical logging of hole, lowering of anodes, coke breeze placement, and backfilling shall be done in a continuous operation and shall be observed by the ENGINEER.
2. CONTRACTOR shall be a certified water well driller in current standing in the State of Utah and shall obtain all drilling permits, submit notification of work, and submit drilling logs in accordance with state regulations.
3. Driller will be solely responsible for all aspects of the drilling and well construction until the well completion.
4. Drilling of the groundbed shall be in accordance with the methods and procedures of the best recognized drilling practices and shall comply with the rules and regulations of the State, County, City, or other governing bodies having jurisdiction.
5. Deep anode groundbed holes shall be sealed as specified herein or as required by well drilling regulations. The most stringent requirements shall apply.
6. Take necessary precautions to avoid entrance of foreign matter, movement of soil strata, or collapsing of the hole during the progress of the work. Should movement of soil strata or collapse of the drilled hole interfere with proper completion of the ground bed, recover the wires and anode strings if necessary and ream or re-drill the well.
7. The driller shall maintain a log describing the depth and type of formations encountered during drilling. Copies of the log shall be submitted to the ENGINEER and appropriate authorities.
8. Wells not completed in accordance with the State of Utah well regulations and these specifications will be subject to rejection and replacement at the CONTRACTOR's sole expense.

B. Drilling:

1. Coordinate the actual location of the ground bed in the field with the ENGINEER before drilling begins. Verify and locate all buried utilities prior to beginning drilling operations.
2. Contractor shall collect and store all drilling fluids, water, muds, and spoils in a manner to avoid any releases. The storage vessel will be selected by the Contractor to be

compatible with the drilling method and volume of materials generated by the Contractor's selected drilling method. All water, drilling muds, and spoils must be contained and collected. Release of water, drilling muds, and spoils is not allowed and the Contractor shall bear all costs to contain and store, and for any penalties, cleanup costs, or fines, if released.

3. CONTRACTOR's containment system shall prevent mud from entering storm drains, gutters, streams, or leaving the project site.
4. CONTRACTOR shall be responsible for cleaning all spills and overflows and, if necessary, will clean storm drains and manholes impacted by uncontained drilling fluids.
5. **Excavation of a temporary mud pit on the project site will not be permitted.**
6. CONTRACTOR shall transport and dispose of all drilling fluids and cuttings to an approved disposal location.
7. Spillage or leakage of oil or hydraulic fluids shall be contained and controlled by the Driller. All oil contamination on the drilling site resulting from drilling equipment shall be contained, cleaned up, and properly disposed of off the project site.
8. Construct the well and set casing round, straight, and plumb.
9. Set surface casing prior to completion of the first 100 feet of the well. Casing, other than surface casing, shall not be installed or left in the well unless in the driller's estimation it is necessary for successful completion of the well. Plastic surface casing shall not extend into the active column.
10. If steel casing is installed into the active column, it shall be cut 100 feet below the surface and the top portion jacked up to provide a 25 foot, minimum, separation between the upper casing and the top of the active column. Complete cutting of the steel casing before the anodes are installed. Jacking operations may be completed before or after installation of the anode assembly at the CONTRACTOR's option.
11. Over drill the well to compensate for sloughing or heaving during anode installation.

C. Electrical Logging:

1. Flush the hole and electrically log the hole in the presence of the ENGINEER to determine the soil characteristic along the length of the well.
2. Electrical Logging Method: make a resistance to earth reading as the first anode is lowered into the hole. Test using suitable meters, connections to a low resistance ground, and a method to measure the down hole wire length or provide footage identification markings on the wire.
3. Record resistance readings and depth from the surface continuously or at 5-foot increments for the entire hole depth. Note depth of groundwater at time of electrical logging.

D. Lowering of Anodes:

1. Anode installation to be observed by the ENGINEER
2. Install anodes and coke breeze the same day as the completion of the drilling and electrical logging. If loading is delayed more than 8 hours after drilling is completed or if loading cannot be completed before sunset or end of working hours, whichever comes first, the drill stem and bit should be reinserted and run back to the bottom of the hole with sufficient rotation and circulation to ensure that the drilled hole is prepared for anode installation.
3. If the hole is drilled with mud, the hole shall be flushed out with clean water in a continuous process before or after the anodes are lowered, at the CONTRACTOR's option, until the return fluid is sufficiently clear to allow proper settlement of the coke.

The ENGINEER shall inspect the return fluid before coke breeze pumping will be permitted to begin.

4. Attach anode centralizers to each of the anodes prior to lowering.
5. Prepare to load the groundbed by assembling the various components and attach them to the steel standpipe. Securely attach anodes to the standpipe using steel banding material or appropriately sized steel hose clamps. Care shall be taken to ensure that the anodes are not damaged during this process and that the anodes are secured in such a way that they do not move. Secure the vent pipe and anode lead wires to the standpipe using a minimum of five wraps of vinyl electrical tape. Carefully lower the standpipe, with the anode string attached, into the hole. Securely attach each successive anode and other down-hole materials to the standpipe as it is lowered into the hole. Add additional joints of standpipe to the top of the string to accommodate all

   anodes. Ensure that the weight of the anode string is born by the standpipe and not the vent pipe or anode lead wires.
6. Provide sufficient slack in the anode wires to prevent damage during the anode and coke breeze installation.
7. The bottom of the vent pipe shall be capped and each joint of pipe solvent welded in accordance with the manufacturer's recommendations. CONTRACTOR shall prevent foreign matter from entering the vent pipe during anode installation and grout sealing placement. The CONTRACTOR shall clear any blockage of the vent pipe. Failure to clear the vent pipe will result in rejection of the groundbed. Vent pipe shall be permitted to flow water during coke breeze pumping to flush any mud and cuttings from the vent.
8. Prior to installation, any damage to anodes or cut, gouged, or scraped wire insulation will result in rejection of the anode and lead wire. CONTRACTOR shall implement means to protect the anode lead wires during and following anode installation.
9. Fit the standpipe with a reverse-threaded coupling assembly above the top anode so the sections of standpipe above the top anode can be retrieved from the hole after the complete anode string is lowered into the hole and secured. Other methods of standpipe retrieval from the inactive column shall be preapproved by ENGINEER.

E. Backfilling of Anode Hole:

1. **Top-loading the coke breeze, by pouring coke breeze into the hole will not be permitted.**
2. Keep hole full of water during installation of the coke breeze.
3. Prepare coke breeze slurry with potable water in accordance with the manufacturer's written recommendations.
4. Using the standpipe as a pump pipe, begin pumping coke breeze at a steady, continuous rate. Mix and pump coke breeze and water in a continuous operation until the hole is filled to the correct level. Do not stop pumping until all coke breeze has been pumped into the hole.
5. Throughout coke breeze pumping, displaced water and mud shall be collected and stored for disposal. Discharge of mud and water into the storm drains or public right-of-way, or roadways will not be allowed. CONTRACTOR will be responsible to determine and provide the storage capacity required. Should the water and mud storage capacity be inadequate for the project, work will be terminated until adequate capacity is provided. Loss of materials or collapse of the hole due to termination of the loading operation will be at the CONTRACTOR's sole expense.

6. Care shall be taken during pumping of the coke breeze to avoid coke breeze bridging or collapse of the hole. If the hole collapses or coke breeze bridges, the Contractor shall take necessary steps to resolve the problem at CONTRACTOR sole expense.
7. Restrain anodes from settling during and following coke breeze installation for 12 hours, minimum, for coke breeze settlement and compaction. Maintain anode restraint until all anode settlement stops.
8. After the coke breeze is installed and has settled for 12 hours, the Engineer shall measure the depth to the top of the coke breeze column. If required, additional coke breeze shall be added by pumping or top loading to the specified elevation.
9. When the coke breeze has properly settled and has been placed to the proper depth, fill the inactive column with the bentonite grout sealing material to within 4 feet of ground surface. Use native material to fill the remainder of the hole to grade.
10. At all times during the progress of the work, the Contractor shall protect the groundbed in such a manner as to effectively prevent tampering or entrance of foreign matter.

F. Placement of Casing Seals:

1. Sanitary Casing Seal
   a. Install sanitary seal between casing and soil.
   b. The ENGINEER shall review the method of seal placement. If the sealing will be placed below ground water elevation, no method will be permitted that does not force the sealing material from the bottom of the annular space to the surface.
   c. The seal placement shall be done continuously and in a manner that will ensure the entire filling of the annular space in one operation.
   d. Place casing sanitary seal by tremie pipe if hole is greater than 25 feet deep or groundwater is present within the hole.
   e. No drilling operations will be permitted until the neat cement or grout has cured. Curing time for Portland cement, Type I or II, is a minimum of 72 hours and for type III a minimum of 36 hours. Addition of an accelerator will be permitted subject to written approval from the State Water Engineer.
2. Casing Seal
   a. After the coke breeze settlement is completed, anode settlement is stopped, and all wires have been terminated, the casing shall be filled with the specified sealing material.
   b. Placement of the sealing material will be with tremie pipe only for slurry type seals. Inserting of the tremie pipe shall be performed in a manner that will not damage the wire insulation.
   c. Granular sealing materials may be top loaded but shall be performed at a rate that will not result in bridging of the seal material.

G. Anode Wire Terminations

1. The CONTRACTOR shall cut a smooth hole in the side of the casing for routing wires to the anode junction box. The penetration of the casing shall be watertight.
2. Anode wires shall be installed in conduit from the ground bed to the anode junction box.
3. The completed electrical conduit shall be watertight.
4. Seal both ends of the conduit from the ground bed with urethane foam to prevent
5. ground bed gases from entering the junction box.
6. Anode lead shall be terminated in numerical order in correspondence to anode depth.

7. Anode header cable from anode junction box shall be terminated to the rectifier positive terminal. Install a new two-barrel lug on rectifier positive terminal stud to serve as a connection for new anode header cables.

H. Groundbed and Vent Pipe Termination

1. Connect the surface pipe directly to the plastic vent pipe with a solvent welded by threaded connection adapter.
2. Terminated vent pipe as shown on the Drawings.
3. After all wire terminations and vent pipe connections are completed, complete filling of the inactive column with the specified sealing material.
4. Plumb and support vent pipe during seal placement and while the seal sets or compacts.

I. Cleanup

1. The drilling site shall be kept neat and orderly under all circumstances.
2. All excess equipment and cuttings shall be removed daily when required by the prevailing conditions at the drilling site. The Contractor shall remove all mud, waste products, and tailings from the project site and dispose of at an approved disposal site.
3. The project sites shall be restored to a condition equivalent to their original condition before construction started and to the satisfaction of the ENGINEER. Damage to sidewalks, curbs, roads, and driveways shall be restored to original condition or better.

3.04 RECTIFIER INSTALLATION:

A. The Contractor shall provide the rectifier mounting hardware, conduit run and connection to designated breaker at pump station panel box, AC power wiring from the breaker panel box to the rectifier, and all AC and DC electrical hardware necessary for the rectifier installation and operation.

B. The rectifier installation and location shall be as shown on the Drawings, except when the Drawings and local or State electrical codes are contradictory. In such cases, local or State electrical codes shall prevail. The Contractor shall coordinate, install, and connect an ac power service to the rectifier location.

C. DC leads from the anode and pipe to the rectifier shall be No. 4 AWG wire with the specified insulation. Lead wires in conduit shall be buried a minimum of 36 inches below finished grade. All leads shall be free of splices, except where shown. Insulation on all anode, structure, and rectifier leads shall be free of cut or abraded areas.

D. Provide the Engineer with 10 working days prior notice of the completion of the rectifier and groundbed installation to allow scheduling of the required energizing and testing procedure.

3.05 REMOTE MONITORING UNIT (RMU) INSTALLATION:

A. Provide all conductors and electrical hardware necessary for installation of the remote monitoring unit including stationary reference electrodes, GPS receiver, and lead wires connected to pipelines.

B. Locate GPS antennae in area where a reliable and consistent signal connection can be maintained. Route antennae wire inside rigid galvanized steel conduit when GPS receiver is located away from the rectifier unit.

C. Remote monitoring unit to be installed at rectifier as shown on Drawings.

3.06 AC POWER SERVICE:

A. The CONTRACTOR shall provide all materials, labor and equipment required for installation of the AC service and pay all building inspection fees and permits that may be required for electrical service connection by the utility or others.

B. Electrical power service installation shall be coordinated with the local electric utility by the CONTRACTOR and shall meet local electrical utility requirements and shall meet or exceed local or NEC codes.

C. Cost for service connection and power line extension to the Contractor provided and meter base will be paid by the OWNER.

D. Power service to rectifier shall be installed underground. CONTRACTOR to provide meter base, AC disconnect switch and all wiring and conduit from the disconnect switch to the rectifier circuit breaker.

3.07 TRENCHING AND BACKFILL

A. Complete excavations and trenching regardless of the type, nature, or condition of materials encountered, and as required to accomplish specified construction to lines and grades shown.

B. Take care to avoid damage to existing structures and utilities during excavating and trenching process. CONTRACTOR may modify location, where approved by the ENGINEER, to minimize possible damage to existing structures. Trench shall be of uniform depth and width, level, smooth, and free of sharp objects.

C. Scrape top soil to the side first so upon backfilling the top soil can be returned as the topmost layer of soil.

D. Slope, shore, or brace excavations and trenches in accordance with OSHA regulations as necessary to prevent caving during excavation in unstable material, or to protect adjacent structures, property, workers, and the public.

E. Backfill trench with excavated backfill materials, unless otherwise specified. Compaction requirements shall be as specified for the pipeline or to 90 percent compaction, whichever is more stringent. Backfill within 5 feet of roadways, paved areas, or other traffic areas shall be compacted to 95 percent.

F. Do not use backfill material of frozen or consolidated debris. Leave the trench with the excess backfill material neatly mounded not more than 4 inches above the existing ground level for the entire width of the trench.

## 3.08 TEST STATION AND REFERENCE CELL

A. Location, type, and style of test stations shall be as shown on the Schedules on Drawings. Final field location shall be determined based on actual site conditions and as approved by the Engineer.

B. Attach all test wires attached to the pipe shall be completed by the thermite weld method unless approved otherwise.

C. Where test leads are already connected to the pipe, Contractor is required to install test station and reference electrode and route existing pipe test lead wires into test station to complete test station installation as specified and as shown on the Drawings.

D. The wires from the test stations shall be buried a minimum of 36 inches below finished grade. Provide 12-inch loop in wires at pipe and beneath test station to prevent them from being stressed or broken during backfilling operations.

E. Test wires within paved roadways and with less than 36 inches of ground cover shall be installed in rigid PVC-coated steel conduit, except when located under concrete floor slabs.

F. Make wire connections to test station terminals with crimp-on ring tongue terminals, except where solid wire is specified.

G. Install a stationary reference cell even with and six (6) inches from the top of the pipeline. See manufacturer's instructions regarding installation of the reference cell.

H. Route test station leads and reference cell lead in 2" minimum schedule 40 PVC into a test station where offset is required. Connect leads to terminals within the test station head.

I. Connect additional lead wire and route in conduit from the test station head to the rectifier and remote monitoring cabinet, where shown on the Drawings.

J. See the Drawings for more details.

## 3.09 CONDUITS

A. Secure conduits entering cabinets, junction boxes, or terminal boxes with double locknuts, one on the outside and one on the inside.

B. Install conduit parallel or horizontal, and plumb to slabs. All changes in direction shall be at 90 degrees using either radius bends or outlet boxes. Conduit crossings shall be perpendicular to the other conduit or pipe.

C. Install insulated bushings and insulated throat connectors on the ends of rigid metallic conduit.

D. Use watertight couplings and connections. Install and equip boxes and fittings to prevent water from entering the conduit or box. Seal unused openings.

3.10 EQUIPMENT GUARD INSTALLATION

A. Install hot dipped galvanized steel guard/bollards around equipment as shown on Drawings or as directed by Engineer.

3.11 ANODE JUNCTION BOX INSTALLATION

A. Install anode junction box and install conduit on anode lead cables into junction box, extending below grade, 18-inches, minimum.

B. Connect the rectifier positive lead and anode wires to the junction box terminals with the shunts, bus bars, and appropriate fasteners.

C. Maintain sufficient slack to keep the wire from being unduly stressed, damaged, or broken during backfill.

3.12 CONCRETE:

A. CONTRACTOR shall finish all concrete work to a smooth troweled finish with radius edges.

B. All forms shall be removed from concrete work prior to final acceptance and removed from the project site.

3.13 QUALITY CONTROL TESTING

A. General:

1. Contractor shall correct all construction defects identified during testing.
2. Provide engineer with 7 days advance notice of completion for Engineer acceptance testing.
3. Contractor required testing as defined herein shall be performed by a Corrosion Expert, with qualifications as specified this section, whom is an employee or subcontractor to the Contractor.

B. Functional Testing of Cathodic Protection Stations

1. Contractor shall perform a functional test of each cathodic protection station installed.
2. Functional testing shall demonstrate the following items are functional and ready for Engineer performed energizing and testing:
    a. AC power service from meter base to rectifier circuit breaker is operational and functional.
    b. Rectifier produces dc voltage and current output up to the maximum dc current output rating of the rectifier.
    c. Rectifier controller cards are fully functional and providing control of the rectifier output as specified.
    d. All impressed current anodes are discharging dc current.
    e. Remote monitoring system is installed and correctly wired.
3. Upon completion of functional testing, the rectifier shall be left in a de-energized state for Engineer performed System Tests and Inspection.
4. If electrical service is not installed at the time of the functional test, the contractor shall provide a generator with the wattage and voltage output necessary to power the

system from the meter base utility connection terminals and complete all testing as defined for functional testing.

## 3.14 TESTS AND INSPECTION

A. General

1. Functional testing shall be performed by the Contractor, in the presence of the Engineer to demonstrate that the completed cathodic protection station is operational.
2. After the installation of the cathodic protection system is completed, JVWCD or their representative shall perform tests throughout the protected system to ensure proper installation of the cathodic protection system and conformance with NACE cathodic protection criteria.
3. Verify continuity of new anode header cable between rectifier and anode junction box.

B. Cathodic Protection System Energizing and Testing:

1. Initial Survey: Conduct an initial potential survey at all test stations and measure the baseline (native) pipe-to-soil potential before energizing the rectifier. Record GPS coordinates for each test station associated with this project.
2. Functional Testing:
   a. Perform functional testing in presence of Engineer.
   b. When construction of cathodic protection station(s) is completed, notify Engineer that installation is ready to be turned ON.
   c. Conduct operating test of rectifier, induvial anodes, test stations, remote monitoring unit, and all other associated equipment to demonstrate equipment is installed correctly and operating properly.
3. Rectifier Meters: Field test meters for accuracy; replace inaccurate meters.
4. Energizing and Testing:
   a. General:
      (1) Upon successful completion of functional testing, energize rectifiers at low current output and increase current output as required. Complete additional testing and adjustment to provide cathodic protection at all test points in accordance with NACE SP0169.
      (2) Record baseline potentials at all test stations.
      (3) Interrupt all cathodic protection rectifiers and obtain ON and OFF potentials at all test stations included in this project.
   b. Initial Testing and Adjustment:
      (1) Adjust cathodic protection system to achieve polarized (instant OFF) pipe-to-soil potentials in the range of -850 millivolts to -1150 millivolts with reference to a copper-copper sulfate reference electrode (CSE).
      (2) Conduct stray current interference testing on other nearby pipelines and structures that are not connected to the cathodic protection system. Measure pipe-to-soil potential with current interruption in process. Report any significant interference identified and provide recommendations for mitigation.
      (3) Measure and record individual anode current at anode junction box.
   c. Final Testing, Adjustment, and Report:
      (1) At least 30 days, but not more than 60 days, after completion of initial testing and adjustment, repeat all tests and make final adjustments to the rectifiers.

(2) After approval of test data, provide final test report with all data and narrative describing construction, testing and adjustment.
(3) All test data shall be submitted in electronic file compatible with Microsoft Excel for Office, most recent version. The data shall be organized in tabular form with location descriptions and GPS coordinates.
(4) Witness of Testing and System Adjustment: Engineer may witness any or all testing and adjustment. Provide at least 7 days advance notice of work.

**END OF SECTION**