

Pennington County  
P 0044(149)40 and P 0044(00)40  
PCN 6925 and 04QJ

**A Pre-Bid meeting will be held at the Rapid City Region Office (2300 Eglin Street) from 10:00am to 12:00pm MT on Wednesday, May 28, 2014. All interested parties are strongly encouraged to attend.**



**DEPARTMENT OF TRANSPORTATION**

**NOTICE TO CONTRACTORS,  
PROPOSAL, SPECIAL PROVISIONS,  
CONTRACT AND CONTRACT BOND**

**FOR**

**CITY UTILITIES**

**CITY**

**PROJECT NO. SSW10 1837( )  
(PCN X02U)**

**JACKSON BLVD**

**IN PENNINGTON COUNTY**

## **NOTICE TO ALL BIDDERS**

### **TO REPORT BID RIGGING ACTIVITIES, CALL: 1-800-424-9071**

THE U.S. DEPARTMENT OF TRANSPORTATION (DOT) OPERATES THE ABOVE TOLL-FREE "HOTLINE" MONDAY THROUGH FRIDAY, 8:00 A.M. TO 5:00 P.M., EASTERN TIME. ANYONE WITH KNOWLEDGE OF POSSIBLE BID RIGGING, BIDDER COLLUSION, OR OTHER FRAUDULENT ACTIVITIES SHOULD USE THE "HOTLINE" TO REPORT SUCH ACTIVITIES.

THE "HOTLINE" IS PART OF THE DOT'S CONTINUING EFFORT TO IDENTIFY AND INVESTIGATE HIGHWAY CONSTRUCTION CONTRACT FRAUD AND ABUSE AND IS OPERATED UNDER THE DIRECTION OF THE DOT INSPECTOR GENERAL.

ALL INFORMATION WILL BE TREATED CONFIDENTIALLY AND CALLER ANONYMITY WILL BE RESPECTED.

\* \* \* \*

### **PLANS, PROPOSALS AND ADDENDA**

AFTER AWARD OF CONTRACT, THE LOW BIDDER WILL RECEIVE TEN (10) COMPLIMENTARY SETS OF PLANS, PROPOSALS, AND ADDENDA FOR FIELD AND OFFICE USE. AN ELECTRONIC COPY WILL ALSO BE PROVIDED. ANY ADDITIONAL COPIES REQUIRED WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.

\* \* \* \*

## NOTICE TO CONTRACTORS

Electronic Bids for this project will be received by the South Dakota Department of Transportation (SDDOT) via the SDDOT secure bid submission site at <http://apps.sd.gov/hc65bidletting/bidsubmittallogin.aspx> until 10 A.M. Central time, on June 11, 2014, at which time the SDDOT will open bids. All bids will be checked for qualifications with results posted on the SDDOT website. The South Dakota Transportation Commission will consider all bids at a scheduled Commission meeting.

The work for which proposals are hereby requested is to be completed: **ON OR BEFORE NOVEMBER 4, 2016.**

The DBE goal for this project is: **None.**

Work Type for this project is: **Work Type 3.**

All proposals shall be prepared and submitted accordance with the Special Provision of Electronic Bidding Requirements. Any proposal otherwise submitted will be deemed informal, irregular and not subject to or worthy of consideration in the award of the contract.

Plans, specifications for the work may be obtained at:  
<http://apps.sd.gov/hc65bidletting/ebslettings1.aspx>

An electronic version of the most recent version of the South Dakota Standard Specifications for Roads and Bridges may be obtained at  
<http://www.sddot.com/business/contractors/specs/Default.aspx>

The electronic bid proposal must be submitted by a valid bidder as designated on the [Bidding Authorization Form](#). The Bidder ID and Password, coupled with a previously Department assigned Company ID, will serve as authentication that an individual is a valid bidder and will assure the secure electronic delivery of bid proposals to the Department. This authorization shall remain in full force and effect until written notice of termination of this authorization is sent by an Officer of the company and received by the Department.

No proposal will be considered unless a guaranty in amount of five percent of the total amount of the bid is secured by the Contractor and received by the Department with the bid or prior to opening of the bids. Satisfactory proposal guaranties include certified checks, cashier's checks, bank drafts issued upon a National or State Bank, or a bid bond issued in accordance with the laws of South Dakota. If electronic bid bonds are used, the Contractor is required to submit the bid bond identification number with the Contractor's bid. Unless otherwise specified in the proposal book, the proposal guaranty shall be made payable at sight to the Department of Transportation, State of South Dakota.

The South Dakota Transportation Commission reserves the right to reject any or all Proposals.



## PROPOSAL

Revised 8/10/11

SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION, STATE OF SOUTH DAKOTA:

Ladies / Gentlemen:

The following proposal is made on behalf of the undersigned and no others. It is in all respects fair and is made without collusion on the part of any other person, firm or corporation not appearing in the signature to this proposal.

The undersigned certifies that she / he has carefully examined the plans listed herein, the Specifications hereinbefore referred to, the Special Provisions and the form of contract, both of which are attached hereto. The undersigned further certifies that she / he has personally inspected the actual location of the work, together with the local sources of supply and that she / he understands the conditions under which the work is to be performed, or, that if she / he has not so inspected the actual location of the work, that she / he waives all right to plea any misunderstanding regarding the location of the work or the conditions peculiar to the same.

On the basis of the plans, Specifications, Special Provisions and form of contract proposed for use, the undersigned proposes to furnish all necessary machinery, tools, apparatus and other means of construction, to do all the work and furnish all the materials in the manner specified, to finish the entire project **ON OR BEFORE NOVEMBER 4, 2016** and to accept as full compensation therefore the amount of the summation of the products of the actual quantities, as finally determined, multiplied by the unit prices bid.

The undersigned understands that the quantities as shown in the Bid Schedule are subject to increase or decrease, and hereby proposes to perform all quantities of work, as increased or decreased, in accordance with the provisions of the specifications, and subject to any applicable special provisions, and at the unit prices bid.

The undersigned understands that the "Total or Gross Amount Bid" as immediately hereinbefore set forth is not the final amount which will be paid if this proposal is accepted and the work done, but that such amount is computed for the purpose of comparison of the bids submitted and the determination of the amount of the contract bond.

The undersigned further proposes to perform all extra work that may be required on the basis provided in the specifications, and to give such work personal attention in order to see that it is economically performed.

The undersigned further proposes to both execute the contract agreement and to furnish a satisfactory contract bond, in accordance with the terms of the specifications, within twenty (20) days after the receipt of notice from the South Dakota Department of Transportation that this proposal has been accepted.



REV. 5/15/14

SPECIAL PROVISIONS

PROJECT NUMBER(S): SSW10 1837( ) PCN: X02U

TYPE OF WORK: CITY UTILITIES

COUNTY: PENNINGTON

The following clauses have been prepared subsequent to the Standard Specifications for Roads and Bridges and refer only to the above described improvement, for which the following Proposal is made. In case of any discrepancy or conflict between said specifications and these Special Provisions, the latter are to govern.

The Contractor's attention is directed to the need for securing from the Department of Environment & Natural Resources, Foss Building, Pierre, South Dakota, permission to remove water from public sources (lakes, rivers, streams, etc.). The Contractor should make his request as early as possible after receiving his contract, and insofar as possible at least 30 days prior to the date that the water is to be used.

Penny Kutz is the official in charge of the Rapid City Career Center for Pennington County.

**THE FOLLOWING ITEMS ARE INCLUDED IN THIS PROPOSAL FORM:**

**Instruction for Bidders, dated 5/15/14**

**Special Provision Regarding Combination Bids, dated 5/13/14**

**Special Provision Regarding the City Portion for Subletting, dated 5/13/14**

**Special Provision Regarding Right of Entry, dated 5/13/14**

**Special Provision for Contract Time, dated 5/7/2014**

**Section 7S Supplemental Conditions**

**Section 02070 Wastewater Flow Diversion Plan**

**Section 02072 Wastewater Discharge Emergency Response Plan**

**Section 13901 Water Main Corrosion Protection**

**Section 195 Specification for Landscape Planting**

Special Provision for Electronic Bidding Requirements, dated 12/18/13.

Special Provision for Differing Site Conditions, dated 12/19/13.

Special Provision for Suspension of Work, dated 2/13/04

Standard Title VI Assurance, dated 1/15/04.

Special Provision For Implementation of Clean Air Act & Federal Water Pollution Control Act, dated 9/1/97.

Supplemental Specification for Errata, dated 3/3/10.

Supplemental Specification to Standard Specifications for Roads and Bridges, dated 3/3/10.

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**SSW10 1837( ), PCN X02U  
CITY UTILITIES**

**INSTRUCTIONS FOR BIDDERS**

May 15, 2014

- 1) This City Utilities Project will be let and awarded by the South Dakota Department of Transportation.
- 2) Department of Transportation procedures regarding letting and awarding of contracts shall be followed.
- 3) Bidders submitting a bid on this project shall also submit a bid on Project P 0044(149)40 & P 0044(00)40 PCN 6925 & 04QJ, Pennington County. Award of these projects will be to the same bidder based on the total of the two projects.
- 4) A prospective bidder must request any explanation regarding the meaning or interpretation of the bidding package in adequate time to allow a Department reply to reach all prospective bidders before submission of final bid proposals. The bidder will contact the Department by submitting a request for explanation to the project Q&A forum.
- 5) All bid bonds shall be made out to the Department of Transportation
- 6) The contract completion date for this project will be the same as specified of Project P 0044(149)40 & P 0044(00)40 PCN 6925 & 04QJ, Pennington County. Any delays in completing this contract will not be a basis for an extension of the contract completion time for PCN 6925 & 04QJ, Pennington County.
- 7) After award of contract, the Contractor shall furnish satisfactory proof of coverage of insurance required. Copies of Certificates of Insurance shall be furnished to the Department of Transportation AND City of Rapid City.
- 8) The contractor is required to schedule and conduct a preconstruction meeting that shall be held jointly with the preconstruction meeting for the state contract. Additionally the contractor is responsible for contacting the city for a list of required submittals upon receiving Notice of Award of the contract.
- 9) Construction engineering for this contract will be performed by the City of Rapid City.
- 10) Payment for this Utilities project will be made to the Contractor by the City of Rapid City.
- 11) The Contractor to whom the work is awarded will be required to give a Surety Bond to the City, executed by a reliable and accredited Surety authorized to do business in the State of South Dakota, acceptable to the Council, signed by and "Attorney in Fact" of residence in South Dakota, and in an amount equal to the total of the utilities contract as a guarantee of the full performance and completion of the contract and payment of all labor and all material bills.

A Warranty Bond, or other equivalent surety, in an amount equivalent to ten percent (10) of the total cost of the utilities project shall be provided to the City to secure the warranty for a period of two years prior to final payment.

- 12) Utility specifications to be followed under this contract are the City of Rapid City Standard Specifications for Public Works Construction (2007 Edition), as currently revised, and any

Special Provisions, Special Conditions, and/or Detailed Specifications pertaining to this contract.

13) Method of payment under this contract will be as checked below:

- (1) Partial Payments Project **XXXXX**
- ~~(2) Single Payment Project~~

14) Consideration of partial or full payments of materials on site within this contract will be as indicated and checked below:

- (1) Yes - Payments will be considered **XXXXX**
- ~~(2) No - Payments will not be considered~~

- a. No payment on stockpiled materials as specified herein shall be made on fuel, hardware(bolts, plates, etc.), supplies, form lumber, false work, perishable materials, or on temporary structures of any kind which will not become an integral part of the finished construction nor on items when unit bid prices are obviously unbalanced as compared to the Engineer's estimated unit prices prepared prior to the letting.
- b. No payment shall be made on stockpiled material until it has been tested and approved for use. All material for which an allowance is requested shall be stored in an approved manner in areas where damage from floodwaters is not likely to occur. If, at any time, stored materials are lost or become damaged by floods or in any other manner, the Contractor will be responsible for repair and replacement of such damaged materials. If payment has been made prior to such damage, the amount so allowed, or a proportionate part thereof, shall be deducted from the next partial payment and withheld until satisfactory repairs or replacements have been made.
- c. Progress payments for stockpiled materials will be made on the basis of the quantities determined by actual measurement as placed in storage in accordance with the stipulations in these specifications and percentages of Contract unit prices listed.

15) In compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the rehabilitation act of 1973, the age discrimination act of 1975, the Americans with disabilities act of 1990, and other nondiscrimination authorities it is the policy of

City of Rapid City  
300 Sixth Street  
Rapid City, SD 57701-5035

to provide benefits, services, and employment to all persons without regard to race, color, national origin, sex, disabilities/handicaps, age, or income status. No distinction is made among any persons in eligibility for the reception of benefits and services provided by or through the auspices of the City of Rapid City.

If you have any concerns regarding the provisions of services or employment on the basis of disability/handicap you may contact our ADA/Section 504 coordinator at telephone no. (605)394-4110.

16) The Contractor shall obtain all applicable permits associated with the project. Building Permit Fees, Drainage Basin Fees, and Inspection and Permit Fees (as covered under Section 13.04.100 for excavations, driveways and patching etc.) shall be borne by the owner. All other fees, taxes and costs shall be borne by the Contractor.

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**STATE OF SOUTH DAKOTA  
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION REGARDING  
COMBINATION BIDS**

**SSW10 1837( ), PCN X02U  
CITY UTILITIES  
PENNINGTON COUNTY**

**MAY 13, 2014**

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Bidders submitting a bid on this project **MUST ALSO** submit a bid on project:

P 0044(149)40, P 0044(00)40, PCN 6925, 04QJ  
SD 44 (JACKSON BLVD.)  
GRADING, STORM SEWER, CURB & GUTTER,  
PCC PAVING, LIGHTING AND SIGNALS  
PENNINGTON COUNTY

Award of both projects will be to the same bidder based on the total of the two projects.

Work on PCN (6925 & 04QJ) CANNOT be used to meet the DBE Goal established for this project.

After award, the contracts will be administered as entirely separate contracts.

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**STATE OF SOUTH DAKOTA  
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION REGARDING  
THE CITY PORTION FOR SUBLETTING**

**SSW10 1837( ), PCN X02U  
PENNINGTON COUNTY**

**MAY 13, 2014**

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This project is being let in combination with State Project Number P 0044(149)40, P 0044(00)40 PCN's 6925 & 04QJ. The provisions of section 8.1 of the Standard Specifications for Roads & Bridges, 2004 ed., requiring Contractor to perform work amounting to not less than 50% of the total contract cost with his own organization does not apply to the work to be performed on this contract.

\* \* \* \*



**STATE OF SOUTH DAKOTA  
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION  
REGARDING  
RIGHT OF ENTRY**

**SSW10 1837( ), PCN X02U  
PENNINGTON COUNTY**

**MAY 13, 2014**

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All right of way and/or right of entry for this project has been secured or will be secured prior to the day of the letting, and all improvements/personal property to be removed under right of way negotiations have been moved or will be moved prior to the day of the letting, **except for those listed below**, unless an extension of time is granted in writing by the Right of Way Program Manager, or his authorized representative. Any extension of time after the letting will be in writing by the Region Engineer, or his authorized representative, subject to concurrence of the construction contractor.

The successful contractor shall arrange his work so as not to interfere with the improvements / personal property listed below until the date(s) stipulated:

**PARCEL**  
RC21

**OWNER**  
Charles McLain

**ANTICIPATED  
POSSESSION DATE**  
6/4/14

\* \* \* \*



**SPECIAL PROVISIONS**

**FOR**

**CONTRACT TIME**

**JACKSON BOULEVARD UTILITIES**

**CHAPEL LANE TO RAPID CREEK**

**PROJECT NO. SSW10-1837 / CIP NO. 50177 / PCN X02U**

**May 7, 2014**

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The overall sequencing, and completion dates, for this project shall be in conjunction with the DOT combination project P 0044(149)40; PCN 6925.

**City Utility and Grading Work Within the DOT Phase Limits**

Applicable City work shall be completed within the phase limits and durations as established by the combination project.

No time extensions will be given on work for the City project without also being considered for the DOT combination project, unless it applies to work that is outside of the limits of the combined work.

All time requests, incentive and dis-incentive payments, and definition of working days and liquidated damages for work affected by and within the limits of the combination project will follow DOT procedures as outlined in Special Provisions for Contract Time detailed in the combination project.

**City Utility and Grading Work Outside of the DOT Phase Limits**

Interim completion dates and notes specific to City work outside of the combination project are detailed below.

**Meadowbrook Golf Course**

In addition to the overall completion date, there is an interim completion date requirement of November 15, 2014 for the completion of the Meadowbrook Golf Course storm sewer, grading, and landscape improvements as shown on Sheets B25-B26 and H9-H11. This work may not proceed until September 1, 2014. Phase 1B of the combination project shall be completed in conjunction with this work. If the Contractor does not complete the above work by the interim completion date, the City will assess liquidated damages in the amount of \$450/day and in accordance with Section 7 of the City of Rapid City Standard Specifications.

### Cottonwood / Jackson Park

In addition to the overall completion date, there is an interim completion date requirement of November 14, 2015 for the completion of the Cottonwood / Jackson Park storm sewer, sanitary sewer, water, grading, and landscape improvements as shown on Sheets B27-B32, H12-H13, and G78-G83. This work may not proceed until March 2, 2015. If the Contractor does not complete the above work by the interim completion date or within the 6-month 4(f)/6(f) requirements detailed below, the City will assess liquidated damages in the amount of \$650/day and in accordance with Section 7 of the City of Rapid City Standard Specifications.

The storm sewer grading work detailed in the above paragraphs for Meadowbrook Golf Course and Cottonwood / Jackson Park lies on land that was purchased using federal funds. These areas are typically referred to as 4(f) and 6(f) property. Impacts to public recreation areas must be minimized to the greatest extent possible. In accordance with agreements with the National Park Service and Federal Highway Administration, work which is outside of the public highway right-of-way as listed above **shall be completely restored to the original public use** within 6 months of initial disturbance. This work can progress concurrently with other work. Quantities of sod have been provided in Section H to accommodate this requirement. Channel bottom that requires special seed mixes as shown in Section H will be exempt from having established vegetation within the 6 month time frame, but shall have been seeded within the time frame. The 6 month time frame will begin in an area when that area is removed from public use.

### Park Drive Bike Path Relocation

The City grading and landscape work as shown on Sheets B22-B24 and H8 shall be completed in conjunction with DOT Phase 2B at the Park Drive intersection. The duration and time restrictions which apply to the DOT Phase shall also apply to the City work in this location. If the Contractor does not complete the above work within the working day count established by the combination project, the City will assess liquidated damages in the amount of \$250/day and in accordance with Section 7 of the City of Rapid City Standard Specifications.

### General

Any time requests, definition of working days, and liquidated damages for work outside of the limits of the combination work will follow City procedures as outlined in Section 7 of the City of Rapid City Standard Specifications.

There are no incentive allowances included for this contract.

**SECTION 7S**  
**SUPPLEMENTAL CONDITIONS**

These Supplemental Conditions amend or supplement appropriate provisions of the Contract Documents as indicated in the following paragraphs. All provisions in the Contract Documents which are not so amended or supplemented remain in full force and effect.

**ARTICLE 1 - DEFINITIONS**

- 1.1 The following terms have the meanings indicated below, which are applicable to both singular and plural thereof:
- A. "FMG" FMG Engineering, Inc. at 3700 Sturgis Rd., Rapid City SD 57702.
  - B. "Resident Project Representative" - the authorized representative of FMG who is assigned to the construction Site or any part thereof.

**ARTICLE 2 –FMG’S STATUS DURING CONSTRUCTION**

2.1 **OWNER'S REPRESENTATIVE:**

- A. FMG will be Owner's representative during the construction period. The duties and responsibilities and the limitations of FMG’s authority as Owner's representative during construction are set forth in the Contract Documents and shall not be extended without written consent of Owner and FMG.

2.2 **VISITS TO SITE:**

- A. FMG will make visits to the Site at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. FMG’s efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform to the Contract Documents. On the basis of such visits and on-site observations as an experienced and qualified design professional, FMG will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defects and deficiencies in the Work.

2.3 LIMITATIONS ON FMG'S RESPONSIBILITIES:

- A. Neither FMG's authority to act under this ARTICLE 2 or elsewhere in the Contract Documents nor any decision made by FMG in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of FMG to Contractor, any Subcontractor, any Supplier, or any other person or organization performing any of the Work, or to any surety for any of them.
- B. Whenever in the Contract Documents the terms "as directed", "as required", "as allowed", "as approved", or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "proper", or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review, or judgment of FMG as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for compliance with the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to FMG any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraphs 2.03C or 2.03D.
- C. FMG and Owner will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. FMG and Owner will not be responsible for Contractor's failure to perform or furnish the Work in accordance with the Contract Documents.
- D. FMG and Owner will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.
- E. The presence or absence of FMG or his representative will not act to relieve Contractor of any responsibility or of any guarantee of his performance. Neither will observation by FMG or his representative in any way be understood to relieve Contractor of any responsibility for proper supervision of the Work at all times.
- F. The limitations upon authority and responsibility set forth in this Paragraph 2.03 shall also apply to FMG, Resident Project Representative, and assistants.

### ARTICLE 3 – OWNERSHIP AND REUSE OF DOCUMENTS

- 3.1 All Contract Documents and copies thereof furnished by FMG shall remain its property. With the exception of those copies signed in connection with the execution of the Agreement, all Contract Documents shall be returned to FMG on request upon completion of the Work.
- 3.2 Neither Contractor nor any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with Owner shall have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of FMG; and they shall not reuse any of the documents on extensions of the Project or any other project without written consent of Owner and FMG and specific written verification or adaptation by FMG.

### ARTICLE 4 – RESERVED

### ARTICLE 5 - INSURANCE

- 5.1 ADDITIONAL INSURED STATUS:
- A. Owner shall be included as additional insured by endorsement on the following Contractor insurance policies:  
Commercial General Liability.  
Commercial Automobile Liability.
- B. Insurance afforded the additional insured shall provide primary coverage for all claims covered thereby. Policies specified in this Article 5 shall contain a "severability of interest" or "cross liability" clause or endorsement, and shall provide that Owner shall not by reason of inclusion as additional insured incur liability to insurance carrier for payment of premiums for such insurance.
- C. Contractor and its Subcontractors and Suppliers shall require their insurance carriers, with respect to policies provided by them, to waive all rights of subrogation against Owner, its partners, directors, officers, affiliates, financing parties, agents, and employees.
- D. Failure by Owner, or its agents or employees, to request proof of such insurance shall not waive Contractor's requirement to have specified insurance coverages and endorsements in place. Contractor shall indemnify Owner from any loss, damage, cost, expense, or

liability, including costs of litigation, for failure of Contractor to provide the insurance coverages and endorsements specified in this Article 5.

## ARTICLE 6 – INDEMNIFICATION

### 6.1 PERSONAL INJURY AND PROPERTY DAMAGE:

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless FMG and Owner, their consultants, agents, and employees from and against all claims, damages, losses and expenses, direct, indirect, or consequential (including but not limited to fees and charges of engineers, architects, attorneys and other professionals, and court and arbitration costs) arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss, or expense:
1. Is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom, and
  2. Is caused in whole or in part by any negligent act or omission of Contractor, any Subcontractor, any person, or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder or arises by or is imposed by Laws and Regulations regardless of the negligence of any such party.
- B. In any and all claims against FMG and Owner, their consultants, agents, or employees by any employee of Contractor, any Subcontractor, any person, or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.01A.1 shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor or other person or organization under workers' or workmen's compensation acts, disability benefit acts, or other employee benefit acts.
- C. If necessary for enforcement of any indemnification and hold harmless requirement herein, or if applicable law requires the Contractor to obtain specified limits of

insurance to insure any indemnity obligation; then Contractor shall obtain such applicable coverage, the cost to be recovered and included in the Contract Price, and any indemnity attributable to the negligence of any indemnified party shall be limited to such insurance.

6.2 **PATENT FEES AND ROYALTIES:**

Contractor shall indemnify and hold harmless Owner, FMG, and anyone directly or indirectly employed by either of them from and against all claims, damages, losses, and expenses (including attorneys' fees and court and arbitration costs) arising out of any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents, and shall defend all such claims in connection with any alleged infringement of such rights.

**END OF SECTION 7S.**

## SECTION 02070

### WASTEWATER FLOW DIVERSION PLAN

#### PART 1 - GENERAL

##### 1.01 Description

- A. This section covers the planning and implementation of wastewater flow diversions, including provisions for maintenance of services and minimization of service outages.

##### 1.02 Related Sections:

Section 01300 - Submittals

Section 02072 - Wastewater Discharge Emergency Response Plan

##### 1.03 Submittals:

- A. Submit under provisions of Section 01300.

##### 1.04 Wastewater Flow Diversion Plan

- A. Sanitary sewer service must be maintained at all times. Contractor shall submit to Engineer a detailed Wastewater Flow Diversion Plan (WFDP) at least 15 working days prior to implementation of the flow diversion. The WFDP shall indicate the sequence of diversion operations and all other operations the Contractor will establish to maintain wastewater service during the construction period. The WFDP must be reviewed and approved by the Engineer and the Owner before flow can be diverted/bypassed. No deviation for the approved WFDP will be allowed without prior approval from the Engineer. At a minimum the plan shall include the following items:
  - 1. Scaled drawing showing existing and planned facilities.
  - 2. Equipment list including detailed pump capacities, suction & discharge head, fuel type, and anticipated run times on full tank of fuel.
  - 3. Discharge pipe size calculations including provisions for head loss.
  - 4. 24-hour a day schedule of operations during any diversions including start date, time, duration of diversion, fueling times, and contact information for personnel responsible for the oversight of the plan.
- B. The WFDP shall include an Emergency Response Plan indicating the procedures, personnel, equipment, and activities that will be implemented in the event of a wastewater discharge or diversion system failure. The Contractor shall be responsible for implementation of the Emergency Response Plan in accordance with Section 02072.

- C. The Contractor shall observe and comply with all Federal, State, and local laws, ordinances, codes, orders, and regulations which, in any manner affect the conduct of the work, specifically as it relates to wastewater discharges. The Contractor shall be fully responsible for preventing wastewater discharges, containing, the sewage, recovery, and legal disposal of the sewage, including any fines, penalties, claims and liability arising from negligent or willful discharge of wastewater, and violation of any law, ordinance, code or regulation as a result of the discharge. The Contractor shall be responsible for any fines assessed against the Owner and Engineer for such sewage spills.

PART 2 - MATERIALS

2.01 Pumps

- A. Pumps shall be selected specifically for each diversion operation to account for suction and discharge requirements and the following flow capacities:

| Pipe Size To Be<br>Diverted | Pump System Capacity Range*<br>(gpm) |
|-----------------------------|--------------------------------------|
| 8"                          | 5 - 300                              |
| 10"                         | 5 - 525                              |
| 12"                         | 25 - 850                             |
| 15"                         | 50 - 1,500                           |
| 18"                         | 50 - 2,500                           |

\*The pump system capacities listed above are only an estimate. Other capacity requirements may be required by the Engineer or Owner during review of the diversion plan.

- B. Complete redundancy of the pump system capacity shall be provided for backup.

PART 3 - EXECUTION

3.01 Execution of the WFDP.

- A. Upon approval of the WFDP, the Contractor shall install the diversion facilities, including backup facilities, in the manner and locations shown and dictated in the plan.
- B. All piping must be fully installed and hydraulically tested to the satisfaction of the Engineer prior to wastewater flow.
- C. The diversion pumping system shall be successfully operated for a minimum of 30 minutes with temporary diversion devices in place. Permanent changes to the existing infrastructure which initiate a "point of no return" diversion shall not be performed until the system has successfully passed the 30 minute demonstration period.

- D. All fuel driven equipment shall have an operational fuel gague to monitor fuel levels. In no case shall the fuel level for any piece of equipment fall below a  $\frac{1}{4}$  tank or the volume required for 2-hours of equipment run time, whichever is less.
- D. If the duration of the diversion is scheduled to last greater than 24 hours, then the backup pump system shall be operated at least 25 percent of the duration of the diversion to ensure adequate exercise and reliable operation of the backup system.
- E. Once the work for which the diversion was initiated has been completed, the new facility shall operate successfully for a period of 30 minutes prior to the removal of the diversion pump system.

### 3.02 System Failure

- A. In the event of a wastewater discharge or diversion system failure, immediately implement the Wastewater Discharge Emergency Response Plan as specified in Section 02072.

END SECTION 02070

## SECTION 02072

### WASTEWATER DISCHARGE EMERGENCY RESPONSE PLAN

#### PART 1 - GENERAL

##### 1.01 Description

- A. This section covers the development of a Wastewater Discharge Emergency Response Plan by the Contractor, to be implemented in the event of a wastewater discharge.

##### 1.02 Related Sections:

Section 01300 - Submittals  
Section 02070 - Wastewater Flow Diversion Plan

##### 1.03 Submittals:

- A. Submit under provisions of Section 01300.

##### 1.04 Wastewater Discharge Emergency Response Plan

- A. The Contractor shall develop and submit to the Engineer at least 15 working days prior to the start of any diversion, a written Wastewater Discharge Emergency Response Plan (WDERP). The WDERP shall be developed to respond to any construction related discharge of wastewater. The Contractor shall not rely upon Owner's personnel for emergency response, however they may be dispatched at the Owner's discretion to provide assistance. If Owner's personnel are utilized, the Contractor shall be responsible for all associated costs. At a minimum the plan shall include the following items:
  - 1. Identification of nearby environmentally sensitive areas such as waterways, drainage channels, catch basins, and entrances to existing storm sewers.
  - 2. Development of an emergency notification procedure. Contractor shall designate primary and secondary representatives and provide their respective 24-hour phone numbers. Owner and Engineer contacts shall also be listed.
  - 3. Identify personnel and equipment that will be utilized in the event of a wastewater discharge. Include emergency response team contacts that can be activated 24-hours a day 7-days a week including weekends and holidays during the flow diversion.
  - 4. Identify property owners who may be affected.
  - 5. Identify step by step procedures to follow to contain, control, and minimize wastewater discharge.

- B. Wastewater flow diversions cannot proceed until the WDERP has been approved. A copy of the WDERP shall be available on the jobsite at all times.

## PART 2 - MATERIALS - (NOT USED)

## PART 3 - EXECUTION

### 3.01 Wastewater Discharge Event

- A. In the event of a wastewater discharge the Contractor shall:
  - 1. Immediately implement the WDERP without direction from the Owner or Engineer, to control and contain the discharge.
  - 2. Contact Owner's personnel as outlined in the plan and transmit the following pertinent information:
    - a. Location of discharge.
    - b. Estimated volume.
    - c. Time discharge began.
    - d. Duration (if already contained).
    - e. Cause (if known).
    - f. Control measures implemented.
    - g. Type of remediation and/or cleanup measures taken.

Based on this information, Contractor, Engineer, and Owner will determine if the discharge is contained and whether or not the Owner's personnel should be dispatched to the site.

- B. The Contractor shall observe and comply with all Federal, State, and local laws, ordinances, codes, orders, and regulations which, in any manner affect the conduct of the work, specifically as it relates to wastewater discharges. The Contractor shall be fully responsible for preventing wastewater discharges, containing, the sewage, recovery, and legal disposal of the sewage, including any fines, penalties, claims and liability arising from negligent or willful discharge of wastewater, and violation of any law, ordinance, code or regulation as a result of the discharge. The Contractor shall be responsible for any fines assessed against the Owner and Engineer for such sewage spills.

END SECTION 02072

## SECTION 13901

### WATER MAIN CORROSION PROTECTION

#### **PART 1 GENERAL**

##### 1.01 WORK INCLUDED

- A. Provide coatings and cathodic protection for all buried, submerged, or immersed ferrous metal (steel, ductile iron, and cast iron) piping and fittings.
- B. Provide galvanic anodes, joint bonds, and tight bonded coatings for all ferrous metallic pipe and fittings used in conjunction with plastic pipe sections.
- C. Maintain electrical isolation of cathodic protected pipes from other unprotected metallic pipes, casings, structures, and grounding systems.
- D. Install test wires for test stations during pipe construction at time pipe is being installed. Install test station type at location as shown on the Drawings and/or listed on Test Station Schedule.
- E. Provide petrolatum tape coatings and cathodic protection galvanic anodes on existing bare fittings exposed as part of the pipe rehabilitation or at connections to existing pipelines.
- F. Insulate and cathodically protect all buried, submerged, or immersed copper services and fittings.

##### 1.02 COATING AND LINING OF MISCELLANEOUS METALLIC PIPE PIECES AND FITTINGS

- A. Below Grade Fittings and Appurtenances Coating:
  - 1. Where coating and lining specified for main pipeline is not feasible, coat and line all buried metallic (steel, ductile iron, and cast iron) valves, fittings, flexible couplings, incidental metallic piping, glands, blow-offs, and hydrants etc. internally and externally with liquid epoxy or fusion bonded epoxy coating in accordance with AWWA C116 or AWWA C550 and this specification. All internal coating and lining materials shall be NSF approved for potable water service.
  - 2. Provide Series 300 stainless steel materials or coat all other miscellaneous buried metallic items, (tie rods, thrust restraints, tapping saddles, harnesses, etc.). Coat tie rods and rebar when directly exposed to soil. Provide with factory applied epoxy coating, fusion bonded epoxy coating, thermo-plastic coating, heat shrink sleeves, or with coating recommended by coating manufacturer for buried application and approved by the Engineer for intended exposure.
  - 3. Coat above-grade piping, vent pipe, bollards, etc. exposed to atmospheric conditions with two coats of polyamide epoxy and one top coat of polyurethane enamel or with a fusion bonded epoxy coating system. Color as selected by Owner.

##### 1.03 RELATED WORK

- A. City of Rapid City Standard Specifications for Public Works, 2007 Edition, Section 8 - Water Piping Systems.

1.04 GENERAL

- A. The latest revision of the following minimum standards shall apply to the materials and installation included in this specification, except where more stringent standards are applicable. In case of conflict, the most stringent requirements shall apply.
- B. Like items of materials provided hereunder shall be the end product of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.
- B. Materials and workmanship as specified in this section shall be coordinated and completed in conjunction with other applicable sections. Coordinate all work specified herein with other crafts and related sections.

1.05 REFERENCE STANDARDS

- A. General: The latest revision of the following minimum standards shall apply to the materials and installation included in this specification, except where more stringent standards are applicable. In case of conflict, the most stringent requirements shall apply.
  - 1. American National Standards Institute (ANSI): C80.1-90, Rigid Steel Conduit-Zinc Coated.
  - 2. American Society for Testing and Materials (ASTM):
    - a) ASTM -A380, Standard Practice for Cleaning, Descaling and Passivation of Stainless Steel Parts, Equipment and Systems
    - b) ASTM -A967 Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts
    - c) ASTM B418, Standard Specification for Cast and Wrought Galvanic Zinc Anodes.
    - d) ASTM B843, Standard Specification for Magnesium Alloy Anodes for Cathodic Protection.
    - e) ASTM C94, Standard Specification for Ready-Mixed Concrete.
    - f) ASTM G97, Laboratory Evaluation of Magnesium Anode Test Specimens for Underground Application.
  - 3. American Water Works Association (AWWA):
    - a) AWWA C116, Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service.
    - b) AWWA C209, Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water - Pipelines.
    - c) AWWA C210, Liquid Epoxy Coating System for the Interior and Exterior of Steel Water Pipelines.
    - d) AWWA C213, Fusion Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
    - e) AWWA C214, Tape Coating Systems for the Exterior of Steel Water Pipelines.

- f) AWWA C216, Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.
  - g) AWWA C217, Cold-Applied Petrolatum Tape and Petroleum Wax Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.
  - h) AWWA C550, Protective Epoxy Interior Coatings for Valves and Hydrants.
4. American Wood Preservers Association (AWPA):
    - a) C2, Commodity Standards for Lumber and Timber
    - b) P5, Waterborne Preservatives
  5. National Association of Corrosion Engineers International (NACE),
    - a) Recommended Practice RP0169, Control of External Corrosion on Underground or Submerged Metallic Piping Systems.
  6. National Electrical Manufacturers Association (NEMA):
    - a) 1-10, TypeR and 4X Enclosures
    - b) TC 2-83, Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
    - c) WC 3-80, Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (R 1986).
    - d) WC 5-73, Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (R 1985).
    - e) WC 7-88, Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
  7. National Fire Protection Association, National Electrical Code (NEC), NFPA 70.
  8. Occupational Safety and Health Administration (OSHA)
  9. Underwriters Laboratories (UL) ANSI/UL 467 "Grounding and Bonding Equipment".

#### 1.06 DEFINITIONS

- A. Anode: The electrode or metallic surface location where DC current is discharged into a surrounding electrolyte and corrosion (oxidation with a loss of electrons) occurs in a corrosion cell. This is the opposite of a cathode.
- B. Appurtenances or Fittings: Items including but not limited to valves, fittings, elbows, tees, glands, angles, bends, blow offs, restrained joints, flanges, couplings, spool pieces, miscellaneous piping, tapping saddles, blow-offs, or hydrants, including metallic glands, etc.

- C. Cathode: The electrode or metallic surface location where DC current is received or collected from a surrounding electrolyte and protection (reduction with a gain of electrons) occurs in a corrosion cell. This is the opposite of an anode.
- D. Cathodic Protection, (Cathodic Protect, Cathodically Protected, etc.): An electrical method of reducing or eliminating corrosion by making previous anodic areas on a structure surface, turn into a cathode by creating a DC current flow to the structure surface.
- E. Cathodic Protection Criteria: The NACE criteria for protected cathodic protection levels of a minimum of -0.85 volt to a copper/copper-sulfate reference electrode or a 1GO-millivolt polarization shift or more negative (instant off or IR accounted for) in accordance with NACE Standard RP 0169. Selection of protective criteria per NACE Standard RP 0169 to be at Engineer's discretion.
- F. Cathodic Protection System: Two common cathodic protection methods are galvanic anodes and impressed current cathodic protection systems. A galvanic anode system consists of galvanic anode materials (usually magnesium or zinc) that naturally corrodes or sacrifices itself and does not require an outside power source. An impressed current type system utilizes an outside power source usually a rectifier (that converts AC to DC current) and forces (impresses) current from a number of anodes (or groundbed) through the environment to the structure to be protected.
- G. Cathodic Protection Station (CPS): An impressed current cathodic protection installation location usually consisting of a rectifier and groundbed.
- H. Drain Anode: A galvanic anode that is installed at foreign pipeline crossing locations with the intent that any interference current be discharged or drained from the affected pipeline by the drain anode.
- I. Electrically Continuous Wire: A wire that demonstrates the ability to conduct current and that has a linear resistance (ohms) equal to or less that printed literature values for the different wire gauges and wire types. Resistance of 1,000 feet of stranded copper wire at 77 degrees F for No. 12 AWG wire is 1.65 ohms and for No. 10 AWG wire is 1.04 ohms.
- J. Electrical Isolation: The condition of being electrically isolated from other metallic structures (including, but not limited to, piping, reinforcement, casings, etc.) and the environment as defined in NACE PR0286, The Electrical Isolation of Cathodically Protected Pipelines.
- K. Ferrous or Metallic Pipe: Any pipe or fitting made of steel or iron, or pipe containing steel or iron as a principal structural material (such as steel, ductile iron, and cast iron), except reinforced concrete pipe or stainless steel.
- L. Fasteners: To include but not be limited to bolts, nuts, washers, tie-rods, restraining devices, etc.
- M. Foreign Owned: Any buried pipe or cable not specifically owned or operated by the Owner.

- N. Functional and Performance Testing: Tests necessary to demonstrate that installed equipment and systems function as specified and operate in the manner intended. Functional testing is a prerequisite to performance testing for equipment and systems specified to have a performance test.
  - O. Joint Bonds: A method of making the pipeline electrically continuous by connecting insulated wire(s) or straps across each side of the pipe joint or fitting.
  - P. Lead, Lead Wire, Joint Bonds, Pipe Connecting Wires, Cable: Insulated copper conductor; the same as wire.
  - Q. Manufacturer's Representative: Employee of manufacturer who is factory trained and knowledgeable in technical aspects of their products and systems.
  - R. Petrolatum: A purified mixture of semisolid hydrocarbons obtained from petroleum jelly.
  - S. Petroleum Wax: A refined mixture of solid hydrocarbons, paraffin in nature, obtained from petroleum. Provided as a refined paraffin wax or microcrystalline wax forms.
  - T. Plastic Reference Pipe: Plastic conduit or pipe placed in soil next to structure to allow a portable reference electrode to be inserted into for structure-to-reference electrode potential measurements.
  - U. Raceways: Conduit, sheath, plastic or metal pipe, or electrical metallic conduit (EMT) for casing of electrical or cathodic protection cables.
  - V. Potential, Structure-to-Reference Electrode Potential (also structure-to-reference electrode voltage): Common method to determine corrosion protection levels by measuring the difference in voltage (potential) between the subject metallic structure and the electrolyte in which it is buried or submerged, as measured to the standard specified reference electrode (usually a copper/copper sulfate reference electrode) placed in contact with the electrolyte.
  - W. Test Station: Insulated lead wire connections to the structure, which are brought to a test station terminal board or box in order to allow an electrical connection to be made to the structure for location, and corrosion and cathodic protection testing.
  - X. Tight Bonded Coatings: A dielectric coating that is bonded or physically attached to the pipe surface. Ductile iron pipe bituminous asphaltic shop coating does not qualify as an approved factory or shop applied tight bonded coating.
- 1.07 SUBMITTALS DURING CONSTRUCTION
- A. Provide catalog cuts and other information for all proposed products proposed for use that shows compliance of those materials with these Specifications. Contractor submittals shall be made in accordance with the Standard Specifications. In addition the following specific information shall be provided.

- B. Submittal information shall clearly show manufacturer name and model number of specified item to be provided, not just supplier name, if only supplier name is provided, then entire submittal shall be rejected and a new resubmittal will be required. Materials provided with only supplier's name shall be relabeled with original manufacturer's name, model number, etc., or be returned at Engineer's discretion at no additional cost to Owner.
- C. Submit required information on a system-by-system basis with items clearly marked for specific products or models to be used. Indiscriminate submittal of manufacturer's literature only is not acceptable.
- D. Submit list of test equipment (make and model) to be provided. If project three miles or more. Test equipment shall be approved and at project site prior to start of pipe installation.
- E. Quality Assurance Submittals:
  - 1. Manufacturer's Certificates of Compliance.
  - 2. Field Test Reports.
- F. Submit as-built and field test report information to Engineer at end of project as one condition to be received and accepted by Engineer prior to application for substantial completion.
- G. Contract Closeout Submittals: Special guarantees as specified hereinafter.
  - 1. Submit record drawings and field test report information to Engineer at end of project as one condition to be received and accepted by Engineer prior to application for substantial completion.
  - 2. The cathodic protection system and corrosion control monitoring systems including joint bonding, test stations, insulators, etc. shall be fully operational and a functional test performed prior to acceptance of and issuing substantial completion of the corrosion protection portions of the project.

#### 1.08 QUALITY ASSURANCE

- A. Contractor's Competency: Contractor shall have a minimum of two (2) years of practical experience in the type of work called for in this specification. Contractor may be required to show proof and furnish a list of references substantiating this requirement to the satisfaction of the Engineer and Owner.
- B. The Contractor shall provide at all times a thoroughly experienced and competent field foreman, who will be present to supervise this portion of construction at the site. This person shall be responsible for the field test reports and have the authority to represent the Contractor and shall be the point of contact with the Engineer for this section of the specifications.
- C. Functional testing shall be completed by the Contractor only in the Engineer's representative's presence on the installed cathodic protection and corrosion protection items.
- D. The final testing shall be completed by the Owner's representative.

1.09 RECORD DRAWINGS

- A. Contractor shall maintain an accurate record of the construction and a marked-up drawing of all construction modifications. Drawings shall show actual number of pipe or fitting joints per each test span, and installed location of corrosion control items as specified. At completion of project, the Contractor shall provide a copy of the record drawings of the corrosion control installations to the Engineer.

1.10 SPECIAL GUARANTEE

- A. The Contractor, Corrosion Sub-Contractor, and Product Manufacturer shall jointly and severally warrant to the Owner and guarantee the work under this section against defective workmanship and materials for a period of two (2) year(s) or longer if required by the General Conditions commencing on the date of final acceptance of the work.
  1. Functional and final testing and warranty inspection(s) of the corrosion protection systems shall be made at the end of the project and within the warranty period, respectively. The Contractor, Sub-Contractor, and/or Product Manufacturer Representatives at their option if desired may be present during the functional or final testing or warranty inspections by the Engineer and Owner.
  2. Any construction defects identified by the Engineer during energizing and testing or during warranty inspections shall be located and corrected by the Contractor at his sole expense including all additional Engineering time, full time inspection, and re-testing time.
  3. Any defects in the corrosion protection system discovered at or during the functional, final, and/or warranty inspection(s) shall immediately be repaired and retested in a timely manner (repairs starting within 30 days and completely completed, tested, and approved within 60 days of notice) by the Contractor. All repairs shall be in accordance with the written product manufacturer's instructions as reviewed and approved by the Engineer.
  4. For all repairs, the Contractor shall provide an extended warranty (equal to the original warranty period length) of two (2) year(s) or longer if required by the General Conditions commencing on the date of final acceptance of the repair work.
  5. All repairs or any damage to other work caused by such defects or repairing of the defects including additional Engineering, full-time observation during repairs, and retesting or re-warranty inspections shall be at sole cost to Contractor.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. Unless otherwise indicated, provide all first-quality, new materials, free from defects, in first class condition suitable for the intended use. Provide materials and equipment, which are the standard products of manufacturers regularly engaged in the production of such materials and equipment for a minimum of three (3) years on a full time basis. Provide the manufacturer's latest standard design that conforms to these specifications.
- B. All materials and equipment shall show evidence of U.L. approval where U.L. standards exist and product listings are available. All materials, equipment, and installations shall conform to National Electrical Code (NEC), and all applicable federal, state, and local laws, codes, and regulations.
- C. Provide new materials intended for this type of service in accordance with this specification and the referenced standards. Whenever the requirements of the Specifications or Drawings exceed those of the codes or manufacturer's instructions, the requirements of the Specifications or Drawings shall prevail. Where a larger size, higher quality, or better grade of material or a higher standard of workmanship is required, the most stringent requirement shall apply.
- D. The use of a manufacturer's name and model or catalog number is solely for the purpose of establishing the standard of quality and general configuration desired. Products of other manufacturers of equal standard and quality will be considered in accordance with the General Conditions.

### 2.02 MATERIAL SUPPLIERS

- A. Suppliers listed below can usually supply the types of materials specified in this section. Alternate suppliers will be considered, subject to approval of the Engineer. Address given is that of offices in the Western United States; contact these offices for information regarding the location of their representative nearest the project site:
  - 1. Farwest Corrosion Control, Denver, CO (888-532-7937).
  - 2. Goudy Engineering, Tucson, AZ (520-298-1104)
  - 3. Hoff Company, Denver CO (800-736-4546)
  - 4. MESA Products, Inc., Tulsa, OK (918-627-3188).
  - 5. Total Corrosion Services, TCS, Billings, MT (406-248-6985).

### 2.03 WIRES

- A. General: All cathodic protection wires, joint bond wires, bonding cables, leads, and cables provided shall be insulated **STRANDED** copper wire. Wire size, type, and insulation type as specified in this section. Wire shall conform to applicable requirements of NEMA WC 3-80, WC 5-73, and WC 7-88.
- B. Joint Bonds:
  - 1. General: Type of joint bonds shall depend on pipe joint coating and shall be either:

- a) Bare copper straps for pipe joint bond locations only where installed under pipe joint heat shrink sleeves.
  - b) Insulated copper joint bond wires or insulated copper bond straps for all other pipe joint bond locations.
  - c) Metallic Fitting Bond Wires: No. 12 AWG metallic fitting bonding wires shall be single-conductor, stranded copper wire with 600-volt, TW, THWN, THHN or HMWPE insulation. Provide with a sleeve on each end of No. 12 AWG metallic fitting bonding wire used for bonding of metallic fittings including but not limited to fittings, valves, couplings, mega-lugs, metallic fitting glands or restraint rings, etc. for metallic and plastic pipe.
2. Copper Sleeves and Insulation for Joint Bond Wires: Provide joint bond wires consisting of single- conductor, stranded insulated copper wire. Supply all joint bonds complete with a formed copper sleeve on each end of the wire. Wire conductor for field-applied sleeves shall extend 1/4 inch beyond end of copper sleeve. End of factory formed copper sleeves shall be angled so as to allow end of wire to be exposed to thermite weld material.
- a) Wires equal to or smaller than No. 10 AWG shall be provided with 600-volt, TW, THWN, THHN or HMWPE insulation.
  - b) All other joint bond wires larger than No. 10 AWG wire shall be provided with 600-volt high molecular weight polyethylene (HMWPE) insulation.
3. Bond Lengths: Length of bond strap and joint bond wire may have to be increased for different pipe size and joint type per pipe manufacturer's recommendations so as to provide sufficient slack (one (1)-inch minimum on each end or two (2)-inches total) for pipe or joint movement between each thermite weld connection. Larger couplings than for 36-inch OD pipe may require longer strap or wire bond lengths.
- a) Generally the minimum bond length for different type of bond and joint and fitting types shall be as listed below.
  - b) For Pipe 16-inch or Larger Diameter Metal Pipe:
    - 1) For Push-on, Mechanical, or Flanged Joints on Metal Pipe: No. 2 AWG wires, 18-inches long minimum.
    - 2) For Flexible Coupling Joints on Metal Pipe: No. 2 AWG wires, 24-inches long minimum, with two 12-inch long minimum insulated No. 12 AWG wire pigtails, as manufactured by Erica Products Inc. (Cadweld), Cleveland, OH; or equal. Smaller couplings than 24-inch OD pipe may allow shorter lengths. Larger couplings than for 36-inch OD pipe may require longer bond wire lengths. Confirm that bond wire length supplied provides a minimum of 1-inch slack on each end (2-inch total).
  - A) Bond wires with pig-tail wires can be utilized at not only flexible couplings, but at fitting or valve locations on metal pipe, where it is easier to bond over the fitting or valve with the larger bond wire. At these locations, the pig tail wires shall be bonded to the fitting or valve body.

- B) For multiple piece fittings on metal pipe, No. 12 AWG pig tail wires shall be utilized to bond different pieces to pipe. Pig tail wire length as required.
  - 3) For Insulated Flexible Coupling Joints on Metal Pipe: Do not bond pipe across insulated flexible couplings.
  - c) For metal pipe smaller than 15-inch diameter, Contractor can utilize No. 4 AWG wire size instead of No.2 AWG wire size, if desired. Bond lengths shall accommodate specified slack as detailed for 16-inch diameter or larger pipe.
  - d) Acceptable pre-made insulated copper joint bond wires are available from:
    - 1) J-Four Pipeline Products (Hoff Company), (800-331-3404), Broken Arrow, OK;
    - 2) Erica Products Inc. (Cadweld- 800-248-9356) Cleveland, OH;
    - 3) Continental Industries, Inc. (Thermoweld- 800-558-1373), Tulsa, OK;
    - 4) Or approved equal.
  - e) For Metallic Fittings and Glands On Plastic Pipe: No. 12 AWG wire to connect multi-piece fittings together. Wire length as required to provide 2-inches of slack.
- C. Pump Station, Vaults, Test Station, and Cross Bond Pipe Connecting Wires:
- 1. Single-conductor, No 2 AWG, No. 4 AWG, No. 6 AWG, and No. 8 AWG cathodic protection cables shall be single-conductor, stranded copper wire with 600-volt high molecular weight polyethylene (HMWPE) insulation. Insulation shall be 7/64-inch (110 mils) minimum thickness in accordance with ASTM D 1248, Class C, Grade 5.
  - 2. Bonding of buried and above grade appurtenances may be required to minimize stray current, safety hazardous, and corrosion effects.
- D. Test Wires:
- 1. No. 12 AWG wire for prepackaged galvanic anode and No. 12 AWG test leads and No. 12 AWG and No. 14 AWG reference electrode lead wires shall be single-conductor, stranded copper wire with 600-volt, TW, THWN, THHN or HMWPE insulation.
  - 2. No. 2, No. 4, No. 6, or No. 8 AWG leads shall be single-conductor, stranded copper wire with 600-volt, HMWPE insulation.
- E. Wire Identification:
- 1. Wire insulation color shall indicate the function of each wire and shall be as shown on the Drawings and as follows:
    - a) Pipeline test wires:

- 1) Water Pipeline: Blue.
  - 2) Waste Water Pipelines: Green or Purple if Reuse
  - 3) Foreign Pipeline: White or as requested by Foreign pipeline company.
  - 4) Unprotected Pipe: Black.
  - 5) Upstream Test Current Span Wires identify with red tape.
- b) Casings: Orange.
  - c) Anode lead wires: Black.
    - 1) Upstream Anodes identify with red tape
  - d) Reference electrode wires: Yellow.
  - e) Coupon wires: Green
    - 1) Pair of leads to protected coupon (one strip of white tape)
    - 2) Pair of leads to unprotected coupon (one strip of black tape)
  - f) Cathodic Protection Groundbed Cables- Black Insulation With
    - 1) No. 2 AWG Rectifier Positive Groundbed Cable- 1 Strip of Red Tape
    - 2) No. 4 AWG Groundbed Anode Header Cable- 2 Strips of Red Tape
    - 3) No. 4 AWG Groundbed Anode Loop Cable- 1 Strip of Orange Tape
  - g) Identify north (one strip) or west (two strips) structures or parallel pipelines of purple tape and south (one strip) or east (two strips) structures or parallel pipelines with one strip of gray tape.

#### 2.04 THERMITE WELD MATERIALS

- A. Electrical connection of copper wire or copper strap to metallic (steel, ductile iron, and cast iron) fittings, pipe, and structures shall be by the thermite weld, (cadweld) method. The thermite weld materials shall be UL listed to ANSI/UL 467 "Grounding and Bonding equipment".
- B. The thermite weld metal shall consist of a mixture of copper oxide and aluminum material ignited by magnesium starting powder with a spark or by an electronic type ignition. Thermite weld materials shall be designed for connection of copper to steel or ductile iron and cast iron surfaces. The materials and exothermic process shall provide a completed permanent type connection that will not loosen or develop high resistant connection points and have a resistance equal to or lower than the strap or wire, be durable, be corrosion resistant, and have a high adhesion connection to both the surface and strap or wire.

- C. Supply the proper size and type of wire sleeves, cartridges, and welder molds as required for each type of connection and pipe material in accordance with the thermite weld manufacturer's written recommendations. Material and equipment shall be from the same manufacturer and utilized throughout the entire project. Weld materials from different manufacturers shall not be interchanged.
- D. The individual thermite weld metal charges shall be sealed in a moisture resistant plastic container (tube or cartridge) with tight fitting caps with the separate steel disks or in a prepackaged sealed container. The starting (ignition) material shall be packed in the bottom of the tube with the weld material on top or for the electrical ignition type intermixed as required. The individual plastic containers shall be packed in sealed boxes so as to protect the individual containers and keep their contents dry. The size (weight in grams) and type of the charge shall be clearly marked on the plastic package and individual sealed containers.
- E. Provide type of charges required for each pipe, fitting, or structure base material.
1. Provide steel charges for steel materials. Charge (cartridge) size shall be minimum of 15 grams and maximum of 25-grams for steel materials.
    - a) Cadweld F-33 (Green Top) or Thermoweld P Standard Powder,
    - b) Electronic ignition materials, Cadweld Plus CA15PLUS33 with black top or CA25PLUS33 with red top,
    - c) Or approved equal.
  2. Provide cast iron charges for all ductile iron and cast iron materials. Charge (cartridge) size shall be a minimum of 25 grams and maximum of 32-grams for ductile and cast iron materials.
    - a) Cadweld XF-19 (Orange top) or Thermoweld CI Cast Iron Powder,
    - b) Electronic ignition materials, Cadweld Plus CA25PLUSXF19 with red top or CA32PLUSXF19 with white top,
    - c) Or approved equal.
  3. Maximum cartridge size for natural gas and petroleum pipelines and structures shall be 15-grams.
  4. Minimum cartridge size for strap bonds shall be 25 grams for 1/2-inch and 5/8-inch diameter hole sizes to steel and 32-grams for 5/8-inch diameter holes for ductile iron pipe per manufacturer recommendations.
- F. Welder molds shall be graphite molds sized for each type and size of charge and pipe size and type to be used as recommended by the cadweld manufacturer. Each mold shall have permanent identification showing manufacturer name, mold part number, wire size, and weld metal type and size.
1. Ceramic "One-Shot" molds will not be acceptable.
  2. Special welders and materials are required for copper strap, formed joint bond wires, and flexible coupling bonds.

3. Vertical type connections require special welders and materials as recommended by the weld manufacturer.
- G. For horizontal type connections to smaller pipe sizes, different molds to match the different pipe curvature are required according to the manufacturer's recommendations. These molds for small pipe sizes shall be identified by each pipe size (PS).
1. For steel pipe, different molds are required for pipe up to 3-1/2-inch diameter. Different steel mold sizes are required for 4-inch and 6-inch to 8-inch pipe sizes. For steel pipe ten-inch (10") or larger, flat steel molds can be used or for other flat surfaces.
  2. For ductile iron, different size of molds are required for different pipe sizes (PS) up to 24-inch and they have to be obtained for each pipe size to be welded. The same welder for flat surfaces can be used for all ductile iron pipe or fitting sizes 30-inch or larger or flat structures.
- H. Cadweld Plus Exothermic- Connections with prepackaged containers with electronic type ignition can be substituted for standard cadweld spark type ignition connections provided that equal or better low resistance, durability, adhesion, and performance characteristics are proven. Electronic type ignition materials shall be able to be used in standard graphite molds for wire and strap type connections for each structure type and size. Electronic ignition material manufacturer shall provide independent test results that show performance characteristics are equal or better than standard type thermite connection. Manufacturer shall provide a reference table with corresponding molds and charge sizes and types. Spark type and electronic ignition type materials from different manufacturers shall not be intermixed.
- I. Weld Mold Sealer shall be heavy duty, clay-like, mold sealer putty material, specially designed for that use such as Electrical Duct Seal as manufactured by Ideal Industries, Cadweld Mold Sealer as manufactured by Erica Products, Inc. or approved equal.
- J. Cleaning Wheels shall be self-cleaning and leave no resin or residue on surface to be bonded to as recommended by the weld manufacturer. The use of resin, rubber, or shellac-impregnated type grinding wheel are not recommended by the weld material manufacturers and shall not be used. Weld manufacturer approved vitrified type-grinding wheels, ERICO's organic cleaning wheels, or approved equal.
- K. Mold cleaner shall be type and size recommended by weld manufacturer for each type of graphite weld mold being used.
- L. Adapter Sleeves:
1. Install adapter sleeves (Cadweld CAB 1331H, Thermoweld A200, or approved equal) for all No. 12 AWG wires. Provide sleeve type as recommended by thermite weld manufacturer and attach in the field.
  2. Install adapter sleeves for all No.4 AWG and No.2 AWG wires. Either premade factory sleeved wires or wires with sleeves made in the field with the appropriate sized sleeves and hammer die are acceptable.
    - a) Factory formed sleeves shall be beveled to allow molten thermite weld material to directly contact wire.

- b) Field formed sleeves shall be attached with the appropriate sized and type of hammer die and method as recommended by the thermite weld manufacturer. Wire conductor for field installed adapter sleeves shall extend 1/4 inch beyond end of the sleeve to allow molten thermite weld material to directly contact wire.

M. Thermite weld materials are available as specified from:

1. Erico Products Inc. (Cadweld - 800-248-9353) Cleveland, OH;
2. Continental Industries, Inc. (Thermoweld- 800-558-1373), Tulsa, OK;
3. Or approved equal

N. Acceptable Materials:

1. Thermite weld materials for **STRANDED** copper wire test leads and joint bonds with factory and field formed sleeves and copper bond straps are given below for reference:

| THERMITE WELD MATERIALS FOR HORIZONTAL CONNECTIONS<br>-SLEEVES & HAMMER DIES- |                     |                         |                     |                         |
|---|---------------------|-------------------------|---------------------|-------------------------|
| STRANDED TEST<br>LEAD OR BOND<br>WIRE SIZE<br>(AWG)                           | CADWELD             |                         | THERMOWELD          |                         |
|   | SLEEVE<br>MODEL No. | HAMMER DIE<br>MODEL No. | SLEEVE<br>MODEL No. | HAMMER DIE<br>MODEL No. |
| No. 12 AWG  | CAB-1331H           | Crimped                 | A-200               | Crimped                 |
| No.10 AWG   | CAB-1331H           | Crimped                 | A-201               | 38-6019-00              |
| No. 4 AWG   | CAS-20-F            | CAD-11                  | A-204               | 38-4859-00              |
| No. 2 AWG   | CAS-09-F            | CAD-09                  | A-203               | 38-0310-00              |

| <b>THERMITE WELD MATERIALS FOR HORIZONTAL CONNECTIONS<br/>-SLEEVES, MOLDS, &amp; CHARGE SIZE AND TYPE FOR INSULATED STRANDED COPPER WIRE-</b> |   |                                       |  |                                       |
|---|---|---------------------------------------|--|---------------------------------------|
| <b>STRANDED TEST<br/>LEAD OR BOND<br/>WIRE SIZE<br/>(AWG)</b>   | <b>CADWELD</b>  |                                       | <b>THERMOWELD</b>  |                                       |
|   | <b>MOLD &gt;10-INCH<br/>DIAMETER PIPE<br/>SURFACE</b> | <b>MAX. SIZE<br/>CHARGE&amp; TYPE</b> | <b>MOLD &gt;10-INCH<br/>DIAMETER PIPE<br/>SURFACE</b>    | <b>MAX. SIZE<br/>CHARGE&amp; TYPE</b> |
| No.12 AWG<br>w/sleeve to Steel  | Sleeve CAB 1331H<br>Mold No.<br>CAHM-1G               | 15 gram F-33 with<br>green caps       | Sleeve No. A-200,<br>Mold No. 100                        | 15 gram P                             |
| No.12 AWG<br>w/sleeve to Ductile<br>Iron and Cast Iron  | Sleeve CAB 1331H<br>Mold No.<br>CAHBA-1G-PS           | 25 gram XF-19 with<br>orange caps     | Sleeve No. A- 200,<br>Mold No. 156 per<br>each pipe size | 25 gram CI                            |
| No. 8 AWG to<br>Steel   | Mold No.<br>CAHM-1G                                   | 15 gram F-33 with<br>green caps       | Mold No. 100   | 15 gram P                             |
| No.8 AWG to<br>Ductile Iron and<br>Cast Iron  | Mold No.<br>CAHBA-1G-PS                               | 25 gram XF-19 with<br>orange caps     | Mold No. 156 per<br>each pipe size                       | 25 gram CI                            |
| No. 4 AWG<br>w/sleeve to Steel  | Sleeve CAS-20-F<br>Mold No.<br>CAFSA-1L               | 25 gram F-33 with<br>green caps       | Sleeve No. A- 204<br>Mold No. 7345                       | 25 gram P                             |
| No. 4 AWG<br>w/sleeve to Ductile<br>Iron and Cast Iron  | Sleeve CAS-20-F<br>Mold No.<br>CAFCA-1L- PS           | 32 gram XF-19 with<br>orange caps     | Sleeve No. A- 204<br>Mold No. 154                        | 32 gram CI                            |
| No. 2 AWG<br>w/sleeve to Steel  | Sleeve CAS-09-F<br>Mold No.<br>CAFSA-1V               | 25 gram F-33 with<br>green caps       | Sleeve No. A- 203<br>Mold No. 129                        | 25 gram P                             |
| No. 2 AWG<br>w/sleeve to Ductile<br>Iron and Cast Iron  | Sleeve CAS-09-F<br>Mold No.<br>CAFCA-1V-PS            | 32 gram XF-<br>19 with orange<br>caps | With Sleeve<br>No. A- 203<br>Mold No. 175                | 32 gram CI                            |

| <b>THERMITE WELD MATERIALS FOR HORIZONTAL CONNECTIONS<br/>-STRAPS, MOLDS, &amp; CHARGE SIZE AND TYPE FOR PUNCHED COPPER STRAP BONDS-</b>  |   |  |   |  |
|---|---|--|---|--|
| <b>MATERIAL,<br/>HOLE SIZE,<br/>&amp;<br/>CHARGE SIZE</b>   | <b>CADWELD</b>  |  | <b>THERMOWELD</b>   |  |
|   | <b>MOLD &gt;10-INCH<br/>DIAMETER PIPE<br/>SURFACE</b> | <b>MAX. SIZE<br/>CHARGE &amp; TYPE</b> | <b>MOLD &gt;10- INCH<br/>DIAMETER PIPE<br/>SURFACE</b>      | <b>MAX. SIZE<br/>CHARGE &amp; TYPE</b> |
| Steel, Min. 1/2" Hole,<br>Minimum 32- gram<br>size required.  | CAHAA-AF  | 25 gram F-33 with<br>green caps        | Hoff Bonding Straps<br>Mold 7366 BS-2<br>for 1/2-inch hole. | 25 gram P                              |
| Ductile or Cast Iron,<br>Min. 5/8" Hole,<br>Minimum 32- gram<br>size required.  | CAHBA-AF  | 32 gram XF-19 with<br>orange caps      | Hoff Bonding Straps<br>Mold 7366 BS-2<br>for 5/8-inch hole  | 32 gram CI                             |
| <p>Note Pipe Size at end of Mold Number per each pipe size for steel up to 3 1/2" diameter pipe size and for ductile iron for 4" to 24" diameter pipe size for each mold.</p> <p>Utilize Molds for sleeved wire per specifications.</p> <p>Mold sizes for small diameter ductile iron and cast iron shall be adjusted based on actual pipe type and pipe diameter per manufacturer recommendations.</p> |   |  |   |  |

## 2.05 THERMITE WELD CAPS

- A. Primerless Weld Caps: Thermite weld caps shall consist of a minimum 4-inch by 4-inch size prefabricated weld cap filled with elastomeric mastic coating and a layer of protective adhesive with an integrated primer.
1. Primerless thermite weld cap materials for No. 10 AWG and smaller wire connections shall be Handy Cap IP available from Chase Tapecoat/Royston Laboratories, thermOcap "PC" Primed Cap from ThermOweld, or approved equal.
  2. Larger sized primerless thermite weld caps shall be utilized for No. 8 and larger wire and Pin Weld type connections such as the Handy Cap XL IP (extra large) available from Chase Tapecoat/Royston Laboratories, or approved equal.
- B. 100-Percent Epoxy Repair Coating
1. Locations where thermite weld caps are not suitable for use due to physical constraints (i.e. too small of flat area for thermite weld cap) such as on dresser coupling rings, mechanical joint follower gland rings, or "Megalug" type bolted restraint joint rings, will require an 100-percent fast cure epoxy, polyurethane, or polyurea type pipe repair coatings. Acceptable fast cure, high build, low temperature, moisture tolerant, one-hundred percent, pipe repair epoxy material in a two component repair cartridge tubes with a dispensing gun such as Denso North America Protal 7125 Repair Cartridge, or approved equal.

2.06 GROUND CLAMPS

- A. Heavy duty all bronze ground clamps for wire connections to copper service pipe shall be sized to fit the pipe and wire and UL 467 listed for direct burial in earth or concrete. All parts of the clamp shall be bronze including bolts and nuts, as manufactured by Burndy, O. Z. Gedney, Thomas and Betts, or approved equal.

2.07 GALVANIC ANODES

- A. Magnesium Anode:

- 1. High-Potential Magnesium Composition for buried soil applications shall be cast of primary magnesium and meet or exceed ASTM B 843 Grade with Alloy M1C chemical requirements and be:

| ELEMENT        | CONTENT                              |
|----------------|--------------------------------------|
| Aluminum (Al)  | 0.010% maximum                       |
| Manganese (Mn) | 0.500% to 1.300%                     |
| Copper (Cu)    | 0.020% maximum                       |
| Silicon (Si)   | 0.050% maximum                       |
| Iron (Fe)      | 0.030% maximum                       |
| Nickel (Ni)    | 0.001% maximum                       |
| Total Others   | 0.050% each or 0.300% maximum, total |
| Magnesium (Mg) | Remainder                            |

- 2. Prepackaged Magnesium Anode Dimensions:

- a) The anode size and weight may differ slightly because of variations in casting and mold shapes, but shall be the manufacturer's standard and should approximate the following:

| BARE ANODE SIZE         | 17 POUND ANODE                |
|-------------------------|-------------------------------|
| Shape                   | 17D3                          |
| Nominal Bare Anode Size | 3 inches by 25 inches long    |
| Packaged Weight         | 42 pounds minimum             |
| Nominal Package Size    | 6 inch dia. by 29 inches long |

- 3. Magnesium anodes shall be verified with a third party ASTM G97 tests for quality control and meet the following minimum requirements:

- a) Minimum Open Circuit Potential shall be -1.7 volts or more negative to a copper/copper sulfate reference electrode.
- b) Minimum current efficiency shall be 50-percent (50%) efficiency or higher or a minimum 500 amp hours or higher.

- c) Anode suppliers (distributors) shall provide anode manufacturing certificates, manufacturing quality control testing results, and supplier's own third party ASTM G97 test results for each batch of anodes supplied for project.
  - d) For each lot of 500 or more anodes supplied for project, two additional anodes shall be randomly selected by Engineer for anode supplier (distributor) or Contractor to conduct third party ASTM G97 testing on for current efficiency and voltage potential. For each increment of 1,000 or more anodes thereafter, three additional third party ASTM G97 tests shall be conducted.
  - e) The minimum current efficiency should be the range of 48 to 52 percent. If any anodes provided for the project do not pass this or other minimum specified ASTM G97 requirements, then all anodes supplied in that batch or lot shall be rejected and replaced at no cost to the Owner.
4. Acceptable High Potential Magnesium Anodes: Galvomag {Timminco Metals), Magcorp (formerly Amax) Maxmag, Galvotec Alloys, Inc. SuperMAG, Farwest UltraMag, or approved equal.

**B. Zinc Anode:**

- 1. Zinc anodes for buried soil conditions shall meet the requirements of ASTM B 418, Type II, composition as follows:

| <b>ELEMENT</b> | <b>CONTENT</b>  |
|----------------|-----------------|
| Aluminum (Al)  | 0.0050% maximum |
| Cadmium (Ca)   | 0.0030% maximum |
| Iron (Fe)      | 0.0014% maximum |
| Lead (Pb)      | 0.0030% maximum |
| Copper (Cu)    | 0.0020% maximum |
| Zinc (Zn)      | Remainder       |

- 2. Prepackaged Zinc Anode Dimensions

- a) The anode size and weight may differ slightly because of variations in casting and mold shapes, but shall be the manufacturer's standard and should approximate the following:

| <b>BARE ANODE SIZE</b>  | <b>18 POUND ANODE</b>         |
|-------------------------|-------------------------------|
| Shape                   | ZUR-18                        |
| Nominal Bare Anode Size | 1.4 inches by 36 inches long  |
| Packaged Weight         | 70 pounds minimum             |
| Nominal Package Size    | 5 inch dia. by 42 inches long |

C. Prepackaged Galvanic Anode General Requirements:

1. Anode Wire: Supply each anode with No. 12 AWG **STRANDED** copper wire with TW, THWN, THHN or HMWPE TW, THWN, THHN or HMWPE insulation, 10 feet long minimum. Provide longer anode leads as required for test stations to extend splice free from anode to test station location. Lead wire shall be coiled and bound.
2. Wire-to-Anode Connection: The anode connection shall be stronger than the wire. The galvanic anode material shall be cast around a galvanized steel wire, strap, or pipe core. The anode connection to the steel core shall silver-soldered (45% silver) by the manufacturer's standard process and be stronger than the wire. Connection of lead wire to anode shall be electrically insulated with manufacturer's standard waterproof epoxy or electrical potting compound type insulation.
3. Prepackaged Anode Backfill: Backfill shall have a grain size so that 100 percent is capable of passing through a 20-mesh screen and 50-percent will be retained by a 100-mesh screen. The backfill mixture shall be thoroughly mixed and firmly packaged around the galvanic anode within the cloth bag or cardboard tube by means of adequate vibration. The complete packaged galvanic anode shall weigh a minimum of 2.0 times the bare anode weight. The quantity of backfill shall be sufficient to cover all surfaces of the anode to a depth of 1-inch.
4. Packaging and Shipping: Bare anodes shall be centered in cotton bag filled with specified backfill. Provide anode packaged in and shipped and stored in waterproof plastic or heavy multi-walled paper bag of sufficient thickness to protect the anode, wire, backfill, and cloth bag.
5. Compliance Statement: Furnish an independent laboratory analysis certifying that all anode and backfill material supplied meets the requirements of this Specification and specified laboratory testing.
6. Field Verification: At Engineer's option, a galvanic anode may be selected at random for Contractor to provide an independent laboratory analysis on to demonstrate that both anode and backfill material supplied meets the requirements of this Specification.
7. Prepackaged Galvanic Anode Backfill Composition:

| ELEMENT                    | CONTENT    |
|----------------------------|------------|
| Ground Hydrated Gypsum     | 75 Percent |
| Powdered Wyoming Bentonite | 20 Percent |
| Anhydrous Sodium Sulfate   | 5 Percent  |

## 2.08 CATHODIC PROTECTION TEST STATIONS/JUNCTION BOXES

### A. Flush Mounted Test Stations

1. Test Box: Traffic H-10 load rated concrete body cast with a cast iron ring, with a minimum weight of 55 pounds and minimum dimensions of 10-inch inside diameter and 12-inches long. Furnish with locking metallic ring extensions as required to penetrate concrete or pavement surfaces by 4- inches minimum. Furnish with a minimum 12-pound cast iron lid with the letters "TS" or words "CP Test", "Test Station" or similar words cast into the lid.
2. Concrete Box Manufacturer and Products:
  - a) Minimum 10-inch by 12 inch size: Brooks Products Model 3RT Traffic Valve Box; Christy Concrete Products Model G3 Traffic Valve Box or approved equal.
3. Terminal Block: Plastic or glass-reinforced, 1/4-inch thick laminate terminal board with minimum dimensions of 3-inches by 4-inches. Furnish terminal block with a minimum of seven (7) terminals. Terminal nuts and studs shall be 1/4-inch with double nuts for securing the studs to the terminal board. Terminal nuts, studs, flat and lock washers shall be nickel- plated brass, bronze, or Series 300 stainless steel. Manufactured terminal boards such as CP Test NM-7 or approved equal are acceptable.

### B. Shunts:

1. Shunts for test stations and junction boxes shall be:
  - a) Test Station shunts shall be 0.01-ohm, minimum 6 amp capacity: Holloway Type RS 0.01 ohm manganin wire shunt with 6 amp capacity or MCM Miller 0.01-ohm shunt, COTT or T and R (Yellow) 0.01-ohm shunt with 8 amp capacity, or approved equal.
  - b) As shown on Drawings.

## 2.09 MISCELLANEOUS REFERENCE MONITORING EQUIPMENT AND MATERIALS

### A. Prepackaged Copper/Copper Sulfate Reference Electrodes:

1. General: Permanent reference electrode for buried piping locations shall be a copper/copper sulfate reference electrode. Reference electrode dimensions shall be approximately 2-inches in diameter by 7-inches long. Reference electrode shall be suitable for permanent installation and designed for a 15-year minimum life expectancy with an accuracy of plus or minus 5-millivolts.
2. Electrode manufacturer shall warrant electrode for 15-year design life and provide both labor and material replacement, if electrode becomes unstable by more than 20 millivolts during design life.
3. Prepackaging and backfill: Electrodes shall be supplied prepackaged in a permeable cloth bag containing manufacturer's special low-resistivity backfill mixture formulated to retain moisture and maintain electrode stability. Outside dimensions of electrode package shall be approximately 6-inches in diameter by 14-inches long.

4. Lead wire: Supply electrode with a lead wire attached and electrically insulated with the manufacturer's standard connection. The connection shall be stronger than the wire. Lead wire shall be single conductor No.14 AWG or larger stranded copper wire insulated as specified under WIRE, this section. Lead wire shall be of sufficient length (minimum 50') or longer as required to reach splice free from reference electrode to test station. Lead wire shall be coiled and bound.
5. Packaging: Package cloth bag with reference electrode in and shipped and stored in waterproof plastic or heavy paper bag of sufficient mil thickness to protect the electrode, wire, backfill, and cloth bag.
6. Acceptable CU/CUS04 reference electrodes are Farwest Corrosion FWCC Series SP-150; GMC STAPERM Model CU-1-UG; Electrochemical Devices, Inc. Model US CUG Longlife Reference Electrode or approved equal.

#### 2.10 CONDUIT, LOCKNUTS, AND STRAPS

- A. The minimum conduit size shall be 1-inch diameter unless otherwise indicated on the Drawings or specified.
- B. Use intermediate metal conduit, including couplings, elbows, nipples, and other fittings, hot-dipped galvanized and meeting the requirements of UL and the NEC. Do not use setscrew type couplings, elbows, and nipples unless approved by the Engineer.
- C. Heavy wall rigid PVC conduit shall be Schedule 40, UL listed for concrete-encasement, underground direct burial, concealed and direct sunlight exposed use. Use conduits, couplings, elbows, nipples, and other fittings meeting the requirements of NEMA TC and TC 3, Federal Specification W-C-1094, UL, NEC, and ASTM specified tests for the intended use.
- D. Flexible metal conduit shall be UL listed, liquid-tight flexible metal conduit consisting of galvanized steel flexible conduit covered with an extruded PVC jacket and terminated with nylon bushings or bushings with steel or malleable iron body and insulated throat and sealing O-ring.
- E. Locknuts, two-hole straps, and other miscellaneous hardware shall be galvanized steel. Galvanized items shall be hot-dipped galvanized in accordance with ASTM A153. Galvanized hardware shall not be used underground or in immersion service.
- F. Conduit bushings shall be threaded plastic or plastic-throated galvanized steel fittings.

#### 2.11 WIRE CONNECTIONS AND SPLICE MATERIALS

- A. Compression Connectors: Compression connectors for in-line, multi-splices, and tap splices shall be "C" taps made of conductive wrought copper, sized to fit the wires being spliced. Compression connectors shall be applied with the crimp tool and die recommended by the manufacturer for the wire and tap connector size. Acceptable Type "YC" wire compression connectors as manufactured by Burndy Co., or approved equal. Inline "butt" type wire splice connectors or wire nuts are **NOT** acceptable. Split bolts are acceptable only if silver soldered after a physical connection is made and both the wires are equal to or smaller than No. 10 AWG size.

- B. Silver Brazing Alloy: Brazing Alloy with minimum 15 percent silver content, 1185 to 1300 degrees F melting range. Provide suitable silver brazing alloy and flux recommended by manufacturer for materials being connected (i.e. copper to stainless steel, copper to steel, and/or copper to copper, etc.).
- C. Splice Kits: Epoxy splice kit shall be type suitable for abovegrade and buried applications and rated for non-shielded cables up to 5 kV and multi-conductor cables through 1,000 volts. Splice kit shall consist of snap together plastic mold sized to fit around splice, funnels, tape for sealing ends of mold, and two-part epoxy resin in a single pouch for mixing. Epoxy resin shall be electrical insulating type that will harden (cure) with time, 3M Scotchcast 4 Epoxy Resin, or approved equal. In-Line splice insulating kit for insulation repair shall be epoxy resin, 3M Company Scotchcast; or approved equal.
- D. Electrical Splicing Tape: Tape for wire splice insulation shall be 30 millinerless rubber high voltage splicing tape, Scotch 130C; and 7 mil vinyl electrical tape, Scotch Super 33+; suitable for moist or wet environments, as manufactured by 3M Products; or approved equal. Minor insulation repair may be made with Royston Splice-Right Kit, or approved equal.
- E. Wire Connector Terminals: A ring tongue terminal or single hole solderless lug (Lug-it) type connector shall be installed on the end of all stranded wire before connecting it to test station, terminal box, or junction box terminal studs.
1. Wire connector terminals shall be sized to fit wire and stud size and be suitable for use with copper conductors.
  2. One-piece heavy duty tin-plated copper crimp-on ring tongue terminal. Acceptable ring tongue wire connectors are manufactured by Anderson, Blackburn, Burndy Co., 3M, Panduit, Thomas and Betts {T and B), IDEAL, or approved equal.
  3. Single hole seamless copper Lug-it type connector rated shall be UL listed for 600 volt service with off-set tongue suitable for wire size being terminated.
    - a) Acceptable No. 4 and No. 2 AWG wire single hole solderless lugs Burndy L125, Thomas and Betts BTC0208-B2, or approved equal)
    - b) As manufactured by Anderson, Blackburn, Burndy, Thomas and Betts (T and B), or approved equal.
  4. Wire forked end type terminals are **NOT** acceptable.
  5. Acceptable one hole non-insulated copper crimp wire lug terminals sizes for %-inch stud sizes are listed below or approved equal:

| STRANDED COPPER WIRE RING TONGUE TERMINAL CONNECTORS |                   |                        |           |             |                              |
|--|-------------------|------------------------|-----------|-------------|------------------------------|
| STRANDED CABLE SIZE                                  | BOLT OR STUD SIZE | MANUFACTURER AND MODEL |           |             |                              |
|  |                   | Anderson               | Blackburn | Burndy      | T and B                      |
| No. 14 to 20 AWG                                     | 1/4"              | ----                   | ----      | YAV14 Box   | Series 54100<br>Model C10-14 |
| No. 10 or 12 AWG                                     | 1/4"              | ----                   | ----      | YAV10 Box   | Series 54100<br>Model C10-14 |
| No. 8 AWG  | 1/4"              | ----                   | CTL8-14   | YA8C-L Box  | 54130                        |
| No. 6 AWG  | 1/4"              | VHCS-6-14              | CTL6-14   | YA6C-L Box  | 54105                        |
| No. 4 AWG  | 1/4"              | VHCS-4-14              | CTL4-14   | YA4C-L Box  | 54106                        |
| No. 2 AWG  | 1/4"              | VHCS-2-14              | CTL2-14   | YA2C-L2 Box | 54107                        |

- F. Electrical Sealer: Provide electrical sealer Ivy-spray Type Scotch 1603, manufactured by 3M Company, Royston Protective Coating Product Data No. 614 from Royston Laboratories, or approved equal.
- G. Electrical Connectors: Hardware used in electrical connections including bolts, studs, nuts, washers, and lock-washers shall be tin or nickel plated copper, brass, bronze, or 300 series stainless steel for electrical conductivity and atmospheric corrosion resistance.

#### 2.12 PLASTIC CONDUIT SHEATHING

- A. Plastic conduit for cathodic protection cable sheathing for cathodic protection cables or wires shall be 1-inch minimum diameter Schedule 40 polyethylene (PE) or polyvinyl chloride (PVC) plastic pipe.

#### 2.13 INSULATING JOINTS

- A. General:
  - 1. Insulating joints shall be dielectric unions, flanges, or couplings. The complete assembly shall have an ANSI rating equal to or higher than that of the joint and pipeline. All materials shall be resistant for the intended exposure, operating temperatures, and products in the pipeline.
- B. Copper Service Line Insulators:
  - 1. Insulated service fittings shall consist of brass union body that encapsulates nylon insulator specially designed to provide electrical isolation for this type of intended use:
    - a) Insulated corporation ball valves, insulated curb ball valves, and Service Line Insulators shall be provided to insulate copper or metallic service lines.
    - b) Insulated Mueller Series 300 Service Line Insulators, Specific Model Number will depend on designated insulator location and piping connections.

2. Consult manufacture for model number and installation procedures for each application. Acceptable Insulated Mueller Series 300 Service Line Insulators are available from:
  - a) Mueller Co., Decatur, IL (800-423-1323).
  - b) Or approved equal.

#### 2.14 INSULATING FLOOR AND WALL SLEEVES AND MODULAR SEALS

- A. Wall Sleeves: Pipe wall sleeves shall be provided at all wall and floor locations in accordance with pipe and sleeve manufacturer's recommendations. The pipe wall sleeves shall be of sufficient thickness to resist any deformation. The pipe wall sleeves shall be round with a maximum+/- 1/8-inch variation in diameter allowed. The wall sleeve shall be a minimum wall thickness of 0.375-inch or standard wall thickness. The minimum width of the wall sleeve shall be per the modular seal manufacturer's recommendations to meet minimum width requirements based on seal type and pipe diameter and weight. Pipe wall sleeves shall be provided with a minimum two-inch (2") or three-inch (3") water stop collar that evenly contacts the wall or floor opening all the way around for a minimum length of one-inch (1") or more if recommended by the sleeve manufacturer. The water stop (collar) shall be of the same type of material as the wall sleeve. The wall sleeve shall have a smooth continuous weld with no welding slag or rough or high welds. The water stop collar shall be continuously welded on both sides of the collar for the entire circumference of the wall sleeve. The wall sleeve and the water stop collar shall be positioned such that it is located in the center of the structure wall or floor, when the wall sleeve is positioned in place. Steel wall sleeves and water stop collars shall be coated. The wall or floor penetration diameter and width shall be sized sufficiently to allow correct installation of the wall sleeve and water stop. Wall penetrations and wall sleeves types and sizes shall be coordinated with sleeve manufacturer, modular seal manufacturer, and pipe manufacturer to provide proper type of opening to provide a liquid tight connection. Wall pipe sleeves placed around pipe and grouted in place in accordance with sleeve and pipe manufacturer's recommendations are an acceptable method of wall openings. Coordinate wall sleeve type, model, size, and location with modular seal and pipe manufacturers.
- B. Insulating Wall or Floor Modular Seals. Insulating wall and floor seals shall be adjustable modular mechanical type seals able to provide a positive seal (liquid tight) and long lasting electrical insulation for wall or floor penetrations for pressures up to 40-feet of static head. Coordinate with and provide pipe and modular seal manufacturer's recommended modular seal type and size for pipe type, pipe diameter, casing or hole opening size, environmental exposure, operating temperature, and intended installation conditions. The modular seal shall be sized, shaped and constructed to continuously fill the annular space between the pipe and the wall opening to form a long lasting liquid tight seal and to maintain electrical isolation. Coordinate type, model, size, and location with modular seal, wall sleeve, and pipe manufacturers.
  1. The modular seals shall consist of synthetic rubber bolted links, heavy duty reinforced high density nylon polymer plastic pressure plates, and Type 316 stainless steel hardware (bolts, nuts, washers, etc.) for adjustment. The modular seals shall be manufactured at a plant with a current ISO-9001 registration which shall be included as part of the submittal.

2. The rubber links shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and the opening. The individual links shall be colored and permanently identified with the manufacturer's name and model number. The link shall be sized per the manufacturer's recommendations. The links shall have the following properties per ASTM standards for standard type applications (-40 degrees to 250 degrees F) Model C EPDM = ASTM 02000 M3 BA510 Black.
  3. The pressure plates shall be molded glass reinforced nylon polymer with an integrally molded compression assist boss on pressure plated top side (bolt entry side). The pressure plate shall incorporate an integral recess ("Hex Nut Interlock") to accommodate commercially available fasteners. The individual pressure plates shall be colored and permanently identified with the manufacturer's name. The pressure plate shall be sized per the manufacturer's recommendations. The links shall have the following properties per ASTM standards for standard type applications:
    - a) ASTM D-256 Izod Impact= Minimum 2.05 foot-pound/inch
    - b) ASTM D-790 Flexure Strength at Yield= Minimum 30,750 PSI
    - c) ASTM D-790 Flexure Modulus= Minimum 1,124,000 PSI
    - d) ASTM D-638 Elongation Break= Minimum 11.07%
    - e) ASTM D-792 Specific Gravity= Minimum 1.38
  4. The modular seal hardware shall be sized according to the seal manufacturer's recommendations depending on the size and type of modular seal. The 316 stainless Steel hardware shall have the following properties per ASTM standards for standard type applications including ASTM F593 with an average tensile strength of a minimum 85,000 PSI.
- C. Small Diameter Modular Wall Seals: Acceptable modular wall seal insulators (up to 24-inch) are:
1. PSI Thunderline Link-Seal Model LS-300 or LS-400 available from Pacific Seal and Insulator, Inc. (PSI) Houston, TX. (800-423-2410).
  2. Pipe Linx Model PL-300 or PL-400 available from Calpico, Inc. South San Francisco, CA. (650-588-2241).
  3. Innerlynx Model IP-300 or IP-400 available from Advance Products and Systems, Inc., Lafayette, LA (800-315-6009).
  4. Or approved equal.
- D. Wall sleeves passing through walls of structures containing liquids shall be provided with double sets of modular wall seals to provide pipe support at the penetration and protection against leakage.

## 2.15 FITTINGS LINING AND COATINGS

- A. Supply pipe and fittings with linings and coatings of the same type as adjacent pipe, except where shown on the Drawings. Coat pipe and fittings installed as required in as specified herein.

- B. Coat metallic pipe and fittings installed above-grade as specified herein. Provide exterior coating for all above-grade piping, fittings, bollards, and vent pipes with two coats of polyamide epoxy coats at 2.5 to 3.5 mils dry film thickness per coat (MDFTPC) and with one top coat of polyurethane enamel at 3 to 4 MDFT or with a 6 to 8-mil fusion bonded epoxy coating system. Minimum surface preparation shall be near-white metal blast (SSPC SP-10) for external surfaces. Color as selected by Owner.
- C. Coat and line all buried metallic (steel, ductile iron, and cast iron) valves, fittings, miscellaneous piping, and hydrants internally and externally. Supply factory coated valves and fittings with linings and coatings of the same type as adjacent above grade pipe, except where shown on the Drawings or where coating or lining specified for buried main pipeline is not feasible for fabricated items or special pipe pieces (such as incidental metallic piping, valves, fittings, tees, flexible couplings, glands, hydrants, etc.).
- D. Factory coat or line the incidental piping, valves, or fittings with liquid epoxy or with fusion-bonded epoxy coating in accordance with AWWA C210, AWWA C213, AWWA C116, or AWWA C550. Internal coatings shall be NSF approved for potable water service. Bolts, nuts, and washers, (including in valve bonnet and stuffing box) shall be fusion-bonded epoxy coated or Series 300 stainless steel.
- E. Internal linings and coatings in contact with water shall be NSF approved for potable water service.
- F. All ferrous interior mounting faces/surfaces shall be prepared and shop primed with a suitable rust-inhibitive holding primer applied in accordance with this specification and the coating manufacturer's recommendations. Holding rust-inhibitive primer shall be compatible with specified top coats. Apply per coating manufacturer's recommendations to a thickness that will not impair the clearances required for proper installation of the joint or fitting (valve) operation.
- G. Ductile Iron and Cast Iron Factory Coating Surface Preparation: Use SSPC SP grades as surface preparation guide only as it applies to cast iron or ductile iron in percentage cleanliness required and surface contaminants removed, not the color of the metal. The abrasive blast cleaning operation shall remove the same percentage of all surface contaminants (including tightly adhered annealing scale) as the SSPC SP grade referenced. The entire surface area shall be abrasive blasted. No tight rust stains shall be allowed. Avoid overblasting, high nozzle velocities, and excessive blast times. Cast iron and ductile iron attain a gray color when abrasive blasted due to the higher carbon content compared to steel. For example if a SSPC SP-10 Near White Grade is specified for cast iron or ductile iron, the degree of surface cleanliness is comparable to a near white blast for steel and requires 95 percent removal of all surface contaminants including tightly adhered annealing scale. The one exception is that the ductile or cast iron will not be required to be near-white but will only be required to be a near-gray color.

- H. Liquid Epoxy: Provide factory applied liquid epoxy lining and coating in accordance with AWWA C210 and AWWA C550 and these specifications. Epoxy material shall meet the performance requirements of the referenced AWWA standards. Epoxy material shall be the product of a coating manufacturer normally engaged in production of such material and shall be for intended service conditions. The liquid epoxy coating shall be a two part chemically cured coating or 1DO-percent material. Coating shall be mixed and applied per coating manufacturer's directions. Liquid-epoxy lining of metallic pipe and fittings shall be potable grade epoxy coating approved for potable water contact and this type of intended service. Abrasive blast with material and in manner as recommended by coating manufacturer to produce surface profile depth and angular shape needed. Surface preparation shall be a minimum of SSPC SP-5 (White) for immersion service and SSPC SP10 (Near White) or better for external service. Coating shall be a minimum of two or more coat system with a minimum thickness of 8 to 12 mils dry film thickness (MDFT). Minimum adhesion to prepared steel shall be 400 psi per ASTM 01002 or per coating manufacturer's printed literature, whichever is higher.

| LIQUID EPOXY   | ICIDEVOE                             | SHERWIN-WILLIAMS                   | TNEMEC   |
|--|--------------------------------------|------------------------------------|--|
| Liquid Epoxy AWWA C210 and AWWA C550 (Coating in contact with potable water surfaces shall be approved for potable water contact and conforming to NSF Standard 61)                    | Bar-Rust 233 H                       | 4.53 Macropoxy 646                 | Pota-Pox Series 20<br>or<br>Pota-Pox Plus Series N140F<br>or<br>Pota-Pox Plus 80 Series N141 |
| Above grade Structures Only - Polyurethane Enamel Top Coat Two-component, aliphatic or acrylic based polyurethane; high gloss finish suitable for the intended service, Color by Owner | Devthane 379 UVA Polyurethane Enamel | 5.21 Hi-Solids Polyurethane Enamel | Series 1074 U Endura-Shield Aliphatic Acrylic Polyurethane                                   |

- I. Fusion-Bonded Epoxy: Provide factory applied fusion-bonded epoxy lining and coating in accordance with AWWA C213, AWWA C116, and AWWA C550, and these specifications. Fusion-bonded epoxy material shall meet the performance requirements of the referenced AWWA standards. Fusion-bonded epoxy material shall be the product of a coating manufacturer normally engaged in production of such resin and shall be for intended service conditions. The fusion bonded epoxy coating shall be a 100 percent powder epoxy based thermosetting coating. Coating shall be applied by flocking, fluidized bed, or electrostatic method per coating manufacturer's directions. Fusion-bonded epoxy lining of metallic pipe and fittings shall be potable grade epoxy coating approved for potable water contact and this type of intended service. Abrasive blast with material and in manner as recommended by coating manufacturer to produce surface profile depth and angular shape needed. Surface preparation shall be a minimum of SSPC SP-5 (White) for immersion service and SSPC SP10 (Near White) or better for external service. Fusion bonded epoxy coating shall be one or two-coat system with a minimum thickness of 6 to 8 mils dry film thickness (MDFT). Minimum adhesion to prepared steel shall be 3,000 psi per ASTM 01002 or per coating manufacturer's printed literature, whichever is higher.

| Fusion-Bonded Epoxy  | 3M Scotch Coat   | Herberts O'Brien Nap Gard DuPont Powder Coatings             | Valspar   |
|--|--|--|---|
| Fusion Bonded Epoxy AWWA C213, AWWA C116, and AWWA C550 (Coating in contact with potable water surfaces shall be approved for potable water contact and conforming to NSF Standard 61) | Scotchkote 206N (NSF 61 Internal and External) or Scotchkote 6233 for pipe | Nap-Gard 7 -2500 Pipe Coating (NSF 61 Internal and External) | Pipeclad 3100 Red (NSF 61 Internal and External) or Pipeclad 2000 Green (External Only) |

- J. Provide repair kits for epoxy-coated materials.
- K. Provide stainless steel materials or coat all other miscellaneous buried metallic items, (tie rods, thrust restraints, tapping saddles, harnesses, etc.). Coat tie rods and rebar when directly exposed to soil. Provide with factory applied epoxy coating, fusion bonded epoxy coating, heat shrink sleeves, or with coating recommended by coating manufacture for buried application and approved by Engineer for intended exposure.
- L. Galvanized or black steel materials (piping, nipples, unions, fittings etc.) shall not be used in wet, immersed, or buried locations or vaults unless coated as specified.
- M. Restrained fittings (wedge assemblies, casting bodies, etc.) may also be pretreated and coated with a thermosetting powder coating at minimum 5 to 7 mils dry film thickness (MDFT) with EBAA Iron Mega-Bond Restraint Coating System, or approved equal.

2.16 FASTENERS (BOLTS, NUTS, WASHERS)

- A. All fasteners (bolts, nuts, tee bolts, and washers) type, size, and strength shall be as designed for the application. All nuts shall be fully seated. Nuts shall be compatible with the bolts and have a proof stress equal or greater than the tensile strength of the bolts. Minimum bolt size, lengths, and tensile shall be as designed for the application.
- B. All fasteners installed below-grade (either buried, submerged, or immersed in vaults) shall either be Stainless Steel Series 300 or coated with an approved fastener coating system. Series 300 stainless steel materials shall be provided in place of coated items, where specifically called out as being required in specific specification sections or applications.
- C. Stainless Steel Fasteners (Bolts, Nuts, and Washers, etc.)
  - 1. Stainless steel bolts, tee bolts nuts, and washers shall be as a minimum Series 304 or Series 316 as specified for that specific environment.
  - 2. Stainless steel bolts and nuts shall be provided with an anti-galling lubricating compound or coated with a 1-mil fluoropolymer or equal fastener coating system to aid in preventing galling.
- D. Bolts and nuts shall be adequately labeled to provide traceability of the material and producer. The identification mark shall be cast, forged or stamped on the bolt and nut. Painted markings are not acceptable. The bolt and nut manufacturer shall provide information on the type of material provided and corresponding identification mark, and country of origin. Markings and traceability requirements shall be in accordance with The Industrial Fasteners Institute and AWWA guidelines.

- E. All bolts and nuts shall be installed according to manufacturer's requirements including the use of anti-galling lubricant compound or use of a thermosetting fluoropolymer type coating for stainless steel materials. If galling or seizing of the nut and bolt occurs they shall be cut off and replaced with a new nut and bolt. Exercise care to assure tightening of the nut is against the flange or gland and not due to galling or seizing.

#### 2.17 STAINLESS STEEL FABRICATION AND PASSIVATIONS

- A. Utilize Type L grade stainless steel for all items to be welded.
- B. During fabrication, handling, and installation take necessary precautions to prevent mild carbon steel impregnation of stainless steel members.
- C. Utilize brushes (stainless steel, non-metallic), grinding wheels (aluminum oxide discs), and tools intended for stainless steel and not used previously for carbon steel work.
- D. Degrease and clean prior to welding with non-chlorinated solvents.
- E. Weld stainless steel with approved materials and techniques.
- F. Clean and remove contamination, remove weld heat tint, and repassivate welds per ASTM A380 and ASTM A967.
- G. After treatment visually inspect surfaces for compliance.
- H. Pack stainless steel parts and pad mild steel fork lift forks and use straps instead of metal chains to handle stainless steel parts to avoid iron contamination of stainless steel.
- I. After installation, visually inspect stainless steel surfaces for evidence of iron cross contamination, rust, oil, paint, and other forms of contamination. Repair as required and reinspect.

#### 2.18 PIPE AND FITTING FIELD COATING REPAIR MATERIALS

- A. Field repair coating shall be compatible with factory coating and linings and be approved by factory coating manufacturer for repair on their products.
- B. Field Coating Repair Materials:
  - 1. Heat Shrink Sleeve and Sleeve Repair Materials: Heat shrink sleeve repair materials shall consist of either heat shrink sleeve in tube form or heat shrink patch kit depending on size and shape of repair. Acceptable heat shrink products are Raychem WaterWrap sleeve or PERP Repair Patch Kit available from Tyco Adhesive (Polyken Kendall) Mansfield, MA.;

CANUSA Aqua-Shield Aqua-Sleeve or CANUSA CRPK Repair Patch Kit available from CANUSA, Inc., The Woodlands, TX.; or approved equal.

2. Tape: Cold-applied field repair polyethylene repair type coatings shall consist of suitable primer and minimum 35-mil thick patch/repair/joint tape with aggressive adhesive and release liner, 4 or 6-inches width. Suitable primer shall be provided with the repair coatings as recommended by the repair-coating manufacturer. Acceptable products are Tapecoat H35 Gray available from The TAPECOAT Company, Evanston, IL.; Polyken 1027 primer and Polyken 934-35 tape available from Tyco Adhesive (Polyken Kendall) Mansfield, MA.; Tek-Rap 200-23 Series primer and Tek-Rap 280 tape available from Tek-Rap, Inc., Houston, TX.; or approved equal.
  3. Epoxy Coatings: Provide acceptable a high or 100 percent epoxy coatings that can cure under wet or dry conditions are "A-788 Splash Zone Compound" by Koppers, Pittsburgh, PA; "Aquata Poxy" by Raven (King Adhesive Corporation), St. Louis, MO; "Concresive No. 1438 or No. 1170" by Adhesive Engineering Company, San Carlos, CA; Protal 7125 Repair Coating by Denso North America, or approved equal.
  4. Four layer petrolatum wax-tape system (AWWA C-217) intended for burial conditions. Acceptable petrolatum coating systems are STAC Coating System as manufactured by Central Plastics Company, Shawnee, OK.; Denso Pipe and Fittings Petrolatum System as manufactured by Denso Products, Houston, TX.; No. 1 Wax-tape Coating Systems for buried locations and No. 2 Wax-tape Coating Systems for above grade and vault applications as manufactured by The Trenton Corporation, Ann Arbor, MI; or approved equal.
- C. Buried Insulated Coupling Top Coating System at Concrete Encasement Locations:
1. Provide heat shrink top coating system for buried insulators and concrete encase up to insulator location as shown on the drawings.

## 2.19 PETROLATUM FIELD TAPE COATING

- A. Provide a petrolatum-based tape coating system for field coating of existing piping or fittings as specified with polyethylene encased option if not factory coated with a tight bonded coating already. Petrolatum-based field tape coating system shall be cold-applied, surface tolerant petrolatum coating suitable for coating of irregular shapes in accordance with AWWA C217. System shall contain no volatile organic compounds and applied in accordance with this specification section.
- B. Petrolatum primer shall consist of saturated petroleum hydrocarbons (petrolatum), inert fillers, and passivating agents. Primer shall be formulated to displace moisture, passivate surface, and promote adhesion with mastics and tape topcoats. Primer type shall be provided that can be applied over moist or wet surfaces. Acceptable petrolatum primers are Dense Paste; Trenton Temcoat or Wax-Tape Primer; or approved equal.
- C. Petrolatum mastic shall be a putty-like compound for profiling or molding around irregular shapes and fill voids to provide a suitable profile for tape application. The profiling mastic shall consist of self-supporting cold applied mastic of saturated petroleum hydrocarbons (petrolatum), inert fillers, reinforcing fibers, thermal extenders, flow control additives, and may contain beads of cellular polymers depending on manufacturer. Mastic shall be formulated to displace moisture and be self-sealing and non-hardening. Acceptable petrolatum mastics are Dense Mastic; Trenton Fill Putty Mastic; or approved equal.

- D. Petrolatum tape shall consist of non-woven synthetic fiber carrier with no chemical impurities suitable for application over irregular surface profiles. Fiber carrier shall be fully impregnated and saturated with neutral petroleum based compounds, inert siliceous fillers, and inhibitors. Tape shall be formulated to displace moisture, form a corrosion barrier, and be highly impermeable to water, water vapor, and gasses. The tape shall be a minimum of 40 Mils thick.
1. For below-grade applications, tape shall be able to maintain stability and plasticity over a wide temperature range, and be non-hardening and non-cracking. Acceptable below-grade petrolatum tapes are Dense Petrolatum Tape, Trenton Wax Tape No. 1, or approved equal.
  2. For above-grade applications, tape shall be able to maintain stability in atmospheric application. Tape shall be able to top-coated or be provided in colors suitable for architectural color coding and cosmetic applications. Acceptable above-grade petrolatum tapes are Trenton Wax Tape No.2, or approved equal.
- E. Outerwrap tape shall be utilized for all burial locations. Outerwrap tape shall provide physical protection to petrolatum tape layers. Acceptable outerwrap tapes are Dense PVC Tape; Trenton Poly-Ply, Glas-Wrap, or Guard-Wrap; or approved equal.
- F. Petrolatum mastic and tape can be provided in suitably sized sheets, pads, or roll form per manufacturer's recommendations for particular application.
- G. Acceptable petrolatum coating systems are:
1. STAG Coating System manufactured by Central Plastics Company, Shawnee, OK. (800-654-3872);
  2. Denso Pipe and Fittings Petrolatum System as manufactured by Denso Products, Houston, TX; (281-821-3355)
  3. PETROL Petrolatum Tape Wrap Coating System as manufactured by Sherwin-Williams, Co., Cleveland, OH. (800-321-8194);
  4. TC Envirocoat System, as manufactured by The TAPECOAT Company, Evanston, IL. (708-866-8500);
  5. Trenton No. 1 Wax-tape Coating Systems for buried locations and Trenton No.2 Wax-tape Coating Systems for above grade and vault applications as manufactured by The Trenton Corporation, Ann Arbor, MI (734-424-3600);
  6. Or approved equal.

## 2.20 CORROSION TEST EQUIPMENT

- A. Obtain and furnish the following equipment and materials for all projects with three (3) miles or more of pipe, before construction begins:
1. One Heavy Duty, Digital Multimeter, (10 amp maximum), with case and test leads. Fluke Model No. 27 as manufactured by John Fluke Mfg. Co., Inc. Everett, WA.; Wavetek Model HD-110B as manufactured by Wavetek Instruments (formerly Beckman) San Diego, CA; or approved equal.

2. Two Copper-Copper Sulfate Reference Electrodes with cone shaped tip, Model 6B as manufactured by Tinker and Razor, San Gabriel, CA; Model RE-5C as manufactured by MCMILLER Co., Vera Beach, FL; or approved equal.
3. One 32 oz bottle of Copper-Copper Sulfate Anti-Freeze Solution as manufactured by Tinker and Razor, San Gabriel, CA; M C MILLER Co., Vera Beach, FL; or approved equal.
4. One 3/4 pound bottle of Copper-Copper Sulfate Crystals as manufactured by Tinker and Razor, San Gabriel, CA; M C MILLER Co., Vero Beach, FL; or approved equal.

## PART 3 EXECUTION

### 3.01 GENERAL

- A. All materials and equipment associated with pipe connecting wires, joint bonding, test stations, reference electrodes, galvanic anodes, insulating joints, and casing insulators as shown and specified herein shall be furnished and installed by the Contractor.
- B. Coordinate installation of the specified work as necessary such that installation of the items herein specified can be completed concurrently with pipeline installation. Test leads shall be installed only during pipe installation. Items not installed before backfilling of the pipe shall be installed at the Contractor's sole expense. Additional excavation of pipe after backfilling shall be minimized to protect pipe and coating from possible damage. Galvanic anodes shall be only installed at same time as metallic pipe or metallic fitting installation.
- C. Nothing included or omitted in this specification shall relieve the Contractor of the obligation of providing a complete and satisfactory pipeline that is electrically continuous, electrically isolated, and provided with a functioning cathodic protection system with test stations as specified.
- D. The Contractor shall examine all Drawings and coordinate his work so as to avoid conflicts, errors, delays, and unnecessary interference with construction of the facilities and to avoid duplication of the work such as excavation, backfilling, etc.
- E. All work shall present a neat and finished appearance. Any changes in the design or method of installation of an item as specified shall be reviewed and approved by Engineer prior to installation.
- F. In the event of any conflicts in the Drawings or Specifications, the Engineer shall be consulted. 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 in writing for review as soon as practical.
- G. Weather Conditions:
  - 1. Installation of the corrosion protection system components, such as splices, bonds, and wire installation shall only be allowed when ambient temperature are above ten degrees (10°) F. (-12° C.) and rising to minimize wire and insulation damage.
  - 2. Materials can be stored in covered and heated storage units to maintain minimum temperatures above restricted temperature limits.
- H. Do not cadweld or utilize open flame or torches in areas of flammable vapors or air borne particles, where a fire or explosion could result.
- I. Install and work around above grade and buried AC powerlines and oil and gas pipelines with extreme care, follow minimum separation distances per foreign company requirements and regulations. Do not work next to powerlines during times of high lightning activity.
- J. Installations shall be completed according to the National Electrical Code (NEC), as specified in this section.

### 3.02 MATERIAL STORAGE AND HANDLING

- A. Store materials in secure, protected location in accordance with material manufacturer's recommendations. Store thermite weld materials, reference electrodes and prepackaged galvanic anodes off the ground and keep them dry at all times. Protect against weather, condensation, and mechanical damage. Handle with care to prevent damage. Wire shall not be sharply bent or tightly coiled to minimize possibility of damage to the wire insulation during manufacture, shipment, or installation. Equipment or materials damaged in shipment or in the course of installation shall be replaced. Immediately remove from site all mechanically damaged materials. Prepackaged corrosion control items shall be handled with care to prevent loss of backfill material. Do not lift, lower, or hold anodes and reference electrodes by the lead wire.
- B. Do not allow reference electrodes to freeze. Store in protected area off the ground and use before expiration date.

### 3.03 PIPE JOINT AND FITTING BONDING

- A. To form an electrically continuous pipeline and associated appurtenances; the joints of all buried metallic pipe, vault, and manhole piping; and all appurtenances, tees, elbows, restrained joints, valves, and fittings including hydrant and blow-off piping; shall be electrically joint bonded. All joints including all bolted and restrained joints shall be joint bonded, except those joints specified to be threaded, welded, or insulated. Blow off and hydrant pipe and fittings shall also be bonded. Do **NOT** joint bond across insulating joints.
- B. Various components of metallic fittings (thrust restraint devices, follower rings or glands, etc.) on plastic or ductile iron pipelines shall be bonded together to provide an electrically continuous fitting or appurtenance.
- C. Install a minimum of one insulated No. 12 AWG stranded copper metallic fitting joint bond wires for all metallic fittings or appurtenances on plastic or metallic pipelines for electrical continuity redundancy. Place metallic fitting bond wires on top quadrant of pipe or fitting to bolt pattern area or where flange edges are to minimize damage to internal coating or joint materials. Bonding can be completed above grade prior to fitting assembly.
- D. Wire connections to pipes or fittings shall be as specified under WIRE CONNECTIONS.
- E. Install one insulated joint bond wire or bond strap per joint on all pipe or fittings 10 inches in diameter or smaller. Install a minimum of two or more insulated joint bond wires or bond straps per joint on all pipe or fittings 12 inches in diameter or larger for redundancy. Pipe joint bond wire size may be No.4 AWG on pipe sizes equal to or smaller than 15-inch diameter. Insulated joint bond wires or coated or bare copper straps may be utilized depending on joint coating type. Place bond wires on top quadrant of pipe.

F. Minimum number of bond wires or straps per pipe size is as follows:

| Pipe or Fitting Size<br>(Diameter Inches)   | STRANDED COPPER INSULATED JOINT BOND WIRES |   |
|---|--|---|
|   | Minimum No. of Joint Bond Wires Required   | Minimum Joint Bond Wire Size Required                               |
| 10-Inch or Smaller Pipe   | 1 Bond Wires                               | No. 4 AWG   |
| 12-Inch to 15-Inch Pipe   | 2 Bond Wires                               | No. 4 AWG   |
| 16-Inch to 36-Inch Pipe   | 2 Bond Wires                               | No. 2 AWG   |
| 40-Inch to 54-Inch Pipe   | 3 Bond Wires                               | No. 2 AWG   |
| Bonding of 10-Inch or Smaller Fitting Glands or Following Rings to Main Fitting Body                        | 1 Bond Wires                               | No. 12 AWG  |
| Bonding of 12-Inch to 20-Inch Fitting Glands or Following Rings to Main Fitting Body                        | 2 Bond Wires                               | No. 12 AWG  |
| Bonding 16-Inch or Smaller Size Fittings Together (less than 10' apart) (max. 3 fittings)                   | 2 Bond Wires                               | No. 12 AWG Between Isolated Fittings on Galvanic Anode Systems ONLY |
| Note: For larger pipe sizes additional bond wires or straps will be required as calculated by the Engineer. |  |   |

G. Bond bolted restrained type joints, multiple segmented fitting sections, and metallic gland connection pieces on fittings on plastic pipe, and metallic pipe into cathodic protected metallic fittings or pipe with No. 12 AWG stranded insulated copper wires with sleeves according to table above. Length of pig tail bond wire as required. Bond across the joint with the specified number and larger sized bonds listed above based on pipe size and material.

H. Joint bonding of cast iron soil pipe not required unless specifically shown on Drawings. Joint bonds for cast iron soil pipe and fittings and high silicon cast iron pipe and fittings shall be in accordance with the manufacturer's recommendations.

I. Bronze wedges, restrained joints, bolted or compression sleeved wires or copper straps, thrust restraints, or welded "Z" bars are **NOT** acceptable methods of achieving electrical continuity.

### 3.04 WIRE CONNECTIONS

A. The electrical connection of copper wire or copper strap to metallic (steel, cast iron, and ductile iron) surfaces shall be by the thermite weld method. Prepare surface and make connections in accordance with the thermite weld manufacturer's recommended procedures and these specifications, whichever one is more stringent.

B. Provide adequate ventilation and safety equipment (gloves, safety glasses, etc.) and follow safety and training requirements as recommended by the thermite weld material manufacturer. Avoid contact with hot materials. Remove or protect fire hazards in the area during the thermite welding operations.

- C. Assure that pipe or fitting wall thickness is of sufficient thickness that the thermite weld process will not damage the pipe or fitting wall's integrity or damage the lining in any way. Do not use on Cast Iron Soil Pipe (ASTM 74-93)
- D. Complete thermite weld connections at locations and in a manner that does not damage sealing materials, gaskets, plastic pipe, and/or coatings.
- E. Complete thermite weld wire connections on horizontal surfaces, if at all possible. Connections to vertical surfaces should be minimized and only if approved by Engineer. Conduct horizontal type installation to fire hydrant risers and pipe stubs in horizontal positions above grade prior to installation in excavations.
- F. All connections to stainless steel materials, copper, and light wall steel tubing (0.035-inch or less), shall be either with a silver soldered connection (silver brazing) or a physical type connection.
  - 1. Attach copper wire to copper service lines with grounding clamp.
  - 2. Connections to stainless steel fittings and appurtenances can be made with a ring tongue terminal placed under a bolt or a soldered connection as approved by the Engineer. Cadweld connections to stainless steel are NOT allowed.
- G. Thermite Weld or Cadweld Method.
  - 1. The Contractor is responsible for repair of any damage to pipe, fitting, lining, or coating as a result of the thermite weld process.
  - 2. Make thermite weld connections at locations as directed by the pipe or fitting manufacturer so as to not damage pipe gasket or internal linings exposed to liquid.
  - 3. On foreign pipelines, the Contractor shall notify foreign pipeline owner and the foreign owned pipe owner shall only attach wires to their own pipelines, unless the foreign pipeline owner grants permission to the Contractor in writing. In that case, the Contractor shall strictly follow foreign-pipeline owner written recommendations and procedures.
  - 4. For connections to gas and petroleum piping systems, the connections are extremely critical and shall only be made according to ANSI/ASME B31.8 and ANSI/ASME B31.4 codes, the specific pipeline owner's recommended procedures, and applicable state and federal regulations. Maximum charge size shall be 15 grams. Crows foot (separate) larger wire per specific pipeline recommended procedures. State and federal regulations require specific training be completed prior to making connections to gas and petroleum pipelines.

If the Contractor is to make connections to gas or petroleum piping, they shall provide copies of certification of training of personnel, prior to making any wire connections.
  - 5. The electrical quality and resistance of the connection is dependent on proper adhesion of the welded connection to the pipe or fitting surface. Observe proper thermite weld material selection, safety precautions, surface preparation, and welding procedures as recommended by the material manufacturer.

6. Use cast iron type charges for all cast iron and ductile iron pipe and fitting thermite weld connections. Use steel type charges for all steel pipe and fitting thermite weld connections. Utilize correct sized mold (as shown on metal tag on graphite mold) based on wire and pipe or fitting size and type. Utilize correct type and size of charges for each connection based on wire and pipe or fitting size and type. Cartridge charge type and size in grams is shown on box and charge tube.
7. The wire and cable to be cadwelded shall be clean, bright, and dry. Clean all wire that is contaminated with oil and grease in accordance with the thermite weld manufacturer's recommendations. Remove all corroded cable including the individual strands.
8. Before the connection is made, clean the surface to bare metal by making a two-inch (2") by two-inch (2") window in the coating, and then filing or grinding the surface with a grinding wheel to produce a bright (white) metal finish.
9. All power grinding shall be with a vitrified type-grinding wheel. The use of resin, rubber, or shellac-impregnated type grinding wheels is not recommended by the thermite weld manufacturer and will not be acceptable.
10. Contractor shall take appropriate actions for existing coatings with asbestos to minimize worker exposure and to contain, handle, and dispose of asbestos per regulations.
11. After the surface is cleaned to a smooth, white metal finish, lightly tap the pipe surface with a sharp tool (back of claw hammer or metal chisel edge, etc.) so as to produce dimples to improve surface profile and adhesion for the weld material.
12. In certain high humidity conditions, cold weather, or on cold or wet surfaces, preheating of the metal surface and/or molds may be required to improve successful connections and minimize porous welds.
13. Exothermic welding should be completed immediately following preparation of the metal surface before surface flash rusting or oxidation can occur.
14. Where specified wire sleeves shall be firmly attached to the end of the wire before thermite welding to the metal surface. Wire and sleeve shall be clean and dry. Wire shall extend 1/4-inch out of field formed sleeves. Factory formed sleeves shall be provided with end of sleeve beveled or angled so that wire is exposed to thermite weld material.
15. Utilize exothermic weld packing compound around mold as required on irregular or small weld surface areas to seal bottom of welder mold to prevent molten metal leakage.
16. Replace worn molds at intervals as recommended by the thermite weld manufacturer to minimize the possibility of molten metal leakage during the thermite welding process.
17. The mold and base metal should always be clean and dry. Avoid moisture and contaminants in mold and materials being welded as this may result in spewing of hot molten material.

18. Place a metal disk in the bottom of the graphite mold and then pour in the weld material or place the prepackaged weld material cartridge in mold. Be sure to squeeze the plastic cylinder to get all of the starting powder out. Close the mold body lid.
  19. Place the graphite mold on the prepared pipe surface and install the wire in the slot at the bottom of the mold. Confirm that the mold and wire provide a proper fit and that the mold is in intimate contact on all sides with the surface being welded to. Hold the wire and mold steady and firm on the pipeline or fitting surface.
  20. Ignite the weld material with the spark gun or electrical starter depending on type of charge. Lightly tap the mold body during the ignition fusion process. Carefully remove the graphite mold after the exothermic fusion process is completed approximately 15 to 20 seconds later.
  21. Care should be taken during the thermite welding process, as the exothermic process produces a molten liquid metal that is extremely hot, 2,500° F (1,400° C) and will result in a local release of smoke. Do not watch the bright light (flash) or breathe the fumes from the thermite welding process. Do NOT sharply hit or move the graphite mold body during the cadweld process to minimize expelling the molten metal out of the graphite mold.
  22. The graphite mold should not be touched or allowed to come in contact with the pipe coating or other flammable or meltable materials, as it is extremely hot. Carefully clean the slag out of the graphite mold body with the mold cleaner intended for that mold size and type.
  23. After the weld connection has cooled, remove slag, visually and physically test quality of connection by tapping with a hammer and lightly pulling on the wire. The completed weld should visually present a good appearance of a well-formed connection with a minimum loss of weld material or splatter. All portions of the wire and sleeve shall be covered with the weld material. Remove and replace all visually defective, porous, or poor welds.
- H. Narrow or Small Fitting Attachment Locations: Thermite weld connections on metallic fittings, restraint devices, glands, mega-lug type joints, and couplings where only a small or narrow metallic surface is available shall be carefully done so as to not damage the internal lining, O-ring, or damage the fitting. Two or more wires can be attached under the same thermite weld connection as long as the bond or pig-tail wires are not being connected to the same structure under the same thermite weld. Apply approved mastic packing material around mold to keep molten thermite material in place. Do not hold mastic packing material in- place with bare or gloved hands. Completing connections prior to complete fitting assembly and installation of the fitting into the trench so as to allow the thermite weld connection to be made to a level surface on top of the fitting is the preferred method. A vertical connection after the fitting is assembled and already in the trench is a more difficult type connection to make than a horizontal type connection. If the area of the thermite weld connection and the geometric arrangement of the fitting (too narrow, sharp angle, edge of lip, etc.) does not allow a tight seal to be made by the prefabricated Handy Cap type materials, then coat with a 100-percent moisture tolerant cold weather cure epoxy (Denso Protal 7125 or approved equal).
- I. Silver Solder:
1. Use for electrical connection of copper wire to thin-wall steel tubing (0.035-inch wall or less), copper, or stainless steel pipe and pin brazing connectors.

2. Silver solder connections shall be made at locations on the edge of the fitting lip at a location that will not damage the rubber gaskets.
3. Before the connection is made, clean and flux the area around the connection with a suitable flux as recommended by the pipe manufacturer for the materials being soldered.
4. Weld the copper sleeved wire to the fluxed area with the suitable silver brazing alloy in such a manner that the completed connection is free of cracks or crevices in accordance with the solder manufacturer's recommendations.
5. After the connection is completed, allow to cool, and remove the remaining flux by wire brush and solvent clean (SSPC-SP-1).
6. Clean and coat silver soldered connections on copper and steel appurtenances with prefabricated thermite weld cap or epoxy repair coating. Stainless steel connections do not require coating.

J. Ground Clamps:

1. Connections to copper service pipe shall be made with a bronze clamp. Clean service pipe and wire and attach to service pipe in accordance with ground clamp manufacturers recommendations.

K. All damage to pipe or fitting coatings or linings, gaskets or O-rings, and/or plastic pipe or fittings, etc., shall be repaired by the Contractor at the Contractor's expense.

### 3.05 WIRE CONNECTION COATING

- A. Clean weld area and install a prefabricated thermite weld cap or liquid epoxy repair coating per manufacturer's directions over each completed connection after testing, unless to be coated by heat shrink joint coating. Type and size of prefabricated HandyCap shall be determined by type of connection and size of wires.
1. Utilize HandyCap IP type prefabricated caps with integrated primer on all No. 10 AWG and smaller wires.
  2. Utilize HandyCap IP EX (extra-large) type prefabricated caps with integrated primer on all No.8 AWG and larger wires and at all pin brazing locations.
  3. Liquid Epoxy Coating - Wire connection at pipe joints where prefabricated caps are too large to fit or as required for factory coating repairs, shall be completed with a liquid repair type coatings. On mechanical joints, restrained rings, and metallic glands, apply liquid repair coating material to thermite weld connection area, where the area of the thermite weld connection and the geometric arrangement of the fitting (too narrow, sharp angle, edge of lip, etc.) is too small to successful installation and adhesion so as to not allow a tight seal to be made by the prefabricated Handy Cap type materials, then coat with a 100-percent moisture tolerant cold weather cure epoxy (Protal 7125 or equal)..
- B. In cold weather, store prefabricated cadweld caps, and coating repair materials in a heated location and keep warm until installation.
- C. The pipe and factory-coating surface shall be clean and dry before application of cap.

- D. Prefabricated cadweld cap shall be applied at connection according to manufacturer's directions. The filler material shall be placed over the thermite weld connection and worked around and under the wire and connection. Apply pressure to the prefabricated cadweld cap to assure good adhesion.
- E. Completed prefabricated cadweld cap assembly shall adhere tightly to pipe and wire connection with no voids or gaps. Inadequate adhesion is demonstrated if there are visible gaps or voids under the cap or if the cap can be easily removed from the pipe surface by pulling with fingertip pressure. At all locations where inadequate adhesion is evident, reprime and replace cap or prime and apply either a minimum six-inch (6") by six-inch (6") square of field repair tape, a 55-mil thick Tapecoat Gray "Pads", or heat shrink repair material over existing cadweld cap. Apply per tape coating or heat shrink manufacturer's directions.
- F. Liquid Repair Epoxy Coating Application - Complete surface preparation and apply 100 percent solids, low temperature epoxy repair coating (Protal 7125 or approved equal) in accordance with coating manufacturer directions. Total minimum dry film thickness shall be 20-mils, apply in multiple coats if required by manufacturer of specific coating utilized. Allow coating to cure to sufficient degree to prevent damage to coating, prior to handling and backfilling. Strictly follow minimum cure time recommended by coating manufacturer based on surface and ambient temperatures.
- G. All exposed metallic surfaces not covered by the thermite weld cap, 100-percent moisture cure liquid epoxy repair coating, or heat shrink sleeve shall be repaired per PIPE AND FITTING COATING REPAIR.

### 3.06 PREPACKAGED GALVANIC ANODE INSTALLATION

- A. General:
  - 1. Remove plastic or paper shipping wrap from prepackaged anode prior to placement. Galvanic anodes packaged in cardboard type chip-tube shall be thoroughly perforated just prior to installation.
  - 2. Install galvanic anodes a minimum of 1-foot below the pipe invert and 3 to 5-feet from buried metallic piping or 3-feet from metallic fittings to be protected. Space galvanic anodes equally around the fitting, pipe section, and/or appurtenance. Locate at bottom edge of pipe trench as shown on the Drawings or as specified. Alternate anode placement on opposite sides of the pipe. If two or more anodes installed at the same location, place on opposite side of the pipe or fitting. Provide a minimum anode spacing of 5-feet from other unprotected pipelines.
  - 3. Install galvanic anode string anodes (five anodes maximum total per string) shall be buried a minimum of 1-foot below the pipe invert and at separation and spacing distance shown for the anode string test station. Connect the anodes to the pipeline through a test station as shown on the drawings.
  - 4. Handle prepackaged anode with care. Damage to the anode, anode to wire connection, or prepackaged backfill bag will require replacement of the entire assembly.
  - 5. Place anode in native earth backfill do not use pipe zone bedding material.

6. Earth backfill around each anode shall be thoroughly compacted to a point 1-foot above the anode. Backfill material around each anode shall be native soil free of roots, organic matter, trash, and rocks. Stop backfill at specified grade to allow for placing of topsoil, pavement, or concrete, when required.
7. All anode wires shall be buried a minimum of 36-inches below finish grade. Wires shall be handled with care. Splices or damage to the insulation on any wire shall be repaired in accordance with WIRE INSULATION REPAIR and be approved by Engineer.
8. Electrical connection of the anode wire to steel, cast or ductile iron metallic pipe or fittings shall either be directly to the pipe or fitting by the thermite weld method or through a test station with shunt as shown on the Drawings.
9. Electrical connection to copper services shall either be directly to the copper service by a ground clamp or through a test station with shunt as shown on the Drawings.

B. Installation:

1. If two or more anodes are installed at same location, they shall be installed on opposite side of pipe or fitting from each other.
2. All metallic valves, blow-offs, air valves, or fittings located in vaults on plastic pipeline, which will be either continuously or intermittently under the water table shall be cathodic protected as if buried. Place galvanic anode inside vault and attach directly to metallic fitting.
3. Install a minimum of one each or more 17 or 18-pound galvanic anode for each concrete encased metal pipe section (stub piece) under or next to pump stations, buildings, or tanks as shown on the drawings.
4. Install a minimum of one each or more 17 or 18-pound galvanic anode for each copper service line.
5. Install a minimum of one each or more 17 or 18-pound galvanic anode for each connection to existing ductile, cast iron, steel, or PCCP piping. Obtain approval for and connect the galvanic anode directly to the existing piping either by the thermite weld method or another method if required by existing pipe owner.
6. Type of Prepackaged Anodes is project specific. For this project utilize: **Zinc**
  - a) Prepackaged zinc galvanic anodes for protection of metallic pipe and fittings in lower resistivity soils (1,500 ohm-em or below).
7. Where two or more metallic fittings are adjacent to each other, install joint bonds as specified in PIPE CONNECTING WIRES, and install the specified quantity of galvanic anodes for each metallic pipe section, appurtenance, valve, or fitting used in conjunction with nonmetallic pipe.
8. At the Contractor's option, larger anodes may be used in place of multiple smaller anodes for a group of bonded metallic components on non-metallic piping provided the same total bare weight of galvanic anode is used. Maximum separation distance shall be 10-feet on fittings to be protected with one anode, if multiple fittings are bonded together. A maximum of 3 fittings may be protected by one anode.

9. For ductile iron and cast iron fittings, where specified coating thickness is not provided by the fitting manufacturer or bare fitting is coated with petrolatum tape type coating system; then install one specified size larger anode or double the number of anodes for each fitting than listed on the following table. For example, if a 17 pound anode is listed and a fitting does not meet coating thickness specified then install two 17 or 18 pound anode instead. If one 17 or 18 pound anode is required per the following table and coating thickness is not as specified, then at Contractor's option, install either a 30-pound anode or two 17 or 18 pound anodes. Existing fittings that are exposed and coated with a four layer petrolatum tape type coating system, shall receive double the number of anodes specified or the next largest anode size shown in these specifications. For example, if a bare fitting (16-inch or less) is exposed and petrolatum tape coated, it shall receive a 17 or 18 pound size anode instead of the 5-pound size anode required for a factory coated fitting.
10. The minimum number of anodes to be installed on buried or submerged factory coated metallic fittings, pipeline sections, or appurtenances with non-metallic pipelines shall be:

| <b>MIN. PREPACKAGED ANODE SPACING FOR COATED FITTINGS FOR DIFFERENT NON-METALLIC PIPE SIZES</b>  |   |                                       |                                       |                                       |
|--|---|---------------------------------------|---------------------------------------|---------------------------------------|
|  | <b>16" or less</b>  | <b>18" to 30"</b>                     | <b>32" to 46"</b>                     | <b>48" or larger</b>                  |
| <b>ITEM</b>  | <b>MINIMUM NUMBER OF AND MINIMUM BARE ANODE SIZE<br/>(Reference Type of Anode Required For Project Per Specification)</b> |                                       |                                       |                                       |
| Single Coated Metallic Fitting   | 1 – 17 lb Mg or<br>1 – 18 lb Zn Anode   | 1 – 17 lb Mg or<br>1 – 18 lb Zn Anode | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode | 3 – 17 lb Mg or<br>3 – 18 lb Zn Anode |
| Multiple (2 to 3) Coated Metallic Fittings (Maximum of 10 feet apart)  | 1 – 17 lb Mg or<br>1 – 18 lb Zn Anode   | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode | 3 – 17 lb Mg or<br>3 – 18 lb Zn Anode | 4 – 17 lb Mg or<br>4 – 18 lb Zn Anode |
| Coated Fire Hydrant or Blow-off Assembly (including tee, valve, and hydrant) with plastic pipe main and 6-inch pvc pipe leg (less than 10 foot leg). | 1 – 17 lb Mg or<br>1 – 18 lb Zn Anode   | 1 – 17 lb Mg or<br>1 – 18 lb Zn Anode | 1 – 17 lb Mg or<br>1 – 18 lb Zn Anode | 1 – 17 lb Mg or<br>1 – 18 lb Zn Anode |
| Coated Fire Hydrant or Blow-off Assembly (including tee, valve, and hydrant) with plastic pipe main and 6-inch pvc pipe leg (more than 10 foot leg)  | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode   | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode |
| Copper Service (less than 75 feet from main to insulated connection)   | 1 – 17 lb Mg or<br>1 – 18 lb Zn Anode   | 1 – 17 lb Mg or<br>1 – 18 lb Zn Anode | 1 – 17 lb Mg or<br>1 – 18 lb Zn Anode | 1 – 17 lb Mg or<br>1 – 18 lb Zn Anode |
| Copper Service (more than 75 feet from main to insulated connection)   | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode   | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode |
| Existing Metallic Pipe Tie- In Location, or Concrete Encased Stub Piece.   | 1 – 17 lb Mg or<br>1 – 18 lb Zn Anode   | 1 – 17 lb Mg or<br>1 – 18 lb Zn Anode | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode |
| Existing Metallic Pipe Leak Locations.   | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode   | 2 – 17 lb Mg or<br>2 – 18 lb Zn Anode | 4 – 17 lb Mg or<br>4 – 18 lb Zn Anode | 4 – 17 lb Mg or<br>4 – 18 lb Zn Anode |

### 3.07 TEST STATION INSTALLATION

- A. Cathodic protection test stations of the types indicated shall be installed and located as specified herein and as shown on the Drawings. Current span wires, reference electrode, coupon, plastic reference pipe, or resistance probe shall be installed only at test station locations indicated on test station schedule.
- B. Install test wires to fittings, only during pipe construction at time of pipe installation along with the necessary reference electrode, coupons (minimum of two each), plastic reference monitoring pipe, drain/ground anode, or resistance probes if required before the pipe is backfilled and compacted around. Install sufficient wire to reach test station final location. Test station boxes and support posts can be completed at a later date. Take actions to protect wires from damage if not terminated in test station or junction box at this time.
  - 1. Test station types shall be installed on metallic pipelines or fittings as shown on test station schedule or drawings.
- C. Color-code and label wires per specifications, before installation of wires in conduit or backfilling of the test station wires.
- D. Locate next to other above-grade facilities and structures for protection, where possible. Install in protected locations, so as to not restrict intended use of the land, outside roadways, cultivated fields, and irrigation facilities.
- E. Test station shall be installed at protected locations such as next to pipeline structures, fences, road crossings, and edges of cultivated fields. The Engineer shall determine the final location of the test stations. Changes in the location of any test station shall be reviewed and approved by Engineer prior to installation.
- F. Flush mounted test stations shall be located behind fire hydrant, unless otherwise directed the Engineer.
  - 1. Compact under, and install flat support blocking or brick under test station flush test station bodies for support. Install supports and concrete collar around test station so as to prevent settlement.
  - 2. Install a minimum 6-inch thick concrete collar either in a minimum 2-foot square pad or 3-foot diameter round concrete pad shape around flush mounted test station body as shown on Drawings. Shape as selected by Owner.
  - 3. Rotate flush mounted test station square concrete slabs so that slab points toward traffic flow.
  - 4. Concrete collar and test station lid shall be set level and flush with the top of curb, sidewalk or roadway. Concrete collar and test station lid shall be set level and 1-inch higher than finished grade in open dirt and lawn areas. Test stations and collars that settle or are set too low or high shall be replaced at Contractor's sole cost.
  - 5. Provide sufficient slack in test wires to allow terminal block to extend a minimum 18-inches out of test station body.
- G. Test wires shall be attached to the pipe as specified under WIRE CONNECTIONS, this section and if possible installed under the heat shrink sleeve joint coating.

- H. Test wires shall be provided with sufficient slack and looped or coiled at the test station and pipeline to prevent the wire from being unduly stressed or broken during backfilling operations. Install test wires to top test station terminals. Wires shall be installed in a continuous length.
- I. At test stations, where multiple metallic fittings are bonded together by No. 12 AWG bond wires on plastic pipelines, install one test lead to first fitting from the test station and second test lead to farthest fitting from the test station. This will allow the continuity between the metallic fittings to be confirmed.
- J. All cathodic protection and test wires shall be buried a minimum of 36-inches below finished grade.
- K. Wire connections to test station terminals shall be with crimp-on ring tongue terminals, or lug-it connectors, except where terminal strips with tubular clamps are used.
- L. Connect wires to test station terminals as shown on Drawings. Wire type, color code, and marker tag designations as shown on Drawings and specified under PRODUCTS, this section, shall be maintained throughout project.
- M. Seal completed wire connection test lead terminals with electrical sealer for all buried flush mounted test stations and at above grade test station locations where high atmospheric corrosion may occur. Clean surface of all dirt, wax, grease and other surface contaminants. Protect or mask other areas from spray application, vigorously shake aerosol can before and during spray application. Apply 2 to 3 mil layer from a 12 to 15-inch distance in light even coats. Allow to dry and close up test station.

### 3.08 TIGHT BONDED COATED PIPE OR FITTINGS

- A. Prepackaged Reference Electrodes:
  - 1. Remove reference electrode and cloth bag from the shipping bag and place 6 inches from the pipe below the centerline of the pipe in a horizontal position, perpendicular to pipe in accordance with manufacturer's directions. Presoak the reference electrode if recommended by the reference electrode manufacturer prior to burial. Do not hold or lower the reference electrode by the wire lead. Prepackaged reference electrode shall be backfilled with clean native soil. Do not allow reference electrode to freeze, place below frost line. Connect reference electrode lead to separate terminal than pipe lead in test station. Do not connect to pipe leads or directly to pipe. Terminate wire leads in test station as shown on Drawings.

### 3.09 WIRE INSULATION REPAIR

- A. Wire splices shall be made with suitably sized Type C compression connectors as specified or mechanically secured and silver soldered. Inline type butt connectors or wire nuts are **NOT** allowed. Split bolts are **NOT** allowed unless silver soldered and both wires are No. 10 AWG wire or smaller.
- B. Minor insulation damage to small cathodic protection wires (equal to or smaller than No. 8 AWG) shall be repaired by spirally wrapping (minimum of 50 percent overlap) with two layers of high voltage rubber splicing tape and two layers of vinyl electrical tape or with a Royston SpliceRight Kit installed in accordance with the product manufacturer's installation instructions.

- C. Insulation damage or splices to large cathodic protection cables (No.4 AWG or larger) shall be made with epoxy insulated splice kits (3M Scotchcast 90-B1 or 82-A1 or approved equal). Allow epoxy splice kits to cool and set before moving.
- D. All wire splices and wire insulation repair locations shall be approved by the Engineer.

### 3.10 INSULATED JOINTS

- A. Insulated joints shall be installed to electrically isolate the pipeline from other structures.
  - 1. Install copper insulating joints where copper services are connected to metallic water mains and at service meters or curb stops where ownership of copper service lines changes.
- B. Install insulated joints at locations listed on test station schedule or as shown on the Drawings. Co-ordinate and carefully follow both insulating joint and manufacturer recommendations for large diameter insulating joint installations.
- C. General:
  - 1. Carefully align and install insulating joints according to the manufacturer's recommendations to avoid damaging insulating materials.
  - 2. Support, backfill, and compact pipe and fitting in accordance with the insulator and pipe manufacturer's recommendations so as to not cause damage to the insulating joint or leaks.
  - 3. Test each insulating joint as specified under INSULATED JOINT TESTING this specification section. Test buried insulating joints before and after backfilling.
- D. Copper Service Line Insulators: Install insulated corporation ball valves, insulated curb ball valves, and insulated service fittings at locations as shown on the Drawings in accordance with the service liner manufacturer's instructions. Coat for a minimum Distance from insulator locations at metallic pipe or fittings as shown on the Drawings.

### 3.11 INSULATING WALL AND FLOOR SLEEVES

- A. Coordinate and install pipe and wall sleeve so as to provide a smooth uniformly round shape opening per pipe and modular seal manufacturer's recommendations.
- B. Coordinate pipe fabrications, wall sleeves and modular seal types and sizes for wall or floor penetrations to allow for the watertight sealing system used at wall or penetrations. Install pipe and wall sleeve or core wall so as to provide uniformly round shape, grind as required to control weld seam height per pipe and modular seal manufacturer's recommendations. Factory grind all welds at wall sleeve location and a minimum of 12-inches on either side of wall or floor opening, do not remove parent material during grinding operations. Repair coating as required.
- C. Insulating wall or floor sleeves or seals shall be installed according to manufacturer's recommendations. Wall sleeves shall be positioned so that the water stop (collar) is centered in the width of the opening and the water stop (collar) contacts the opening evenly for the minimum 1-inch distance or more as recommended by the modular seal manufacturer. Center the pipe in the opening and adequately support on both sides. Make sure that the pipe, opening, and wall sleeve are clean, smooth, and round. Install the exact number of links per the manufacturer recommendations for the size and type of opening and pipe diameter.

- D. Install the links in the same direction so that the bolts can be tightened from the inside of the building or vault location. Assemble, insert, align, and evenly tighten insulating modular seal in accordance with the manufacturer's installation instructions so as to not damage pipe coating or insulating modular seal. Position centering blocks for casing end seal type installations on bottom one-half of the pipeline as recommended by the modular seal manufacturer. Position the modular seal so that it is centered in the wall sleeve and that when tightened down it provides an even, uniform spacing in the wall sleeve. Take up free slack in bolts and then tighten each bolt clockwise in opposing succession at torque and sequence as recommended by seal manufacturer. Evenly tighten the individual bolts the maximum number of turns as recommended by the manufacturer until the sealing elements bulges around all of the pressure plates. Do not use power tools to tighten stainless steel bolts. Completed installation shall provide long term insulated and sealed (liquid tight) connection between pipe and floor or wall opening, sleeve, or casing.
- E. Insulating wall or floor sleeve shall be positioned so as to allow adjustment from interior side of building and vault locations and exterior side of water bearing structure locations.
- F. For water bearing structures or for locations if shown on the drawings install a second modular wall seal.
- G. Test completed installation for electrical isolation between wall sleeve and pipe with radio frequency type insulator checker.

### 3.12 COATING FOR PIPING, FITTINGS AND ACCESSORIES

- A. Install coated valves, fittings, and miscellaneous metallic pieces so as to not damage coating or lining.
- B. Provide corrosion protection for ferrous metal piping appurtenances such as tie- rods, thrust restraints, tapping saddles and bands, harnesses, and similar items: Stainless steel, fusion bonded epoxy coated, or heat shrink tube wrapped.
- C. Coat rebar or tie-rods where utilized as tie-downs or thrust restraints and exposed to soil or liquid with fusion bonded epoxy, heat shrink tube, or four layer petrolatum tape system.
- D. Flange bolts, Nuts, and Similar Items: Series 300 stainless steel.
- E. Conduct testing of Series 300 stainless steel materials with magnet to confirm stainless steel provided prior to installation.
- F. If approved by Engineer, coat miscellaneous hard to coat items with four layer petrolatum tape system or heat shrink repair coating.

### 3.13 PIPE AND FITTING COATING REPAIR

- A. Inspect and repair any coating or lining damage with original manufacturer's approved repair kit. Follow coating manufacturer's written directions for surface preparation and repair coating application. Utilize potable water approved materials for coatings and linings in contact with potable water.
- B. Complete surface preparation and field repairs of coatings and linings in accordance with coating manufacturer written directions. Observe environmental (weather and surface temperature) requirements. Allow to cure in strict accordance with coating manufacturers based on surface and weather conditions prior to handling, burial, or exposure to liquids.

- C. Field coating for field repair of damaged coating on new or existing pipe, piping, appurtenances, and fittings shall be in accordance with this specification.
- D. External pipe and fitting repair coatings shall consist of external coating materials and repair procedures as recommended by the pipe or fitting coating manufacturer.
1. Fusion-bonded epoxy coated items shall be repaired with liquid epoxy repair kits provided by the fusion-bonded coating manufacturer.
  2. Epoxy coated items shall be repaired with repair coating from the original coating manufacturer.
  3. Spot coating damage at thermite weld connections not covered by standard thermite weld cap coating repair procedure shall be repaired with a field applied 6-inch minimum piece of tape coating, 6-inch minimum size of heat shrink repair material, or a 100 percent solids epoxy repair coating that can cure in either wet or dry conditions.
  4. Copper service lines shall not be sandblasted.
  5. Repair coating should overlap intact factory coating a minimum of four inches in all directions from the damaged area.
  6. Field Tape Coating:
    - a) For hand taping, provide suitable field primer (if required) and 35- mil field applied repair tape with aggressive adhesive and release liner, 4 or 6-inches width.
    - b) Pipe shall be clean and dry prior to and during application of both primer and tape coating. Tape shall be applied in a spiral wrap with a 50 percent overlap in accordance with AWWA Standard C209 Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines.
  7. Heat Shrink Field Coating:
    - a) For heat shrink sleeve installation, provide suitable filler material and heat shrink sleeve material for pipe size required or heat shrink repair patch as required for field repair.
    - b) Pipe shall be clean and dry prior to and during installation of heat shrink sleeve. Install sleeve in accordance with AWWA C216, Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines in accordance with coating manufacturer's recommendations and these specifications.
  8. Moisture Cure 1GO-Percent Epoxy Repair Coating
    - a) Spot coated damaged locations and hard to coat fittings and appurtenance (edges, flanges, tie-rods, bolts, nuts, etc.) locations shall be coated with a moisture cure 1GO-percent epoxy repair coating. Clean and prepare surface in accordance with repair coating manufacturer's directions. Wire brush and sand as required. Clean per SSPC SP-1 if required.

- b) Mix epoxy repair coatings at ratio and for time per repair coating manufacturer's directions. Apply to repair area by hand application method (brush, trowel, spatula, etc.) and smooth out onto intact coating in accordance with repair coating manufacturer's recommendations.

9. Petrolatum Tape Coating System

- a) Field apply petrolatum tape system for all restraining fittings and rods if not already coated with an approved specified factory applied coating system or stainless steel.
- b) Provide petrolatum system coating at insulated location to existing pipe or appurtenances exposed as part of connection installation if not already coated.
- c) For petrolatum system tape installation (AWWA C217), provide suitable primer, filler material (mastic), petrolatum tape and outer wrap material for burial application. Pipe or fitting shall be clean and dry prior to and during installation of four layer petrolatum wax tape system. Install petrolatum tape system in accordance with coating manufacturer's instructions and these specifications. Apply primer in an even uniform manner to entire tie rod, pipe, or fitting surface area to be coated to achieve minimum primer thickness of 3-mil wet film thickness. Increase amount of primer at and work primer into threads, cavities, pits, angles, edges, and other irregular areas. Apply primer with brush or glove. Apply mastic or tape immediately after application of primer, drying of primer is not required. Work and mold mastic into irregular shapes so as to fill voids and achieve a uniform contour to provide a smooth even support for the tape coating system to avoid bridging. Apply petrolatum tape layer in a spiral wrap fashion around the tie rod or fitting circumference with a 50 percent minimum overlap onto the proceeding layer.
- d) The completed petrolatum coating system shall be a minimum of 40 MDFT and adhere tightly to the coated structure and present a smooth unwrinkled appearance.

3.14 FUNCTIONAL AND PERFORMANCE TESTING

- A. Functional Testing: Provide the Engineer with a minimum of seven (7) days' advance notice before beginning functional testing unless the Engineer is already scheduled to or already onsite doing construction observations (services during construction). At such a time as the Engineer may indicate, the Contractor, in the presence of the Engineer shall conduct the following functional testing.
- B. Test Stations:
  - 1. Test each test station wire for continuity, correct termination, and proper connection and color code to the designated structure. Test each wire for continuity with potential measurements to a copper/copper sulfate reference electrode and with an ohm-meter between wires prior to connecting together on the terminal board.
  - 2. Do not connect reference electrodes to pipe test lead terminals.

- C. Galvanic Anode Energizing and Testing:
1. Some of the galvanic anodes will be connected to the pipe or the fittings in the anode test stations with calibrated shunts after the installation of the galvanic anode cathodic protection system is completed.
  2. Test continuity of each anode lead wires and to confirm correct type of anode with potential measurements prior to connecting to test station terminal board. Zinc anodes should read a minimum of -1.0 volt and high potential magnesium anodes shall read a minimum of -1.6 volt to a copper/copper sulfate reference electrode
  3. Do not connect anode and pipe or fitting leads together in test stations until Engineer is present.

3.15 FINAL TESTING

- A. After construction is complete and all of the individual functional tests have been completed by the Contractor, the City of Rapid City Utility Maintenance Department shall conduct final testing and/or walkthrough inspection on the pipeline to ensure proper installation of the specified corrosion protection items.
- B. The City of Rapid City Utility Maintenance Department may make sufficient tests throughout the network of galvanic anode cathodic protected metallic pipe and fittings to determine proper installation of the galvanic anode cathodic protection system. Any construction defects identified during energizing and testing shall be located and corrected by the Contractor at the Contractor's expense.
- C. Any construction defects or incomplete work identified by the Engineer during functional or final testing or during warranty inspections shall be located and corrected by the Contractor at his sole expense including additional Engineering, retesting, and inspection time. Any defects in the corrosion protection system, (including but not limited to coating or lining, pipeline continuity, pipeline electrical isolation, cathodic protection system, test stations, etc.) when discovered shall immediately be repaired and retested in a timely manner (warranty work shall be completed within 60 days of notice) by the Contractor in accordance with this specification and the written product manufacturer's instructions as reviewed and approved by the Engineer.

END OF SECTION

## SECTION 195

### SPECIFICATIONS FOR LANDSCAPE PLANTING

#### 195.1 DESCRIPTION

##### A. General

This work consists of furnishing planting seed, furnishing & installing sod, furnishing & planting trees, shrubs, or other plants of the species, grade, & size specified. Included is the preparation of the soil, storage, staking, wrapping, furnishing & placing topsoil, 'dakota', mulch, water, & other incidentals.

- B. Planting seasons shall be from April 15 to June 15 & from September 1 to November 1, unless otherwise coordinated. Exceptions shall be coordinated with the owner.
- C. Contractor shall locate & protect all existing & new utilities. Contractor to repair or replace any damaged utilities at no cost to owner. Landscape Contractor shall coordinate with General Contractor prior to digging to verify safe digging locations. Trees to maintain a minimum of 10 feet from rootball to any utility.
- D. All plant material shall conform to the guidelines established by the current American Standard for Nursery Stock, published by the American Association of Nurserymen or equivalent. All trees shall be nursery grown for at least (1) year in a nursery located within USDA hardiness zones 1-5.
- E. All tree and shrub locations shall be staked by contractor & approved by owner.
- F. All plants shall bear the same relationship to finished grade as the plant's original grade before digging.
- G. Trees in lawn areas are to receive a 48" dia. shredded cedar mulch ring with a min. depth of 3 inches. Mulch shall be installed immediately upon planting tree. Form earth saucer around base of tree per detail prior to placing mulch. Contractor shall provide 'dakota' for all tree planting pits. See 195.3.E2 Planting Soil amending mixing and placing in landscape areas. Mechanically mix soil onsite, not in the planting pit. Refer to details for planting fertilizer & staking requirements.
- H. Contractor is responsible for maintaining health of all plant material including trees and shrubs through final acceptance of project and the establishment period. Contractor shall take care as to not damage or disturb areas outside of the work limits. Any damage to these areas will be repaired at the expense of the contractor.
- I. Remove all surplus soil and waste material, including excess subsoil, unsuitable soil, trash, debris and legally dispose of these items off of the owner's property.
- J. Contractor will need to hand water all trees at time of planting through establishment period to assure that tree is provided sufficient water. This item is contingent on the planting season restriction per 195.1 B. If planted within the planting season and the establishment period overlaps outside of the planting season additional watering and maintenance may be required by the contractor at the direction of the engineer.

#### 195.2 MATERIALS

##### A. Plant Materials (Nursery Stock)

- 1. Limitations on Source of Material - Plants furnished shall have been grown in western South Dakota or states or provinces located within the boundaries of Hardiness Zones 2, 3, or 4, as established by the USDA.
- 2. Notification of Source of Supply & Verification of Origin as soon as possible & before any planting, the Contractor shall furnish written notification of the location of the proposed source for each item of plant materials. Contractor shall furnish written verification from the supplier and grower to establish the origin of plant materials, seed, or vegetative material. The source of supply & origin of plant materials will be subject to approval.
- 3. Names of Plants  
Plant materials furnished shall be of the genus, species, and variety specified and shall follow standard names of plant materials as adopted by the American Joint Committee on Horticultural Nomenclature and as this standard nomenclature is referred to in the current edition of Standardized Plant Names. Substitutions will not be permitted without the written consent of the Engineer.

4. **Form, Shape, and Condition of Plants**

Trees furnished shall have been at least twice transplanted or root pruned, shall be well branched according to species or variety, and uniformly straight-trunked. Shrubs shall have been at least twice transplanted or root pruned and is heavily caned. Trees, shrubs, and vines shall be number one (1), heavy-grade, nursery-grown stock, strong, healthy, clean, well-grown, free from insects, disease, rodents, mechanical injuries, disfiguring knots, sunscald, frost cracks, broken bark, broken or dead branches, broken roots, stubs, or any other objectionable features and shall possess a healthy, normal root system of sufficient size to permit successful establishment and good growth and shall be typical of the species or variety specified. Evergreen plants delivered to the project with new growth in an advanced stage of candling out will be rejected.
5. **Size of Plants**

Plants shall be of uniform height and diameter. The figures shown on the plans indicate the minimum height of the plants called for. When such figures are used in connection with spread, they indicate the minimum and maximum spread of the plant to be furnished. The height of each species or variety of plant shall be the vertical measurement of the plant from the ground upward as it stands in its natural position in the nursery without straightening branches or leaders. The measurements shall not include the fine or slender terminal leader, twig or branch growth, but shall stop where the main part of the plant ends. The spread of each species or variety shall be the horizontal measurement of the plant as it stands in its natural position in the nursery without straightening its branches. The measurements shall not include the fine or slender terminal shoots. Each plant shall be measured both in its smallest and greatest dimension and averaged. Caliper shall be taken six (6) inches above the ground level, up to and including four (4) inches caliper size, and (12) inches above ground level for larger sizes.
6. **Nursery Stock**

Plant materials shall be nursery grown unless otherwise specified, shall have been subjected to proper transplanting during growth in the nursery, shall bear evidence of proper top and root pruning, and shall be thrifty, well-grown, and hardy northern stock, grown under the same climatic conditions as exist at the location to be planted. Plants shall meet the standards as set forth in South Dakota Nursery Laws and in the edition of the American Standard for Nursery Stock. In all cases where grades are indicated in these standards, No. 1 or top grade will be required.
7. **Labeling**

Legible labels must be attached to all specimens, boxes, bundles, bales, or other containers indicating the genus, species, size, grade, or age of each species or variety and the quantity contained.
8. **Inspection, Certificates, and Rejection of Plants**

Before removal from the nursery, plant materials, must be inspected by authorized Federal or State authorities. Plants must be declared and certified free of diseases and insects, and necessary inspection certificates to this effect must accompany each shipment, invoice, or order of plants. Plants not approved by the Plant Industry Representative or Nursery Inspector or otherwise not meeting these specifications will be rejected. Rejected plants shall immediately be removed and disposed of by the Contractor and replaced with approved nursery stock of like variety, size, and age at no additional cost.
9. **Bluegrass Sod:**
  - a. The sod shall consist of a dense, well-rooted growth of Kentucky Blue Grass or other approved grass native to the general locality of the project. The sod shall be free from noxious weeds and substantially free from other objectionable grasses, weeds, or foreign materials detrimental to the development and future maintenance of the sod. At the time the sod is cut, the grass shall have a length of approximately two inches. If longer than three inches, the grass shall be cut to approximately two inches in length, and the sod shall have been raked

- free of debris. Sod shall be delivered to the jobsite in live, moist condition without undue crumbling or breaking.
- b. Sod shall be machine cut into rectangular sections. The sections shall be of uniform width of not less than 10 inches or more than 24 inches. The sections may vary in length, up to nine feet maximum. The sod shall be cut to a depth of three-fourths inch or more so the dense root system will be retained and exposed in the bottom side of sod, and the sod can be handled without undue tearing or breaking. Sod shall be rolled with the top growth inside. Sod strips, which indicate crumbling, tearing, breaking, or loss of soil during the operations of cutting, transporting, or handling will not be acceptable. Sod shall be laid in its final position within 36 hours after being cut. During the period between cutting and laying, the sod shall be protected from damage.
  - c. Surface Preparation: The surfaces to be sodded shall be constructed to the required cross-section and contour and shall be smooth, uniform, and free from stones, roots, or other undesirable foreign material. These surfaces shall be undercut to sufficient depth below adjacent areas so the top of newly-laid sod will be flush with any adjacent seeded or turfed areas and one inch below top of sidewalks, curbs, or other structures. Some trenching-in of the areas to be sodded and some building up of the adjacent areas may be necessary. The adjacent areas shall smoothly blend with each other, without sharp breaks in the contours.
    - a. If the soil bed is dry and/or hot, the Engineer may require the Contractor to pre-water to a depth of one inch prior to sodding. The earth planting bed shall be allowed to dry sufficiently after watering to permit sod placement without tracking.
    - b. Immediately prior to placing the sod, the soil shall be loosened and brought to a fine granular texture, to a depth of not less than one inch. Clods, lumps, weeds or other unsatisfactory materials shall be removed.
  - d. Fertilizer shall be uniformly incorporated into the soil prior to sodding. SEE SHEET H4 FOR FERTILIZER AND APPLICATION RATE.
  - e. Laying Sod
    - a. Sod shall be placed as soon as practicable following the winter season. When sod is available in the spring, the Engineer may issue written notice requiring the Contractor to begin placing sod within 10 working days of receipt of the notice. Failure to begin placement of the sod within the specified time shall result in issuance of a stop-work order. However, contract time will continue to be counted.
    - b. The sod on berm slopes shall be laid by hand in horizontal strips, beginning at the bottom of the slope and working upwards. In waterways, strips shall be laid parallel to the flow. Each section of sod shall be laid parallel to the flow. Each section of sod shall join the adjacent sections without overlapping but shall abut snugly against the section previously laid. End joints shall be staggered and open joints or gaps shall be filled with sod cut to the proper size and shape. The top and bottom ends of sodded areas shall extend at least two inches into the ground or ditch bottom. Other edges of sodded areas shall be turned into the ground two inches and covered with a layer of topsoil which shall be compacted to conduct the surface water over the edge of the sod and blend the sodded areas into the adjacent finished grades.
    - c. Anchoring:
      - i. On slopes steeper than 6:1, the sod shall be anchored with one inch wide by six inch long U-shaped staples made from No. 11 or heavier ungalvanized steel wire. A minimum of four staples per sod strip in every other row shall be used.
      - ii. In waterways, two staples shall be placed in the upper end of each sod strip in the end facing flow.
      - iii. Staples shall be driven flush with the top of the sod. Additional staples as required, to obtain adequate anchoring shall be placed as determined by the Engineer.
    - d. Watering After sod has been laid, it shall be watered to provide a moist condition through the thickness of the sod and 6 inches into the underlying soil bed.

- e. For a period of three weeks after sodding and initial watering, the Contractor shall apply adequate water to insure proper germination of the seed and growth of the grass. The Engineer may waive watering requirements if adequate natural moisture has been present. At the end of the three week watering period, the Engineer will make an inspection to determine if the sod is rooted into the underlying soil and is alive and growing. If sod has not satisfactorily rooted into the soil and is not alive and growing, the Engineer will determine if new sod and / or additional watering, at the Contractors expense, are required. Replaced sod shall be watered as required for the original.
- f. After the Engineers acceptance of the newly sodded areas, the Contractor shall notify all affected property owners, with notification of watering requirements provided by the Owner, that they will be responsible for watering the newly sodded areas. The Contractor shall provide written verification that affected property owners have both been notified and accepted the condition of the newly sodded areas.
- g. The sod growing season is defined as May through September.
- h. Sodding will be paid for at the contract unit price per square yard. Payment will be full compensation for cutting, preparing the earth planting bed, for furnishing, hauling, placing, anchoring, rolling, tamping, and maintaining the sod, and for labor, equipment, tools, and incidentals, which may be necessary.
- i. Payment for fertilizing sod and sodding will be included under the same bid item. Water for sodding shall be considered incidental and shall be included in the unit price bid for sodding.

10. Detention Cell Seeding

- a. The areas to be seeded comprise of all newly graded areas within the detention cell along Hole #16 at Meadowbrook Golf Course at approximately 47+50 RT.
- b. All permanent seed shall be raked in the topsoil at a depth of ¼” to ½”.
- c. All seed broadcast must be raked or dragged in (incorporated) within the top ¼” to ½” of topsoil. This requirement may be waived by the Engineer during construction when raking or dragging is deemed not feasible by conventional methods.
- d. Special Permanent Seed Mixture 1 shall be used for the Detention Cell seeding. Seed Mix is “MSI Detention Basin – Garden Mix” available at Millborn Seeds. Millborn Seeds 1335 Western Ave, Brookings, SD 57006 (888) 498-7333 · (605) 697-6306 · (888) 471-1706 Fax [www.millbornseeds.com](http://www.millbornseeds.com)
- e. Special Permanent Seed Mixture 1 shall be applied at a rate of 25 lbs per acre.
- f. The seed mix consists of the following grass/forb species:

| Scientific Name                 | Common Name           | Total Lbs./Acre |
|---------------------------------|-----------------------|-----------------|
| <i>Agropyron smithii</i>        | Western Wheatgrass    | 0.50 LB         |
| <i>Andropogon gerardii</i>      | Big Bluestem          | 2.50 LB         |
| <i>Calamagrostis canadensis</i> | Blue Joint Reed Grass | 0.03 LB         |
| <i>Elymus virginicus</i>        | Virginia Wildrye      | 1.50 LB         |
| <i>Glyceria grandis</i>         | Reed Manna Grass      | 0.05 LB         |
| <i>Leersia oryzoides</i>        | Rice Cut Grass        | 0.10 LB         |
| <i>Panicum virgatum</i>         | Switchgrass           | 0.25 LB         |
| <i>Scolochloa festucacea</i>    | White Top             | 0.02 LB         |
| <i>Sorghastrum nutans</i>       | Indiangrass           | 1.00 LB         |

Seed mix continued

|                                  |                       |         |
|----------------------------------|-----------------------|---------|
| <i>Spartina pectinata</i>        | Prairie Cord Grass    | 0.25 LB |
| <i>Sphenopholis obtusata</i>     | Prairie Wedgegrass    | 0.20 LB |
| <i>Anemone canadensis</i>        | Canada Anemone        | 0.02 LB |
| <i>Asclepias incarnata</i>       | Swamp Milkweed        | 0.05 LB |
| <i>Aster novae-angliae</i>       | New England Aster     | 0.02 LB |
| <i>Desmodium canadense</i>       | Showy Tick Trefoil    | 0.02 LB |
| <i>Eupatorium maculatum</i>      | Joe Pye Weed          | 0.03 LB |
| <i>Eupatorium perfoliatum</i>    | Boneset               | 0.02 LB |
| <i>Helenium autumnale</i>        | Sneezeweed            | 0.04 LB |
| <i>Helianthus grosseserratus</i> | Sawtooth Sunflower    | 0.03 LB |
| <i>Heliopsis helianthoides</i>   | False Sunflower       | 0.10 LB |
| <i>Liatris pycnostachya</i>      | Prairie Blazingstar   | 0.05 LB |
| <i>Rudbeckia hirta</i>           | Black-Eyed Susan      | 0.09 LB |
| <i>Silphium integrifolium</i>    | Rosin Weed            | 0.06 LB |
| <i>Silphium perfoliatum</i>      | Cup Plant             | 0.07 LB |
| <i>Verbena hastata</i>           | Blue Vervain          | 0.10 LB |
| <i>Vernonia fasciculata</i>      | Ironweed              | 0.05 LB |
| <i>Veronicastrum virginicum</i>  | Culver's Root         | 0.01 LB |
| <i>Zizia aurea</i>               | Golden Alexanders     | 0.13 LB |
| <i>Beckmannia syzigachne</i>     | American Slough       | 0.50 LB |
| <i>Carex atherodes</i>           | Wheat Sedge           | 0.01 LB |
| <i>Carex brevior</i>             | Plains Oval Sedge     | 0.01 LB |
| <i>Carex hystricina</i>          | Porcupine Sedge       | 0.01 LB |
| <i>Carex laeviconica</i>         | Smoothcone Sedge      | 0.01 LB |
| <i>Carex pellita</i>             | Woolly Sedge          | 0.01 LB |
| <i>Carex praegracilis</i>        | Clustered Field Sedge | 0.01 LB |
| <i>Carex vulpinodea</i>          | Brown Fox Sedge       | 0.01 LB |
| <i>Eleocharis palustris</i>      | Great Spike Rush      | 0.01 LB |
| <i>Juncus balticus</i>           | Baltic Rush           | 0.01 LB |
| <i>Juncus dudleyi</i>            | Dudley's Rush         | 0.01 LB |
| <i>Juncus torreyi</i>            | Torrey's Rush         | 0.01 LB |
| <i>Scirpus acutus</i>            | Hardstem Bulrush      | 0.01 LB |
| <i>Scirpus atrovirens</i>        | Dark Green Bulrush    | 0.02 LB |
| <i>Scirpus cyperinus</i>         | Wool Grass            | 0.01 LB |
| <i>Scirpus fluvialtilis</i>      | River Bulrush         | 0.01 LB |
| <i>Scirpus pungens</i>           | Chairmaker's Rush     | 0.01 LB |
| <i>Scirpus validus</i>           | Softstem Bulrush      | 0.02 LB |
| <i>Sparganium eurycarpum</i>     | Giant Bur Reed        | 0.02 LB |

B. Incidental Materials

1. Planting soils shall conform to the requirements of Section 17 of CORC Standard Specifications.
2. Organic soil conditioners shall be 'dakota' or other approved organic soil enhancer.
3. Staking materials are incidental to the tree planting bid item.
4. Wrapping material shall be a 2-ply asphalt cemented Kraft crepe paper in strips or burlap in strips and shall be secured to the trunk with a good-quality 6-ply cotton.
5. Tree ties shall be minimum one (1) inch wide heavy duty canvas with a steel grommet in each end to secure tie wire. Tie wire shall not be wrapped around tree, but shall be tied through the steel grommets in the canvas wrap. Lengths of garden hose shall not be used.
6. Tree trunk guards shall be minimum six (6) inch diameter by twelve (12) inch length flexible PVC drain tile pipe.

### 195.3 CONSTRUCTION REQUIREMENTS

#### A. General

1. Notify the Engineer one week in advance of the beginning of planting operations.
2. During planting operations, of applicable - suitable warning signs shall be provided in accordance with Section 7 of CORC Standard Specifications.
3. The digging, transporting, storing, layout, planting, pruning, watering, mulching, wrapping, staking, maintenance, & replacement of plants shall be performed by a qualified nurseryman, landscape specialist or by experienced crews under the direct supervision of a qualified nurseryman or landscape specialist.
4. The Contractor shall provide necessary safeguards to prevent accidents during the time the plant holes are open.

#### B. Digging and Transporting Nursery Stock

Plants shall be dug with care and skill immediately before shipping. Possible injury to the roots, particularly to the fibrous roots, shall be avoided. Balled and burlapped plants shall be dug to retain as many fibrous roots as possible and shall come from soil which will form a firm ball. The soil in the ball shall be the original undisturbed soil in which the plant has been grown. The plant shall be dug, wrapped, packed, and transported in such a manner that, upon delivery, the soil in the ball will not have been cracked, loosened, or caused to drop away from contact with the small and fine feeding roots. As plants are dug and during transportation to the planting site, precautions shall be taken to prevent roots from drying out, balls of earth from being broken, and to otherwise assure the arrival of plants at their destination in good condition.

#### C. Temporary Storage

Plant materials which cannot be immediately planted upon delivery shall be heeled in by placing the plants in a trench in a shaded location and covering the roots firmly with moist soil or by storing in a cool, moist cellar or similar enclosure with roots packed in wet sphagnum moss and covered with tarpaulins. Other methods of storage must be, approved by the Engineer. Roots shall be kept thoroughly moist at all times, and stored plants shall be properly maintained by the Contractor. Balled and burlapped plants shall be protected against drying of the ball by covering with wet sawdust, soil, or peat moss in a manner appropriate to the conditions. Risks involved in storing and transporting plant materials shall be borne by the Contractor.

#### D. Staking and Layout of Planting

Planting holes shall not be dug until all plant locations have been staked. Plan-shown locations, spacings, and quantities may be adjusted by the Engineer to suit field conditions.

#### E. The Planting Operation

##### 1. Digging of Planting Holes

- a. Planting holes shall have vertical sides & flat bottoms. The hole shall be of sufficient size to provide 12 inches of topsoil backfill around the root ball. Set the rootball on firm soil so that the top of the root ball will sit slightly higher than the final grade.

##### 2. Topsoil Amending, Blending and Placing for Landscape Areas

**Tree Pits:** Prior to planting, approved existing soil to be used for backfilling plant holes shall be thoroughly mixed with 25% 'dakota' by volume. 66 CY of Blended mix has been included in the Amending Existing Topsoil bid item for use in tree plantings not included in the detention cell planting area at Sta 47+50 R. (16 CY Dakota and 50 CY Screened onsite topsoil)

**Bioengineered Soil for Detention Cell:** Contractor blended, 14" depth onsite screened topsoil shall be thoroughly mixed with 2" depth 'Dakota' and 2" depth imported washed masonry sand for a total bioengineered soil depth of 18" by volume. At the completion of the rough grading of the Detention Cell, contractor shall place 4" of the amended soil to the rough grade and then disc that soil into the top 2" of the underlying soil then place 8" of the amended soil and complete the finish grading operation and landscape plantings. Mixing of soil, sand and 'Dakota' is incidental to the 'Amending Existing Topsoil' bid item. A total 117 CY each of Dakota and Washed Masonry Sand will be needed for this area mixed with 819 CY of Screened onsite top soil.

Basis of Design Product: 'Dakota' soil & plant enhancer is available at  
Dakota

PO Box 14088

Grand Forks, ND 58208 phone: US Toll Free 800.424.3443

3. Care of Plants Prior to Planting

When plants are taken from storage to the planting site, roots of plants shall be immersed in water immediately upon opening the bundle and kept in water until planted. The Contractor shall have sufficient tanks and pails to keep roots of plants from opened bundles in water until planted.

In transferring plants from the site of temporary storage to the planting site, only plants that can be planted in that day shall be transferred. Material not planted the day it is taken from storage shall be rewrapped in the approved manner or the roots kept immersed in water at the storage site until planted. Bare roots shall not lie exposed to the sun or air.
4. Balled and Burlap Plants

Plants shall not be handled by the plant stem. After the planting hole is dug as described in 195.3.F.1.b, the bottom portion of the wire basket shall be cut away prior to setting the plant in the hole. After setting plant in planting hole, the remaining portion of the wire basket shall be removed and the burlap cut six (6) inches below the top of the root ball. All twine and shipping tree wraps shall be removed from the trunk. Balled and burlapped plants shall have a minimum of (12) inches of top soil packed around the sides of the root ball.
- a. Potted Plants

Potted plant holes shall be dug as described in 195.3.F.1.b.

  - a. All plants shall be removed from containers in a manner, which does not damage the root ball.
  - b. Holes shall be backfilled in not less than two (2) lifts, the first lift shall not exceed one half (1/2) total hole depth. Each lift shall be heel tamped.
5. Cultivation

Shrub beds are to be cultivated as a unit two (2) feet on each side of rows before planting and the plants placed separately.
6. Watering

All plants shall be thoroughly watered within four hours of planting & every seven days thereafter until a letter of acceptance for the project is received from the Engineer. Each plant shall receive the gal. equivalent on the size of the root ball planted, at each watering. The required watering of trees, plants, sod, and seeded areas shall be considered incidental to the contract unit prices for their respective bid items.
7. Mulching

Mulch shall be placed between and around the trees within forty-eight (48) hours after planting and shall be applied uniformly to cover the cultivated areas inside dikes to a depth of three (3) inches. Mulch shall be pulled back a minimum of (1) foot from trunks and canes.
8. Wrapping

Newly transplanted deciduous trees shall be wrapped with strips of 2-ply Kraft asphalt crepe paper or burlap, starting at the bottom and lapping one-half (1/2) strip to a point well into the crown of the tree and not less than four (4) feet above the ground. Wrapping shall be secured with 6-ply cotton twine, starting at the top and wrapping toward the bottom, or with as many separate ties as necessary to hold the wrapping securely but loosely enough to allow a normal season's growth.
9. Staking

Each newly-planted deciduous tree under three (3) inches in caliper or conifer tree under eight (8) feet in height shall be staked with three (3) standard "T" type studded posts. The posts shall be driven an adequate distance away from the trunk of the tree so they are not driven into the root ball of the newly planted tree. A tie wire, 12-gauge minimum, shall be used for each post. Canvas tree ties shall secure the tie wire to the tree as specified in 195.2.B.6. Three (3) ties per tree are required.
10. Guying

Deciduous trees over three 3" in diameter or conifers over eight 8' in height shall be guyed. Guy wires, minimum 12 gauge, shall be secured using canvas tree ties & 6' "T" type studded posts. Three (3) guys per tree are required. Posts shall be driven a minimum of two (2) feet into the ground.
11. Cleanup

When planting is complete, all debris shall be removed from the jobsite. All excess earth materials shall be graded or otherwise removed, damaged turf reseeded, & the area left in a neat, orderly condition.

12. **Establishment Period**  
An establishment period shall begin immediately after original planting is made and shall continue for one year. The plants shall be guaranteed during this period against defects, including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse, or damage by others, or unusual phenomena or incidents, which are beyond, landscape installer's control.  
Contractor shall be responsible for watering all plants until a letter of acceptance for the project is received from the Engineer.
13. **Warranty**  
The contractor shall provide a two (2) year warranty for all plant material including replacements within the warranty period. Warranty period commences at the substantial completion date. Warranty covers death, unsatisfactory growth (except for defects due to lack of adequate maintenance, neglect or abuse by owner, abnormal weather conditions, unusual for warranty period, or incidents such as damage due to vandalism, hail, fire, owner neglect or other circumstances that are out of the contractors control.) Warranted replacement plants shall be of same species and size.
14. **Replacement of Plants**  
The Contractor shall remove and replace trees, shrubs, or other plants found to be dead or in unhealthy condition during establishment period. The Contractor shall also plant missing trees, shrubs, and plants, make replacements during growing season following end of establishment period, and furnish and plant replacements which comply with requirements shown and specified. The Contractor shall also replace trees and shrubs, which are in doubtful condition at end of the establishment period, unless, in the opinion of the Engineer, it is advisable to extend the establishment period for a full growing season. The Engineer will make another inspection at the end of the extended establishment period to determine acceptance or rejection. Only one (1) replacement will be required at the end of the establishment period, except for losses or replacements due to failure to comply with specified requirements.
- 195.4 **METHOD OF MEASUREMENT**  
Quantities of each species or variety of trees, shrubs, and vines will be determined from count of each.
- 195.5 **BASIS OF PAYMENT**  
Upon satisfactory completion of planting, payment will be made at the contract unit price per tree, shrub, or vine. Payment will constitute full compensation for furnishing, transporting, handling, storing, planting, wrapping, pruning, watering, necessary excavation, disposal of surplus materials, screening, mixing and placing topsoil, 'dakota', sand, staking, mulching material, and labor, equipment, tools, and necessary incidental.

END OF SECTION

**STATE OF SOUTH DAKOTA  
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION  
FOR  
ELECTRONIC BIDDING REQUIREMENTS**

**DECEMBER 18, 2013**

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The South Dakota Department of Transportation requires all bid proposals submitted for this project be prepared and submitted using the latest version of the South Dakota Electronic Bidding System (SDEBS).

A prospective bidder may obtain the latest version of the SDEBS software from the SDDOT Website:

<http://apps.sd.gov/hc65bidletting/ebsInstall.aspx>

**MAKE THE INDICATED CHANGES TO THE FOLLOWING SPECIFIED SECTIONS OF THE STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES:**

**Delete Section 2.1 and replace with the following:**

**2.1**

- A. PREQUALIFICATION OF BIDDERS** - Prequalification on state highway construction contracts is required unless the amount being bid is less than \$200,000.

A prospective bidder must be prequalified prior to the time and date specified for bid opening. A prospective bidder may apply for prequalification by completing and executing a Contractor's prequalification statement on a form approved by the Department. This application must be received by the Department's classification and rating committee at least 14 calendar days prior to the letting date.

Once prequalified, the Department will issue a notice to the prospective bidder stating the prospective bidder's approved work classification or work classifications, the prospective bidder's bidding capacity, and the prospective bidder's expiration date for prequalification status.

A prospective bidder may obtain the prequalification requirements contained in South Dakota Administrative Rules from the website:

<http://legis.sd.gov/rules/DisplayRule.aspx?Rule=70:07>

**B. ELECTRONIC IDENTIFICATION** – A prospective bidder must register as a new user on the Department’s website to obtain a company identification and password. Certain bidding documents will only be available for download with proper company identification and password. Each company will receive one company identification and password.

In addition to the company identification and password, a prospective bidder must obtain a bidder identification and password for each individual who will be authorized to submit a bid proposal on behalf of the company. To authorize an individual to submit a bid proposal on behalf of the company, and obtain the bidder identification(s) and password(s), the company must complete a Bidding Authorization Form (available on the Department’s website), furnishing all required information and all appropriate notarized signatures, and submit the form to the Department no later than 48 hours prior to the bid opening.

The individual receiving this bidder identification and password must be an authorized agent of the company having legal authority to do business for the company.

**Delete Section 2.2 and replace with the following:**

**2.2 CONTENTS OF BIDDING PACKAGE** - The bidding package consists of the proposal booklet, plans, electronic design files, specifications, special provisions, supplemental specifications, addenda, project question and answer (Q&A) forum, and electronic bid files. The bidding package will state the location and description of the contemplated construction, show the estimate of the various quantities and type of work to be performed or materials to be furnished, and will have a schedule of items for which unit bid prices are invited. The bidding package will state the time in which the contract work must be completed, the time and date deadline for submitting the required bid proposals, and prequalification requirements.

Prospective bidders must refer to the SDDOT Website to acquire the bidding package. The prospective bidder will be responsible for all costs associated with utilizing the SDEBS and electronic bonds through the bond management company.

The Department will open the project Q&A forum when the project is advertised for letting. Prospective bidders are responsible for periodically checking the project Q&A forum for new questions and answers. The Department will post questions and answers, but will provide no additional notification of posted questions and answers. Prospective bidders may post new questions to the project Q&A forum until 10:00 AM CT on the Friday prior to the letting, at which time prospective bidders will be locked from further posting. The Department may post new questions and answers to the project Q&A forum up until 10:00 AM CT

on the Tuesday prior to the letting, at which time the project Q&A forum will be final and locked from all editing. In submitting a complete and final bid, a prospective bidder must account for any and all information posted to the final project Q&A forum regardless of when the prospective bidder submits a bid proposal.

**Delete Section 2.3 and replace with the following:**

**2.3 ISSUANCE OF BIDDING PACKAGE** - The Department will not place restrictions on who may download the bidding package from the website, except that certain documents will require the company identification described in Section 2.1 B. The bidder must verify the bidder's prequalification status prior to bidding. The Department will verify bidder status in accordance with Section 3.1 prior to opening bids.

**Delete Section 2.5 and replace with the following:**

**2.5 EXAMINATION OF PLANS, SPECIFICATIONS, SPECIAL PROVISIONS, PROJECT Q&A FORUM, AND SITE OF WORK** - The bidder must examine the project site, and the entire bidding package for the work contemplated. The submission of a bid proposal will be considered conclusive evidence the bidder has investigated and is satisfied as to the conditions to be encountered, the character, quality, and quantities of work to be performed, and materials to be furnished, according to all contract documents.

Boring logs and other records of subsurface investigations are available for inspection by prospective bidders. Prospective bidders must understand this information was obtained and is intended for Department design and estimating purposes and the Department cannot guarantee the accuracy of this information. This information is made available so all prospective bidders have access to the same subsurface information available to the Department. The furnishing of this information is not intended as a substitute for the prospective bidder's personal investigation, interpretation, and judgment.

The Department will not be bound by any statement or representation made by any Department employee or agent prior to the execution of the contract, unless included in the bidding package.

A prospective bidder must request any explanation regarding the meaning or interpretation of the bidding package in adequate time to allow a Department reply to reach all prospective bidders before submission of final bid proposals. The bidder will contact the Department by submitting a request for explanation to the project Q&A forum. If the deadline for submitting questions to the project Q&A forum has passed, the bidder will submit the request for explanation to the Department Bid Letting office. The Department may answer the request for explanation on the project Q&A forum or issue an addendum to all prospective

bidders, as appropriate, in the Department's sole discretion. The Department will furnish any addendum to all prospective bidders by electronic addendum before the time specified for opening of bid proposals.

The bidder will not take advantage of any apparent error, omission, or ambiguity in the bidding package. If the bidder discovers an error, omission, or ambiguity, the bidder will immediately notify the Department of the apparent error, omission, or ambiguity and its perceived consequences. The bidder will notify the Department by submitting a question to the project Q&A forum. If the deadline for submitting questions to the project Q&A forum has passed, the bidder will notify the Department Bid Letting office. The Department may certify the error, omission, or ambiguity and may answer the question on the project Q&A forum or issue an addendum to all prospective bidders, as appropriate, in the Department's sole discretion. The Department will furnish any addendum to all prospective bidders by electronic addendum before the time specified for opening of bid proposals.

The Contractor will not take advantage of any apparent error, omission, or ambiguity in the contract. If the Contractor discovers an error, omission, or ambiguity, the Contractor will immediately notify the Department of the apparent error, omission, or ambiguity and its perceived consequences. The Contractor will notify the Engineer. The Engineer will make corrections and interpretations as necessary to fulfill the intent of the Contract.

**Delete Section 2.6 and replace with the following:**

**2.6 PREPARATION OF PROPOSAL** - The bidder must submit the proposal using the SDEBS.

The bidder must specify a unit price, in numerals, for each bid item for which a quantity is given. A unit price cannot be "\$0.00."

When the bidding package contains an alternate bid item or group(s) of alternate bid items, the bidder must indicate a choice for each available group by entering unit prices for all bid items within the alternate chosen.

The bidder must complete all required fields in the SDEBS. If the bidder does not completely fill out all required fields the Department may consider the bid irregular and reject the bid proposal in accordance with Section 2.7.

For bidding purposes, in case of a discrepancy between the line number, bid item description, or quantity shown in the SDEBS and the corresponding item shown in the plans, the bid item description and the quantity shown in the SDEBS will govern.

**2.7 IRREGULAR BID PROPOSALS** – The Department will consider a bid proposal irregular and may reject the bid proposal for any of the following reasons:

- A. The bid proposal is incomplete, or is submitted on a form other than the Department’s latest version of the SDEBS;
- B. The bid proposal contains unauthorized additions, conditional or alternate bids, or other irregularities, which may tend to make the bid proposal incomplete, indefinite, or ambiguous as to its meaning;
- C. The bid proposal contains provisions reserving the right to accept or reject an award, or to enter into a contract pursuant to an award (this is not intended to exclude a bid proposal limiting the maximum gross amount of awards acceptable to a bidder at one bid letting. The Department will select awards in its sole discretion.);
- D. The bid proposal does not contain a unit price in numerals for each pay item listed, except in the case of authorized alternate pay items;
- E. The bid proposal is signed with an invalid bidder identification;
- F. The Department determines, in its sole discretion, that any of the unit bid prices are significantly unbalanced to the potential detriment of the Department; or,
- G. Confirmation of receipt of all addenda issued by the Department is not included in the bid proposal.

**Delete Section 2.8 and replace with the following:**

**2.8 PROPOSAL GUARANTY** - The Department will not consider any bid proposal unless the bidder has furnished the Department a guaranty in the amount of five percent of the total amount of the bid prior to opening of the bids. Satisfactory forms of proposal guaranties are certified checks, cashier’s checks, bank drafts issued upon a national or state bank, and bid bonds issued in accordance with South Dakota law. If the bidder uses an electronic bid bond, the bidder must submit the bid bond identification number with the bid proposal. Unless otherwise specified in the bidding package, the proposal guaranty must be made payable at sight to the “South Dakota Department of Transportation.”

**Delete Section 2.9 and replace with the following:**

**2.9 SUBMISSION OF BID PROPOSALS** – A bidder must submit a bid proposal electronically using the SDEBS to the Department’s secure bid submission site prior to the time and date specified by the Notice to Contractors in the bidding

package. The Department will not accept any bid proposal received after the time specified for opening of bids.

**Delete Section 2.10 and replace with the following:**

**2.10 WITHDRAWAL OR REVISION OF PROPOSALS** - A bidder may withdraw a proposal after it has been submitted, if the withdrawal is made before the time set for opening the proposals.

A bidder may revise and resubmit a bid proposal any time prior to the time set for opening the proposals. The Department will consider only the last bid proposal submitted as a valid bid proposal for that project. A bidder may revise a bid only through the SDEBS.

**Delete Section 3.1 and replace with the following:**

**3.1 CONSIDERATION OF BID PROPOSALS** - After the bids are received, but prior to opening, the Department will verify the bidder is prequalified for the specified work type. After the bids are opened, the Department will verify the bidder's status at that time is sufficient to handle the work for which the bidder submitted a bid. The Department reserves the right to refuse to accept a bid proposal for any of the following reasons:

- A.** Lack of competency or adequate machinery, plant, and other equipment, as shown by the Contractor's Prequalification Statement;
- B.** Uncompleted work which the Department determines, in its sole discretion, may hinder or prevent the prompt completion of additional work;
- C.** Failure to pay or satisfactorily settle any legal obligation due for labor or material on any contract at the time of issuance of proposals;
- D.** Failure to comply with the Department's prequalification regulations;
- E.** Default under any previous contract or contracts;
- F.** Debarment by the Department or the federal government;
- G.** Lack of bidding capacity as established by the Contractor's prequalification statement, considering the uncompleted work currently under contract; or,
- H.** Unsatisfactory performance on previous work or any current contract or contracts consisting of, but not limited to:
  - 1.** Noncompliance with contract specifications, contract requirements, or Engineer's directives;

2. Failure to complete work on time;
3. Instances of substantial corrective work prior to acceptance;
4. Instances of completed work that requires acceptance at reduced pay;
5. Production of work or materials not meeting required specifications, and when applicable, requiring price reductions or corrective work;
6. Failure to provide adequate safety measures or appropriate traffic control that endangers the safety of the work force and public;
7. Questionable moral integrity as determined by the Attorney General of the State, or the Department; or,
8. Failure to reimburse the State for monies owed on any previously awarded contract including any contract where the prospective bidder is a party to a joint venture and the joint venture has failed to reimburse the State for monies owed.

After the bid proposals are opened, the Department will compare the bids on the basis of the summation of the products of the quantities shown in the bid proposal by the unit bid prices. The results of such comparisons will be available to the public via the Department's Internet Website.

The Department reserves the right to reject any bid proposal, the right to waive technicalities, and the right to reject all bid proposals and advertise for new bid proposals, if in the sole judgment of the Department the rejection or waiver will promote the best interest of the Department.

**Delete Section 3.4 and replace with the following:**

- 3.4 PROPOSAL GUARANTY** - The Department will retain the proposal guaranties of the two lowest responsible and competent bidders. The Department will release the remaining proposal guaranties following opening and checking of bid proposals. The Department will release the proposal guaranties of the two low bidders when the contract has been executed.

**Delete Section 5.4 and replace with the following:**

- 5.4 COORDINATION OF CONTRACT DOCUMENTS** – The contents of the bidding package are essential parts of the contract. A requirement occurring in one is as binding as though occurring in all. The contents of the bidding package are intended to be complimentary and to describe and provide for a complete work.

If any discrepancy exists, the governing ranking is:

1. Addenda
2. Project Q&A forum
3. Special provisions
4. Plans
5. Supplemental specifications
6. Standard specifications
7. Electronic design files

Notwithstanding the above governing ranking, addenda will govern over the project Q&A forum unless specifically addressed by a Department response in the project Q&A forum.

In case of a discrepancy between questions on the project Q&A forum regarding the same topic, the most recent question and answer will govern over previous questions and answers. Questions will be numbered on the project Q&A forum in order of date and time posted.

In addition, calculated dimensions will govern over scaled dimensions.

**Delete Section 570**

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**STATE OF SOUTH DAKOTA  
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION  
FOR  
DIFFERING SITE CONDITIONS**

**DECEMBER 19, 2013**

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During the progress of the work, if subsurface or latent physical conditions are encountered at the site differing materially from those indicated in the contract or if unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract, are encountered at the site, the party discovering such conditions shall promptly notify the other party in writing of the specific differing conditions before the site is disturbed and before the affected work is performed.

Upon written notification, the Engineer will investigate the conditions, and if it is determined that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any work under the contract, an adjustment, excluding anticipated profits, will be made and the contract modified in writing accordingly. The Engineer will notify the Contractor of the determination whether or not an adjustment of the contract is warranted.

No contract adjustment which results in a benefit to the Contractor will be allowed unless the Contractor has provided the required written notice.

No contract adjustment will be allowed under this clause for any effects caused on unchanged work.

This section does not apply to material sources shown on the plans and as defined in Section 6.

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**STATE OF SOUTH DAKOTA  
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION  
FOR  
SUSPENSION OF WORK**

**FEBRUARY 13, 2004**

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The following shall apply when suspension of the work is ordered by the Engineer.

If the performance of all or any portion of the work is suspended or delayed by the Engineer in writing for an unreasonable period of time (not originally anticipated, customary, or inherent to the construction industry) and the Contractor believes that additional compensation and/ or contract time is due as a result of such suspension or delay, the Contractor shall submit to the Engineer in writing a request for adjustment within 7 calendar days of receipt of the notice to resume work. The request shall set forth the reasons and support for such adjustment.

Upon receipt, the Engineer will evaluate the contractor's request in accordance with Section 5.17 and/or Section 8.6 of the Standard Specifications. If the Engineer agrees that the cost and/or time required for the performance of the contract has increased as a result of such suspension and the suspension was caused by conditions beyond the control of and not the fault of the Contractor, its suppliers, or subcontractors at any approved tier, and not caused by weather, the Engineer will make an adjustment (excluding profit) and modify the contract in writing accordingly. The Contractor will be notified of the Engineer's determination whether or not an adjustment of the contract is warranted.

No contract adjustment will be allowed unless the Contractor has submitted the request for adjustment within the time prescribed.

No contract adjustment will be allowed under this clause to the extent that performance would have been suspended or delayed by any other cause, or for which an adjustment is provided or excluded under any other term or condition of this contract.

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**STATE OF SOUTH DAKOTA  
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION  
FOR  
STANDARD TITLE VI ASSURANCE**

**JANUARY 15, 2004**

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**TITLE VI – NONDISCRIMINATION:**

During the performance of this contract, the contractor, for itself, its assignees and successors in interest (hereinafter referred to as the “Contractor”) agrees as follows:

- (1) Compliance with Regulations: The contractor shall comply with the Regulations relative to nondiscrimination in Federally or State assisted programs of the South Dakota Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended (hereinafter referred to as the “Regulations”), incorporated by reference and made a part of this contract.
- (2) Nondiscrimination: The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, religion, national origin, sex, age or disability in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.
- (3) Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor’s obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, religion, national origin, sex, age or disability.
- (4) Information and Reports: The contractor shall provide all information and reports required by the Regulations, or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the South Dakota Department of Transportation or the Federal Highway Administration to be pertinent to ascertain compliance with such Regulations or directives. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the South Dakota Department of Transportation, or the Federal Highway Administration as appropriate, and shall set forth what efforts it has made to obtain this information.
- (5) Sanctions for Noncompliance: In the event of the contractor’s noncompliance with the nondiscrimination provisions of this contract, the South Dakota Department of Transportation shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including but not limited to:
  - (a) withholding of payments to the contractor under the contract until the contractor complies, and/or
  - (b) cancellation, termination or suspension of the contract, in whole or in part.
- (6) Incorporation of Provisions: The contractor shall include the provisions of paragraphs (1) through (6) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the South Dakota Department of Transportation or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for non-compliance. Provided, however, that, in the event of a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the South Dakota Department of Transportation to enter into such litigation to protect the interest of the State, and, in addition, the contractor may request the United States to enter such litigation to protect the interests of the United States.

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**STATE OF SOUTH DAKOTA  
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION FOR  
IMPLEMENTATION OF CLEAN AIR ACT  
AND  
FEDERAL WATER POLLUTION CONTROL ACT**

**SEPTEMBER 1, 1997**

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By signing this bid, the bidder will be deemed to have stipulated as follows:

- a) That any facility to be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub. L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub. L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR, Part 15), is not listed on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.
- b) That the State Transportation Department shall be promptly notified prior to contract award of the receipt by the bidder of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility to be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

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**STATE OF SOUTH DAKOTA  
DEPARTMENT OF TRANSPORTATION  
SUPPLEMENTAL SPECIFICATION FOR  
ERRATA**

**MARCH 3, 2010**

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**MAKE THE INDICATED CORRECTIONS TO THE FOLLOWING SPECIFIED SECTIONS:**

**Section 491.5 A, B, C, D, E – Page 290 – Add the following to the end of the first sentence of each of these sections:**

(square meter).

**Section 629.4 C – Page 351 – Replace the first sentence with the following:**

Remove Three Cable Guardrail will be measured to the nearest foot (0.1 meter) along the centerline of the cable.

**Section 629.4 D – Page 351 – Replace the first sentence with the following:**

Removal of Anchor Assembly will be measured by the each.

**Section 630.3 D – Page 354 – Replace the fourth sentence with the following:**

The drawings shall contain all components of the W beam end terminal.

**Section 634.2 – Page 371 – Replace the second paragraph with the following:**

Traffic control devices shall meet the crashworthy requirements of the National Cooperative Highway Research Program Report 350 (NCHRP 350) for Category I, II and III devices.

**Section 635.3 L – Page 383 – Delete and replace with the following:**

**L. Luminaires:** Luminaires shall be adjusted on the support so the lamina sets level as indicated by a small bubble level. Bolts shall be firmly tightened.

**Section 635.4 K – Page 385 – Delete and replace with the following:**

**K. Luminaires:** Measurement will be by the actual count of the various types and sizes of luminaires furnished and installed.

**Section 635.5 K – Page 387 – Delete and replace with the following:**

**K. Luminaires:** Payment for luminaires of the various types and sizes will be at their respective contract unit prices per each. Payment will be full compensation for furnishing and installing luminaires.

**Section 984.3 H – Page 504 – Replace the first paragraph with the following:**

Temporary road markers shall consist of a yellow or white plastic body providing a horizontal width and length of approximately 3 ½ inches (90 mm) in both dimensions and approximately ¾ inches (20

mm) high. If flexible vertical markers are used they shall be approximately 4 inches (100 mm) wide and approximately 2 inches (50 mm) high.

**Index – Page 532 – Under Portland Cement Concrete Pavement – Delete “Dowel and Tie Bars...517” and replace with the following:**

Dowel and Tie Bars..... 519

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**STATE OF SOUTH DAKOTA  
DEPARTMENT OF TRANSPORTATION**

**SUPPLEMENTAL SPECIFICATION TO  
STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES**

**MARCH 3, 2010**

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All items included in this supplemental specification will govern over the Errata.

**MAKE THE INDICATED CHANGES TO THE FOLLOWING SPECIFIED SECTIONS:**

**Section 2.6 D – Page 11 – Delete and replace with the following:**

D. PCN

**Section 3.6 – Page 15 – Delete and replace with the following:**

**3.6 EXECUTION AND APPROVAL OF CONTRACT** - The contract shall be signed and returned by the successful bidder, together with the contract bond, within 20 calendar days after the receipt of the Notice of Award. If the contract is not executed by the Department within 15 calendar days following the receipt from the bidder of the signed contract and related documents, the bidder shall have the right to withdraw the bid without penalty. A contract will not be considered in effect until it has been executed by all parties to the contract.

**Section 3.7 – Page 15 – Delete the first sentence and replace with the following:**

Failure to execute the contract and file acceptable bonds within 20 calendar days after bidder's receipt of the Notice of Award shall be just cause for the cancellation of the award and the forfeiture of the proposal guaranty which shall become the property of the Department, for liquidation of damages sustained.

**Section 4.6 – Page 19 – Delete and replace with the following:**

**4.6 FINAL CLEANING UP** - Before Acceptance of Field Work is made by the Area Office, the highway and areas occupied by the Contractor in connection with the work shall be cleaned of rubbish, excess materials, temporary structures, and equipment; and the work left in an acceptable condition, unless otherwise approved by the Engineer.

**Section 5.6 – Page 24 – Delete the last sentence of the seventh paragraph and replace with the following:**

The depth applies to the existing grade or ditch flowline within the right-of-way.

**Section 5.6 – Page 24 – Delete the last two sentences of the eighth paragraph and replace with the following:**

Contractors shall give at least 48 hour notice prior to commencement of excavation, excluding Saturdays, Sundays, and legal holidays of the state. South Dakota One Call phone number is **1-800-781-7474** or **811** within the State of South Dakota.

**Section 5.6 – Page 24 – Add the following to the list of items on page 25:**

Tunneling or Boring  
Duration of Excavation  
Nearest Cross Street

**Section 5.6 – Page 24 – Delete the third sentence of the last paragraph on page 25 and replace with the following:**

The utility shall as soon as possible but not longer than two hours from the notification time during the business day and not longer than four hours from the notification time outside of the business day or by the start time on the ticket, whichever is later provide all reasonably available practical information to the Contractor.

**Section 5.10 – Page 27 – Add the following sentence to this section:**

Neither the Department's authority to inspect all work nor any actual inspections performed by the Department during the course of construction shall constitute an acceptance of work performed, or operate to relieve the Contractor of its obligation to construct the project in compliance with the plans and specifications.

**Section 5.14 – Page 28 – Delete the first sentence of the first paragraph and replace with the following:**

The Contractor shall maintain the work during construction and until the Area Office issues the Acceptance of Field Work.

**Section 5.14 – Page 28 – Delete the last paragraph and replace with the following:**

Cost of maintenance work during construction and before the Area Office issues the Acceptance of Field Work shall be included in the unit price bid on the various pay items and the Contractor will not be paid an additional amount for such work.

**Section 5.16 – Page 29 – Delete and replace with the following:**

**5.16 ACCEPTANCE OF FIELD WORK** - When the contract work, including authorized modifications and final cleanup has been completed, the Area Engineer or his designee will, within fourteen days, make a final inspection of the work. When provided in the Contract, the Area Engineer or his designee may make inspections following completion of portions of the contract. If the work is found to conform with the requirements of the Contract, the Area Engineer or his designee will issue written notification to the Contractor of Acceptance of Field Work. Such notice is not to be construed as an acceptance by the Area Engineer or his designee of previously noted defective or unauthorized work, or of unauthorized work subsequently determined during the final computations of field measurements. Should the work fail to conform with requirements of the Contract, a written statement of the features to be remedied will be given the Contractor. Final Acceptance will not be made until the Contractor advises the Engineer that the corrections have been made and the requirements have been met.

**Section 5.17 – Page 29 – Delete the first paragraph and replace with the following:**

**5.17 CLAIMS FOR ADJUSTMENT AND DISPUTES** - If the Contractor deems that additional compensation is warranted for work or materials not covered in the Contract and not ordered as extra work as defined herein, the Contractor shall give the Area Engineer written notice of the claim for additional compensation.

**Section 5.17 – Page 29 – Delete the fourth paragraph and replace with the following:**

Under no circumstances will a claim be considered if written notification is made more than 30 days after the final payment is made.

**Section 5.17 – Page 30 – Delete the sixth and seventh paragraphs and replace with the following two paragraphs:**

The Contractor hereby agrees to waive any claim for additional compensation if timely written notification is not furnished and the Area Engineer is not provided the opportunity to keep account of or determine costs, to incorporate alternate methods of accomplishing the disputed work or to otherwise resolve the claim.

A Claims Documentation Form, furnished by the Department, shall be completed by the Contractor and submitted to the Area Engineer after completion of the work on which the claim is based. The Claims Documentation Form shall be completed within 120 calendar days after completion of the work unless an extension is granted, in writing, by the Area Engineer.

**Section 5.17 – Page 30 – Delete the last three paragraphs of this section and replace with the following five paragraphs:**

Claims which are properly submitted, but which are not approved, will be automatically escalated to the next higher authority level within the Department for review. The Secretary of Transportation has final resolution authority on all submitted claims.

Claims may be submitted by the Department to a third-party claim investigator for further review and investigation. The report prepared by the claim investigator shall not be shared with the Contractor, nor shall the report be used in subsequent administrative or legal proceedings. Failure to fully cooperate with the third-party investigator may result in

denial of the claim. After the Secretary of Transportation receives the report, the parties, by mutual agreement, may initiate a non-binding mediation to attempt to resolve the claim.

If the claim is determined completely or partially valid, those portions determined valid, plus interest computed at the rate of 4.25% per annum for the time period between the date shown on the Region Engineer's letter of Final Acceptance and the date the claim was resolved, will be paid.

If a claim is determined completely or partially valid in a subsequent proceeding in circuit court and pre-judgment interest is awarded by the court on all or a portion of the judgment, that interest shall be computed at the rate of 4.25% per annum.

Nothing in this section shall be construed as establishing any claim contrary to the terms of Section 4.2.

**Section 7.6 – Page 37 – Add the following paragraph to this section:**

All workers within the right of way who are exposed either to traffic (vehicles using the highway for purposes of travel) or to construction equipment within the work area shall wear high-visibility safety apparel intended to provide conspicuity during both daytime and nighttime usage, and meeting the Performance Class 2 or 3 requirements of the ANSI/ISEA 107-2004 publication entitled "American National Standard for High-Visibility Safety Apparel and Headwear".

**Section 7.12 – Page 39 – Delete the last sentence of the second paragraph and replace with the following:**

The Contractor's responsibility will not be released until completion of the project and Final Acceptance is made, as noted by the date shown on the Region Engineer's letter of Final Acceptance.

**Section 7.14 – Page 39 – Delete this section and replace with the following:**

**7.14 RESPONSIBILITY FOR DAMAGE CLAIMS** - The Contractor shall hold harmless and indemnify the Department, its officers and employees, from all suits, actions, or claims of any character brought because of any injuries or damages received or sustained by any person, persons or property arising from the operations of the said Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act", or any other law, ordinance, order, or decree; and so much of the money due the said Contractor under and by virtue of his contract as may be considered necessary by the Department for such purpose may be retained for the use of the State; or in case no money is due, his surety may be held until such suit or suits, action or actions, claim or claims for injuries or damages as aforesaid shall have been settled and suitable evidence to that effect furnished to the Department; money due the Contractor will not be withheld when the Contractor produces satisfactory written confirmation from its insurer that adequate public liability insurance and property damage insurance providing coverage for such particular claims as may be made is in force; a copy of a certificate of insurance, without further confirmation of coverage for the particular claim being made, will not be sufficient to satisfy the requirement of written confirmation.

**Section 7.15 – Page 40 – Delete the first sentence and replace with the following:**

**7.15 LIABILITY INSURANCE** - The Contractor shall procure and maintain at the Contractor's expense, during duration of the Contract, liability insurance with an insurance company authorized to do business in the state of South Dakota, for damages imposed by law.

**Section 7.16 – Page 40 – Delete the second sentence of the last paragraph and replace with the following:**

In such event, the Contractor shall not be relieved of liability or responsibility during the period the work is so opened and prior to Acceptance of Field Work.

**Section 7.17 – Page 40 – Delete the first paragraph and replace with the following two paragraphs:**

**CONTRACTOR'S RESPONSIBILITY FOR WORK** - The Contractor is responsible for the work until the Acceptance of Field Work is made by the Area Office, except as set forth in Section 4.4 B.1. The Contractor shall protect the work against injury or damage from all causes, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and replace all work that is injured or damaged prior to the Acceptance of Field Work, at no additional cost to the Department. Damage to work due to unforeseeable

causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God, acts of the public enemy, or acts of governmental authorities shall be restored by the Contractor at the Department's expense according to subsection 4.2 or 4.3, as applicable.

Following the Acceptance of Field Work, but prior to Final Acceptance as described in Section 9.9, the Contractor shall be responsible for damage to work resulting from an act, omission, neglect, or misconduct in the Contractor's manner or method of executing the work, or due to defective work or materials at no additional cost to the Department.

**Section 8.1 – Page 45 – Delete and replace with the following:**

**8.1 SUBLETTING OF CONTRACT** - The Contractor shall not sublet, sell, transfer, assign, or dispose of the contract or contracts or any portion of them, without written consent of the Engineer. Each request to sublet shall be submitted on the form provided by the Engineer. The Contractor shall submit a request to sublet for any contracting firms a subcontractor proposes to use as a lower tier subcontractor. The Contractor shall obtain approval of each subcontractor before the start of the work performed by the subcontractor.

The Contractor will be permitted to sublet up to 50 percent of the contract amount, based on the contract unit prices, but shall perform work amounting to not less than 50 percent of the total contract amount with his own organization.

The Department will consider the Contractor's own organization to include only workers employed and paid directly by the Contractor, equipment owned or rented by the Contractor, and materials purchased by the Contractor for its use in performing Contract work. This does not include employees, equipment, or materials purchased by or incorporated into work of any subcontractor, assignee, or agent of the Contractor.

The Department will not consider as subcontracting the following; 1) any material produced outside the project limits including but not limited to the production of sand, gravel, crushed stone, batched concrete aggregates, ready mix concrete, off-site fabricated structural steel, other off-site fabricated items, and any materials delivered by established and recognized commercial plants; or 2) delivery of these materials to the work site from an off-site location in vehicles owned or operated by such plants or by recognized independent or commercial hauling companies. Project limits is defined as being within a 1/2 mile radius of the project proper.

Any items designated in the contract as "specialty items" may be performed by subcontract and the cost of designated specialty items performed by subcontract will be deducted from the total contract amount before computing the amount of work required to be performed by the Contractor's own organization.

The Contractor shall give assurance to the Engineer that all pertinent provisions of the prime contract including minimum wage for labor shall apply to the work sublet. Subcontract, or transfer of contract, shall not relieve the Contractor of his responsibilities and liability under the contract and bonds.

**Section 8.2 – Page 45 – Delete and replace with the following:**

**8.2 NOTICE TO PROCEED** - The Notice to Proceed shall consist of written notification to the Contractor to proceed with the work. Such notification will be issued within 15 calendar days following the receipt from the bidder of the signed contract and related documents. The contract time will start on the date the Contractor actually starts construction work or 30 calendar days after the date of the Notice to Proceed, whichever date is earlier. The Contractor shall not begin work prior to the date of the Notice to Proceed.

**Section 8.6 A – Page 48 – Delete the first paragraph on page 48 and replace with the following:**

If for reasons beyond the Contractor's control the work cannot be completed within the contract time as specified or as extended according to the provisions of this section, the Contractor may make a written request for an extension of contract time. The written request shall be made at any time prior to the expiration of the contract time as extended. The Contractor's time extension request shall set forth the reasons which will justify an extension of time.

A Time Extension Request Form, furnished by the Department, shall be completed by the Contractor and submitted to the Area Engineer. If the written request was properly filed in accordance with the requirements of this section, the time extension request will be forwarded through the proper channels, to the Secretary of Transportation for final resolution.

The Time Extension Request Form shall be fully completed and will contain the following:

1. A narrative justification citing the basis for the time extension.
2. A statement of the amount of extra compensation, including liquidated damages, incentive, or disincentive associated with the time extension.
3. A signed and notarized statement that the information furnished is true and fully documented.
4. Permission for the Department or its authorized representative to examine all Contractor records concerning this time extension request.

The Secretary of Transportation may submit the time extension request to a third-party investigator for further review and investigation. The report prepared by the investigator shall not be shared with the Contractor, nor shall the report be used in subsequent administrative or legal proceedings. Failure to fully cooperate with the third-party investigator may result in denial of the time extension request. After the Secretary of Transportation receives the report, the parties, by mutual agreement, may initiate a non-binding mediation to attempt to resolve the time extension request.

**Section 8.6 A – Page 48 – Delete the first sentence of the second to last paragraph and replace with the following:**

If the Secretary of Transportation finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, the Secretary may extend the time for completion in such amount as the conditions justify.

**Section 8.6 A – Page 48 – Delete the last paragraph and replace with the following:**

When Acceptance of Field Work has been duly made as prescribed in Section 5.16, the daily time count/assessment will cease. The daily time count/assessment may resume if the Contractor fails to provide, in a timely manner, required project documentation as ordered by the Area Engineer. The daily time count/assessment may also resume when in accordance with Section 7.17, repairs, rework, or other activities are ordered for work that the Contractor is responsible for.

**Section 8.6 B – Page 50 – Delete the second paragraph on page 50 and replace with the following:**

If for reasons beyond the Contractor's control the work cannot be completed within the contract time as specified or as extended according to the provisions of this section, the Contractor may make a written request for an extension of contract time. The written request shall be made at any time prior to the expiration of the contract time as extended. The Contractor's time extension request shall set forth the reasons which will justify an extension of time.

A Time Extension Request Form, furnished by the Department, shall be completed by the Contractor and submitted to the Area Engineer. If the written request was properly filed in accordance with the requirements of this section, the time extension request will be forwarded through the proper channels, to the Secretary of Transportation for final resolution.

The Time Extension Request Form shall be fully completed and will contain the following:

1. A narrative justification citing the basis for the time extension.
2. A statement of the amount of extra compensation, including liquidated damages, incentive, or disincentive associated with the time extension.
3. A signed and notarized statement that the information furnished is true and fully documented.
4. Permission for the Department or its authorized representative to examine all Contractor records concerning this time extension request.

The Secretary of Transportation may submit the time extension request to a third-party investigator for further review and investigation. The report prepared by the investigator shall not be shared with the Contractor, nor shall the report be used in subsequent administrative or legal proceedings. Failure to fully cooperate with the third-party investigator may result in denial of the time extension request. After the Secretary of Transportation receives the report, the parties, by mutual agreement, may initiate a non-binding mediation to attempt to resolve the time extension request.

**Section 8.6 B – Page 51 – Delete the last sentence of the second to last paragraph and replace with the following:**

If the Secretary of Transportation finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, the Secretary may extend the time for completion in such amount as the conditions justify. The extended time for completion shall then be in full force and effect the same as though it were the original time for completion.

**Section 8.6 B – Page 51 – Delete the last paragraph and replace with the following:**

When Acceptance of Field Work has been duly made as prescribed in Section 5.16, the daily time count/assessment will cease. The daily time count/assessment may resume if the Contractor fails to provide, in a timely manner, required project documentation as ordered by the Area Engineer. The daily time count/assessment may also resume when in accordance with Section 7.17, repairs, rework, or other activities are ordered for work that the Contractor is responsible for.

**Section 8.7 – Page 51 – Delete the last sentence of the second paragraph and replace with the following:**

This sum shall be considered and treated not as a penalty but as liquidated damages due the Department from the Contractor by reason of added cost of engineering and supervision resulting from failure to complete the work within the time specified in the contract.

**Section 9.1 B – Page 56 – Delete the fourth paragraph on page 57 and replace with the following:**

Loader Scales - Loader scales will be allowed to be used on contracts when the quantity per line item of granular material to be weighed for payment is less than 10,000 tons (10,000 metric tons).

**Section 9.1 B – Page 56 – Add the following sentence to the end of the sixth paragraph on page 57:**

The accuracy check shall be performed prior to weighing the material for payment and then once per week thereafter.

**Section 9.4 – Page 61 – Delete and replace with the following:**

**9.4 COMPENSATION FOR ALTERED QUANTITIES** - When the accepted quantities of work vary from the estimated quantities in the Contract, the Contractor shall accept as payment in full, payment at the original contract unit prices for the accepted quantities of work. Allowance will not be made for increased expense, except as provided in Section 4.2. Allowance will also not be made for loss of expected reimbursement or loss of anticipated profits.

**Section 9.5 D – Page 62 – Delete the first paragraph of this section and replace with the following:**

**D. Equipment:** For machinery or special equipment including fuel and lubricants, plus transportation costs, authorized by the Engineer, the Contractor shall be paid in accordance with the provisions and rates set forth in the South Dakota Equipment Rental Rates Book which is currently established as the “Rental Rate Blue Book” published by EquipmentWatch, a division of Penton Media, Inc. For purposes of determining an hourly rate, the monthly rate divided by 176 shall be used. This rate will be adjusted for regional factors, age and operating expenses as set forth in the “Rental Rate Blue Book”.

**Section 9.7 – Page 64 – Add the following sentence to the end of the second to last paragraph:**

Progress payments shall not constitute acceptance of the work.

**Section 9.9 - Page 65 - Delete this section and replace with the following:**

**9.9 FINAL ACCEPTANCE AND FINAL PAYMENT** - When Acceptance of Field Work has been made as prescribed in Section 5.16, and all project documentation has been provided, the Engineer will prepare the final estimate of the quantities of the various classes of work performed. After the Engineer determines the final estimate, the Contractor will be paid the entire sum found to be due after deducting previous payments and amounts to be retained or deducted under the provisions of the contract.

Prior partial estimates and payments shall be subject to correction in the final estimate of payment. Final payment will be due 120 days after the date shown on the Region Engineer’s letter of Final Acceptance.

Interest will be added to payments in excess of \$2000 which are due the Contractor and remain unpaid 120 days after the date shown on the Region Engineer's letter of Final Acceptance. Interest will accrue at a rate of 4.25% per annum for the time period after the noted 120 days until final payment is made.

**Section 9.12 – Page 66 – Delete and replace with the following:**

**9.12 THIS SECTION INTENTIONALLY LEFT BLANK**

**Section 120.2 A – Page 73 – Delete and replace with the following:**

- A. Unclassified Excavation:** All materials except those classified as rock excavation, unclassified/rock excavation, muck excavation, option borrow excavation, contractor furnished borrow, or borrow unclassified excavation encountered during the construction of the work, regardless of their nature or manner in which they are removed, will be considered unclassified excavation.

**Section 120.2 – Page 73 – Add the following to the end of this Section:**

- I. Option Borrow Excavation:** Material, furnished by the State, from a pit or other source. The Contractor may use this material at his option.
- J. Contractor Furnished Borrow:** Material, furnished by the Contractor, from a pit or other source.
- K. Borrow Unclassified Excavation:** Material, furnished by the State, from a pit or other source. The Contractor must use this material.

**Section 120.3 – Page 74 – Delete the fifth paragraph and replace with the following:**

The subgrade shall be finished to within minus 0.04 feet (13 mm) to plus 0.08 feet (25 mm) from the design grade and typical section shown in the plans and to within  $\pm 0.5$  percent of the typical section cross slope. The quarter crown within any 12 foot (3.6 m) transverse length shall not exceed 0.04 feet (13 mm) when measured with a straight edge, stringline, or by other suitable equipment.

**Section 120.3 B.3.a – Page 77 – Delete the fifth paragraph and replace with the following:**

Density shall be determined in accordance with SD 105 (AASHTO T 191), SD 106, or SD 114 (AASHTO T 310).

**Section 120.3 B.3.a – Page 78 – Add the following sentence to the end of the second to last paragraph:**

If the material does not contain enough fines to allow for conventional density testing (SD 105 or SD 106), the material shall be compacted as specified for A-2-4(0) and A-3 soils.

**Section 120.4 – Page 79 – Add the following to the end of this Section:**

- I. Borrow Unclassified Excavation:** Borrow unclassified excavation will be measured in its original position by cross sectioning. Volumes will be computed in cubic yards (cubic meters) by the average end area method.

Original cross sections will be taken prior to removal of any material and final sections will be taken following replacement of topsoil. Salvaged topsoil which is stockpiled from the borrow sources will be included as borrow unclassified excavation.

The quantity of topsoil stockpiled and respread on borrow sources will be determined by measuring the stockpiles prior to removal of the material from the stockpiles.

**Section 120.5 – Page 81 – Add the following to the end of this Section:**

- I. Borrow Unclassified Excavation:** Borrow unclassified excavation will be paid for at the contract unit price per cubic yard (cubic meter). Payment will be full compensation for excavation and furnishing the material on the project, construction and compaction of embankments, shaping of slopes, finishing of surface, completion of subgrade, shoulders, and roadway, and maintenance, and for furnishing materials (except topsoil), labor, and incidentals required for restoration of the pit.

Topsoil which is stockpiled from the borrow source will be respread and paid for at the contract unit price per cubic yard (cubic meter) of borrow unclassified excavation and placing topsoil.

**Section 120.5 F – Page 82 – Delete the last sentence and replace with the following:**

Topsoil, seed, fertilizer and mulch for the restoration of the pit shall be incidental to the unit price per cubic yard (cubic meter) of contractor furnished borrow.

**Section 210.3 – Page 85 – Delete the second to last paragraph and replace with the following:**

The subgrade shall be finished to within minus 0.04 feet (13 mm) to plus 0.08 feet (25 mm) from the design grade and typical section shown in the plans and to within  $\pm 0.5$  percent of the typical section cross slope. The quarter crown within any 12 foot (3.6 m) transverse length shall not exceed 0.04 feet (13 mm) when measured with a straight edge, stringline, or by other suitable equipment.

**Section 260.3 A – Page 93 - Delete the first paragraph and replace with the following:**

**A. Subbase and Base Course:** Roadway shaping shall be performed in accordance with Section 210.3 B prior to placement of the material.

**Section 260.3 A – Page 94 - Delete the last paragraph and replace with the following:**

Recycled Portland cement concrete pavement used as a granular base material shall not be used for Base Course, Salvaged Base Course, or in areas where drainage fabric, edge drains, or other similar drainage systems are present.

**Section 270.1 – Page 97 – Delete and replace with the following:**

**270.1 DESCRIPTION**

This work consists of salvaging, processing or crushing, and stockpiling salvaged material from the existing roadway. Salvaged material shall consist of granular material, asphalt concrete mix material, or asphalt mix and granular base material.

**Section 270.2 – Page 97 – Delete this section and replace with the following:**

**270.2 MATERIALS**

The salvaged material shall be processed or crushed to provide material meeting the following gradation.

| <u>Sieve Size</u>  | <u>% Passing</u> |
|--------------------|------------------|
| 1 ½ inch (37.5 mm) | 100              |
| 1 inch (25.0 mm)   | 95-100           |

**Section 270.3 – Page 97 – Delete and replace with the following:**

**270.3 CONSTRUCTION REQUIREMENTS**

**A. Salvage and Stockpile Granular Material or Asphalt Mix and Granular Base Material:**

- 1. Salvaging:** The salvaged material shall be moved and loaded in a manner that minimizes waste and avoids contamination of the salvage material with underlying subgrade soil. Scrapers shall not be used for the removing or loading operations, but may be used to haul the material. Salvaging of material shall not exceed two miles (3.2 kilometers) in advance of the grading operation, unless otherwise directed. The material shall be moved toward the center of the road, to the extent necessary to ensure that salvage material is not lost down inslopes.
- 2. Processing:** Processing and blending may be accomplished in place, provided the Contractor's method meets the blending and gradation requirements and has positive depth control.

3. **Stockpiling:** Asphalt concrete mix and granular material shall be processed or crushed and stockpiled together so that a uniform blend is obtained. The salvaged material may be stockpiled at contractor provided sites. Prior to stockpiling, the stockpile site shall be prepared by removal of the top six inches (150 mm) of topsoil and the area bladed smooth.

**B. Salvage and Stockpile Asphalt Mix Material:**

1. **Salvaging:** The salvaged material shall be moved and loaded in a manner that minimizes waste and avoids contamination of the salvage material. Scrapers shall not be used for the removing or loading operations, but may be used to haul the material. Salvaging of material shall not exceed two miles (3.2 kilometers) in advance of the grading operation, unless otherwise directed. The material shall be moved toward the center of the road, to the extent necessary to ensure that salvage material is not lost down inslopes.
2. **Stockpiling:** Salvaged asphalt mix material shall be processed or crushed and stockpiled so that a uniform blend is obtained. Prior to stockpiling, the stockpile site shall be prepared by removal of the top six inches (150 mm) of topsoil and the area bladed smooth. Stockpiles shall be constructed in accordance with Section 320. The stockpiles shall not contain dirt, grease, oil, brick, paving fabric, clay balls, organic debris, and other foreign material.

**Section 270.4 – Page 97 – Delete and replace with the following:**

**270.4 METHOD OF MEASUREMENT**

Salvage and stockpile granular material, salvage and stockpile asphalt mix and granular base material, and salvage and stockpile asphalt mix material will be measured to the nearest 0.1 ton (0.1 metric ton) or 0.1 cubic yard (0.1 cubic meter) at the time it is hauled to the road.

When less than 5000 tons (4500 metric tons) of salvaged material is generated on a project, the material may be measured in a stockpile and converted to tons (metric tons) using a factor of 1.5 tons per Cu. Yd. (1.78 metric tons per cubic meter), in lieu of weighing the material.

Alternate measurement techniques may be allowed if agreed upon by the Contractor and Engineer prior to salvaging operations commencing.

Material stockpiled for future use will be measured in the stockpile and converted to tons (metric tons) using a factor of 1.50 tons per Cu. Yd. (1.78 metric tons per cubic meter).

The unclassified excavation quantities will not be increased or decreased to reflect whether salvaged material was taken from cut or fill sections.

**Section 270.5 – Page 97 – Delete and replace with the following:**

**270.5 BASIS OF PAYMENT**

Salvage and stockpile granular material, salvage and stockpile asphalt mix and granular base material, and salvage and stockpile asphalt mix material will be paid for at the contract unit price per ton (metric ton) or cubic yard (cubic meter). Payment will be full compensation for work required to salvage, haul, process or crush, and stockpile the material.

Removal of this material is included in and paid for under the item of unclassified excavation.

**Section 280.2 – Page 99 – Delete this section and replace with the following:**

**280.2 MATERIALS**

The asphalt mix and granular material shall be processed to provide material meeting the following gradation.

| <u>Sieve Size</u>  | <u>% Passing</u> |
|--------------------|------------------|
| 1 ½ inch (37.5 mm) | 100              |
| 1 inch (25.0 mm)   | 95-100           |

**Section 320.3 B.1 – Page 103 – Delete the first sentence of the fourth paragraph and replace with the following:**

Burner fuel used for production of asphalt concrete shall be propane, butane, natural gas, Grade 1 fuel oil, Grade 2 fuel oil, Grade 4 fuel oil, Grade 4 (light) fuel oil, Grade 5 (light or heavy) fuel oil, or Grade 6 fuel oil.

**Section 320.3 B.1 – Page 103 – Add the following to the end of the seventh paragraph:**

An accurate thermometer must be installed in the tank so the temperature can be monitored.

**Section 320.3 B.4 – Page 104 – Delete the third sentence of the first paragraph.**

**Section 320.3 B.4 – Page 105 – Delete the last sentence of the third paragraph and replace with the following:**

The system shall be capable of manually controlling the transverse slope and the screed height.

**Section 320.3 B.5 – Page 105 – Delete the last sentence of the first paragraph and replace with the following:**

The rollers shall be capable of being reversed smoothly, without shoving or tearing the asphalt concrete.

**Section 320.3 C.3.d – Page 106 – Delete and replace with the following:**

- d. A one-gallon (four liter) sample of asphalt binder intended for use shall be obtained from the designated supplier for the project.

**Section 320.3 D – Page 107 – Delete the last sentence of the fifth paragraph and replace with the following:**

A water spray system must be installed at the discharge end of the pug mill. This water system must be used when directed by the Engineer to prevent fugitive lime dust from being released into the air.

**Section 320.3 E – Page 107 – Add the following after the fourth sentence in the first paragraph:**

No material shall be used which could adversely affect the asphalt concrete.

**Section 320.3 F – Page 107 – Add the following new paragraph after the first paragraph:**

Surfaces which have been primed with cutback asphalt shall be allowed to cure for a minimum of 72 hours prior to being covered.

**Section 320.3 F – Page 107 – Add the following to the end of the third paragraph:**

In lieu of a self-propelled paver, asphalt concrete may be placed by a shouldering machine on shoulders less than 6 feet (2 m) in width.

**Section 320.3 F – Page 110 – Delete the first paragraph at the top of Page 110 and replace with the following:**

Irregularities shall be corrected before the temperature of the asphalt mix drops below 175° F (80° C). The longitudinal profile can only be improved by using a grinder with diamond blades mounted on a horizontal shaft and when approved by the Engineer. Areas that have been ground shall not be left smooth or polished, but shall have a uniform texture equal in roughness to the surrounding unground asphalt concrete. Grinding shall be daylighted to the outside edge of the pavement. Ground surfaces shall be flushed sealed. Under no circumstances shall operations continue when it becomes evident final rolling is not producing a smooth, uniform, compacted surface free from roller marks and other irregularities.

**Section 320.4 A – Page 111 – Add the following after the first sentence:**

Quantities of asphalt binder in excess of the asphalt content listed on the job mix formula plus 0.3% tolerance will not be accepted for payment.

**Section 320.4 B – Page 111 – Delete the last two sentences of the first paragraph and replace with the following:**

The mixture of mineral aggregate, asphalt binder, and hydrated lime, when required, will be weighed after mixing. No deduction will be made for the weight of the asphalt binder or hydrated lime, when required, included in the mixture.

**Section 320.4 E – Page 112 – Add the following after the first sentence:**

Quantities of hydrated lime in excess of the lime content listed on the job mix formula plus 0.1% tolerance will not be accepted for payment.

**Section 320.5 C – Page 112 – Add the following sentence to the end of the paragraph:**

Payment will be full compensation for all labor, equipment, materials, and all other items incidental to sampling and repair of the sample locations to the satisfaction of the Engineer.

**Section 321.3 B – Page 113 – Delete and replace with the following:**

**B. Density:** The minimum density requirement shall be 92 percent of the maximum specific gravity of the test specimens prepared in the field in accordance with SD 312. The compacted density of asphalt concrete shall be determined according to SD 311.

**Section 324.5 – Page 115 and 116 – Delete the last sentence and replace with the following:**

When required, the following shall also be included in the contract unit price per ton (metric ton) for Asphalt Concrete Composite: Asphalt for Prime MC-70, Blotting Sand for Prime, Asphalt for Flush Seal SS-1h or CSS-1h, Sand for Flush seal, Hydrated Lime, equipment, labor and incidentals necessary.

**Section 330.2 – Page 121 – Add the following to the end of this section:**

**D. Sand for Fog Seal:** Section 879

**Section 330.3 A.2.b – Page 121 – Add the following paragraph after the second paragraph:**

Surfaces primed with cutback asphalt shall be allowed to cure for a minimum of 72 hours prior to being overlaid with asphalt concrete.

**Section 330.3 F – Page 123 – Delete the first sentence of the fourth paragraph and replace with the following:**

When applying fog seal coats, a light application of sand may be ordered by the Engineer to prevent material pickup.

**Section 330.4 – Page 124 – Add the following to the end of this section:**

**D. Sand for Fog Seal:** Sand for fog seal will be measured to the nearest 0.1 ton (0.1 metric ton).

**Section 330.5 – Page 124 – Add the following to the end of this section:**

**D. Sand for Fog Seal:** Sand for fog seal will be paid for at the contract unit price per ton (metric ton) complete in place. Payment will be full compensation for furnishing, installing, and all incidentals required to complete the work.

**Section 332.2 – Page 125 – Delete this section and replace with the following:**

**332.2 MATERIALS**

The material produced by cold milling shall be processed or crushed to provide material meeting the following requirements.

| <u>Sieve Size</u>  | <u>% Passing</u> |
|--------------------|------------------|
| 1 ½ inch (37.5 mm) | 100              |
| 1 inch (25.0 mm)   | 95-100           |

Cold milled asphalt concrete material used in hot mixed asphalt as recycled asphalt pavement (RAP) shall have the 1 inch sieve size requirement waived.

**Section 332.3 B – Page 125 – Delete the first paragraph and replace with the following:**

- B. Equipment:** The equipment for cold milling shall consist of a rotating drum equipped with teeth capable of removing material to a depth of up to three inches (75 mm) in one pass, producing a uniform surface finish.

**Section 332.3 C – Page 125 – Delete the last paragraph of this section on page 126 and replace with the following:**

When traffic will be exposed to the milled surface, all cold milling asphalt concrete shall be accomplished on one-half of the roadway at a time. The Contractor shall schedule the cold milling asphalt concrete operations so that there are no drop offs, uneven lanes, or windrows of milled material remaining on the roadway overnight. At the end of the day the Contractor shall place cold milled asphalt concrete material to provide temporary ramps as a transition onto or off of the milled surface and the project limits, bridge approaches, and intersecting roads. The resultant transition shall be of sufficient length to provide a slope no steeper than 20:1.

- 1. Cold Milling Asphalt Concrete and Placing Cold Milled Material:** Some areas of the shoulder may require the movement of cold milled asphalt concrete material either ahead or back to achieve the required cross section. No separate payment will be made for the movement of this material.

Material placed on the shoulders shall be compacted according to Section 260.3 B of the Standard Specifications except that a pneumatic tired roller with an effective roller weight of at least 250 pounds per inch (4.5 kilograms per mm) of roller width will be required.

- 2. Cold Milling Asphalt Concrete:** Loose material resulting from the milling shall be immediately picked up, hauled to the stockpile site(s), and stockpiled. Prior to allowing traffic on the milled surface, the surface shall be thoroughly broomed free of remaining loose material.

Cold milled asphalt concrete material shall be processed or crushed and stockpiled so that a uniform blend is obtained. Prior to stockpiling, the stockpile site shall be prepared by removal of the top six inches (150 mm) of topsoil and the area bladed smooth. Stockpiles shall be constructed in accordance with Section 320. The stockpiles shall not contain dirt, grease, oil, brick, paving fabric, clay balls, organic debris, and other foreign material

**Section 332.4 – Page 126 – Delete and replace with the following:**

**332.4 METHOD OF MEASUREMENT**

- A. Cold Milling Asphalt Concrete and Placing Cold Milled Material:** Cold Milling Asphalt Concrete and Placing Cold Milled Material will not be measured. Plans quantity will be used. If changes from the plans quantity are ordered these areas will be measured and the plans quantity will be appropriately adjusted.
- B. Cold Milling Asphalt Concrete:** Cold milling Asphalt Concrete will not be measured. Plans quantity will be used. If changes from the plans quantity are ordered these areas will be measured and the plans quantity will be appropriately adjusted.

**Section 332.5 – Page 126 – Delete and replace with the following:**

**332.5 BASIS OF PAYMENT**

- A. Cold Milling Asphalt Concrete and Placing Cold Milled Material:** Cold Milling Asphalt Concrete and Placing Cold Milled Material will be paid for at the contract unit price per square yard (square meter) or as indicated in the plans. Payment will be full compensation for the removal of grass, weeds, topsoil, etc. from the placement location, milling, removing, placing, and compaction of the cold milled material and the brooming, equipment, labor, and all incidentals required.
- B. Cold Milling Asphalt Concrete:** Cold Milling Asphalt Concrete will be paid for at the contract unit price per square yard (square meter) or as indicated in the plans. Payment will be full compensation for milling, removing, hauling, stockpiling, processing or crushing the cold milled material, brooming, equipment, labor, and all incidentals required.

**Section 350.2 – Page 127 – Delete this section and replace with the following:**

The sealant shall conform to the requirements of ASTM D-6690 Type IV.

The sealant material shall have a unit weight no greater than 9.35 lbs./gal (1124 kilograms per cubic meter).

Only products that meet the above requirements and have performed satisfactorily based on Department analysis may be used. A listing of acceptable products meeting ASTM D-6690 Type IV requirements may be obtained from the Department's Approved Products List. Products on the Approved Products list for Joint Sealant for Asphalt Over Long Jointed Concrete Pavement may also be used.

The blocking medium shall be an inert, compressible material, which is compatible with the sealant.

**Section 350.4 – Page 129 – Add the following sentence to this section:**

Quantities of asphalt concrete crack sealing with a manufacturer's unit weight in excess of the specified unit weight will be reduced to the specified maximum unit weight prior to measurement for payment.

**Section 360.3 A – Page 131 – Delete the minimum temperature and seasonal limitations table and replace with the following:**

Minimum temperatures and seasonal limitations are as follows:

| Cover<br>Aggregates | Air and<br>Surface Temp.<br>(In the Shade and Rising) | Seasonal<br>Limitations<br>(Dates are Inclusive) |
|---------------------|---|--|
| Type 1              | 70° F (21° C)   | May 15 - Aug. 31                                 |
| Type 2              | 70° F (21° C)   | May 15 - Aug. 31                                 |
| Type 3              | 70° F (21° C)   | May 15 - Sept. 15                                |

**Section 360.3 B.3 – Page 131 – Delete the last sentence of this section:**

**Section 370.2 – Page 135 – Delete the first paragraph of this section and replace with the following:**

The RAP material, after processing, shall meet the following gradation.

| <u>Sieve Size</u>  | <u>% Passing</u> |
|--------------------|------------------|
| 1 ¼ inch (31.5 mm) | 100              |
| 1 inch (25.0 mm)   | 95-100           |

**Section 380.2 – Page 139 – Add the following to the end of this section:**

- L. Epoxy Resin Adhesive:** Epoxy resin adhesive shall be of the type intended for horizontal applications, and shall conform to the requirements of ASTM C 881, Type IV, Grade 3 (equivalent to AASHTO M235, Type IV, Grade 3).

**Section 380.3 B.1 – Page 140 – Delete the first paragraph on page 141 and replace with the following:**

When automatic moisture sensing equipment is used for an aggregate component, the batch ticket shall show the percent of moisture for the aggregate component with moisture sensing equipment. The results of the most recent two hour moisture test shall be shown for aggregate components without moisture sensing equipment.

The W/C ratio shall be calculated using the following formula and rounded to the nearest 0.01:

$$W / C \text{ ratio} = \left[ \frac{\text{weight of free water} + \text{weight of batch water}}{\text{weight of cement} + \text{weight of supplementary cementitious material}} \right]$$

weight of free water = (% total moisture in aggregate - % absorption of aggregate) x weight of aggregate

weight of batch water = total weight of water added to the batch of concrete either at the plant or in the truck

The weight of free water shall be calculated for both the fine aggregate and the coarse aggregate.

**Section 380.3 D – Page 146 – Add the following paragraph to the end of this section:**

The amount of batch water and aggregates added to the mix shall be adjusted accordingly using the results of the most recent two hour moisture tests. If automatic moisture sensing equipment is used, the Engineer may allow the use of the automatic moisture sensing results to make adjustments.

**Section 380.3 E – Page 146 – Delete the second sentence and replace with the following:**

Truck mixing will be permitted only when approved by the Engineer.

**Section 380.3 E – Page 146 – Delete the fifth paragraph and replace with the following:**

When a concrete batch is transported in a truck mixer or agitator and the batch is smaller than 60 percent of the rated capacity of the truck mixer or agitator, the following percentage of additional cementitious material at the same proportions as listed on the mix design shall be added to the batch:

**Section 380.3 E – Page 146 – Delete the paragraph below the table at the top of page 147 and replace with the following:**

The above provisions regarding additional cementitious material shall also apply to the mixing of small batches in central plants. Additional cementitious material will not be required when the small batch is mixed in a drum that is sufficiently coated with mortar to withstand the loss of cementitious material. Sufficient mortar coating, as determined by the Engineer, may include mortar coating the drum from a previously mixed batch during continuous mixing operations. Additional cementitious material will be required if more than 30 minutes has passed from the mixing of the previous batch, if the drum has been cleaned following the previous batch, or if the mortar coating the drum has been disturbed following the previous batch.

**Section 380.3 E.2 – Page 147 – Delete the second sentence of the second paragraph and replace with the following:**

When approved by the Engineer, additional water or cement may be added to the batch after completion of the original mixing, in which case the batch shall be mixed an additional 30 revolutions at mixing speed.

**Section 380.3 L – Page 149 – Add the following sentence to the end of this section:**

Epoxy coated dowel bars and tie bars shall meet the requirements of Section 480.3 A.

**Section 380.3 M.2 – Page 151 – Delete the first sentence of the last paragraph and replace with the following:**

The Contractor shall load test five percent of the first 500 tie bars that are drilled and epoxied in place.

**Section 380.3 M.3 – Page 151 – Add the following paragraph to this section:**

If a soft cut style saw is used, the soft cut shall remain approximately 1” (25mm) from the edges of the concrete slab to control spalling at the edge. Additionally if a soft cut is used, the Contractor shall complete the initial saw cut for the entire width and to the required depth before the end of the 72 hour curing period.

**Section 380.3 M.4 – Page 151 – Delete the first sentence of the fourth paragraph and replace with the following:**

If an uncontrolled crack develops within six feet (1.8 m) of the contraction joint, a minimum of six feet (1.8 m) of pavement removal and replacement will be required.

**Section 380.3 N.6 – Page 153 – Delete this section and replace with the following:**

- 6. Final Finish:** Before the concrete has attained its initial set, the surface shall be given a final finish with a carpet drag drawn over the surface in a longitudinal direction. The drag shall be mounted on a bridge and shall be sized so that a strip of the carpet approximately two feet (600 mm) wide is in contact with the pavement surface while the drag is operated.

The condition of the drag shall be maintained so the resultant surface is of uniform appearance with corrugations approximately 1/16 inch (2 mm) in depth. Drags shall be maintained clean and free of encrusted mortar. Drags that cannot be cleaned shall be discarded and replaced.

The carpet shall meet the following requirements:

- Facing Material - Molded polyethylene pile face
- Blade Length - 7/8", ±1/8" (22 mm, ±3 mm)
- Total Fabric Weight - 70 oz. per square yard min.  
(2.37 kg per square meter min.)

The backing shall be of a strong, durable material, not subject to rot, which is adequately bonded to the facing.

Plain Jointed concrete pavement shall be either longitudinally or transversely tined as specified in the plans.

Continuously reinforced concrete pavement shall be longitudinally tined.

Tining depth and spacing shall be determined according to SD 418.

- a. Transverse Tining:** Immediately following the carpet drag, the surface of the concrete pavement shall be given a transverse metal-tine finish with a separate self-propelled mechanical device. The metal-tine finish shall provide a groove width of 1/8" and a groove depth of 6/32 inch (5 mm) ± 2/32 inch (2 mm). The spacing between the individual tines shall meet the following:

Inches (ten foot tining rake)

2-5/16, 2-15/16, 1-1/4, 2-7/16, 2-1/16, 1-1/4, 13/16, 1, 1-5/16, 1-1/8, 2-5/16  
 2-1/2, 2-7/8, 2-3/4, 1-1/8, 2-3/4, 2-1/8, 1-15/16, 13/16, 7/8, 2-5/8, 3-1/16  
 3-1/16, 7/8, 9/16, 9/16, 1-5/8, 2-3/8, 1, 1-1/4, 1-9/16, 2-15/16, 1-1/8  
 1-15/16, 2-3/16, 2, 2-13/16, 1, 2-11/16, 13/16, 1-7/8, 9/16, 2-5/16, 1-7/8  
 2-1/2, 1-5/16, 3-3/16, 1-3/8, 15/16, 7/8, 1-5/8, 9/16, 1-3/4, 2-7/8, 3  
 1-5/8, 1-5/8, 7/8, 9/16, 5/8, 2-13/16, 1-5/8, 2-7/16, 13/16, 1-1/4, 11/16  
 2-3/4, 2-5/16, 1-1/8

Millimeters (3 meter tining rake)

58, 74, 31, 62, 53, 32, 21, 26, 33, 28, 59  
 64, 73, 70, 29, 70, 54, 49, 20, 22, 67, 78  
 77, 23, 15, 15, 41, 60, 25, 32, 39, 75, 28  
 50, 55, 51, 72, 25, 69, 21, 47, 15, 59, 47  
 64, 34, 55, 35, 24, 22, 42, 14, 45, 73, 76  
 41, 41, 22, 15, 16, 71, 41, 62, 21, 31, 17  
 70, 58, 29

Successive passes of the tining shall not overlap.

Each location, where transverse joint saw cuts are to be made, shall be protected from tining by covering with a metal strip from four inches (100 mm) to six inches (150 mm) or by other methods that produce acceptable results.

Brooming may be used on irregular areas in lieu of the carpet drag and tine finish. The broom shall be drawn transversely across the pavement with adjacent strokes slightly overlapping.

Brooming shall be uniform in appearance and shall produce grooves 1/16 inch (2 mm) deep. Texturing shall be completed while the concrete surface can be broomed without being torn or unduly roughened by the operation.

The finished surface shall be free from rough and porous areas, irregularities, and depressions resulting from improper handling of the broom.

- b. Longitudinal Tining:** Immediately following the carpet drag, the surface of the concrete pavement shall be given a longitudinal metal-tine finish with a wire broom or comb attached to a separate self-propelled mechanical device.

Transverse joints shall not be protected from longitudinal tining, the tining shall be continuous across the joints.

The slab shall not be tined within 3 inches of the edge of the slab, centerline, or rumblestrip.

The longitudinal tining equipment shall have the ability to be raised and lowered, and shall have vertical and horizontal string line controls to ensure straight grooves that are parallel to the longitudinal joint.

The curing unit shall be separate from the tining unit when longitudinal tining is used unless the tining and curing can be accomplished simultaneously with the same piece of equipment at the specified rate to the satisfaction of the Engineer.

The tine bar shall have a single row of tines and shall provide a groove width of 1/8 inch (3 mm)  $\pm$  1/64 inch (0.4 mm) and a groove depth of 6/32 inch (5 mm)  $\pm$  2/32 inch (2 mm). The spacing between the individual tines shall be uniformly spaced at 3/4 inch (20 mm) intervals.

**Section 380.3 N.7 – Page 155 – Delete the first sentence of the first paragraph and replace with the following:**

After the final finish, and while the concrete is still plastic, the edges of the pavement along each side of the slab, and on each side of transverse construction joints, shall be worked with an approved tool and rounded to the specified radius.

**Section 380.3 O – Page 155 – Add the following two sentences to the beginning of this section:**

The pavement surface shall be checked for deviations using either a ten foot (3 meter) straightedge or a profilograph (when specified). When the use of a profilograph is specified, the ten foot (3 meter) straightedge check may also be required in locations determined by the Engineer.

**Section 380.3 O.2.c.2 – Page 157 – Delete the first paragraph and replace with the following:**

Areas excluded from profilograph testing shall be shoulders, transitions, area within 50 feet (15 m) of existing pavement and bridges, existing curb and gutter sections, ramps, pavements on horizontal curves having a centerline radius less than 1,000 feet (300 m) and the superelevation transitions. Pavement sections not subject to profilograph testing shall meet the 10 foot (3 m) straight edge test requirements in Section 380.3 O.1.

**Section 380.3 O.2.c.2 – Page 157 – Add the following to the end of the last paragraph:**

Grinding shall be day lighted to the outside edge of the pavement.

**Section 380.3 O.2.f.1 – Page 158 – Delete this section and replace with the following:**

- 1) Satisfactorily correct deficient area by grinding with equipment meeting the requirements of Section 380.3 O.2.c.2.

**Section 380.3 O.2.h – Page 158 – Delete the last paragraph of this section.**

**Section 380.3 R.2 – Page 161 – Delete the first sentence of the third paragraph and replace with the following:**

The sealant surface shall be tooled to produce a slightly concave surface below the pavement surface.

**Section 380.3 T – Page 162 – Add the following sentence after the first sentence in the second paragraph:**

Equipment operated on a previously constructed pavement that has attained a compressive strength of at least 3000 psi (21 Mpa) but less than 4000 psi (28 Mpa) shall be tracked type equipment.

**Section 390.2 B – Page 167 – Delete and replace with the following:**

**B. Concrete Patches:** Concrete patching material shall be one of the following:

1. A packaged, dry, rapid-hardening cementitious mortar conforming to the requirements of ASTM C 928, Type R-3 containing no chloride ions.
2. A packaged, dry, rapid-hardening concrete materials conforming to the requirements of ASTM C 928, Type R-3 containing no chloride ions.
3. A patching material meeting the following requirements:
  - a. **Cement:** Cement shall be Type III conforming to Section 750.
  - b. **Air Entraining Admixtures:** Air entraining admixtures shall conform to Section 751.
  - c. **Water:** Water shall conform to Section 790.
  - d. **Fine Aggregate:** Fine aggregate shall conform to Section 800.
  - e. **Coarse Aggregate:** Coarse aggregate shall be crushed quarry stone, size five, conforming to Section 820.
  - f. **Curing Compound:** Curing compound shall conform to Section 821.
  - g. **Proportioning:** Materials for concrete patches shall be mixed at the following proportions:

Fine Aggregate.....165 lbs./bag (75 kg/bag) cement  
 Coarse Aggregate.....165 lbs./bag (75 kg/bag) cement  
 Cement (min)..... 8.0 bags/c. y.(10.5 bags/cubic meter) concrete  
 Water (maximum).....5.0 gallon/bag (19 L/bag) cement

- h. **Air and Slump:** The slump and air shall conform to the following:

Air.....7% ± 2%  
 Slump.....1-1/2" (40 mm) maximum

**Section 391.2 A – Page 171 – Add the following paragraph to the end of this Section:**

Alternate design mixes for the grout may be submitted to the Engineer for approval.

**Section 392.2 A – Page 177 – Add the following paragraph to the end of this section:**

Alternate jacking slurry design mixes may be submitted to the Engineer for approval.

**Section 410.3 G.6 – Page 195 – Add the following section to the end of this section:**

- g. The turn-of-nut method for bolt tightening may be used when specified in the plans. When the turn-of-nut installation method is specified, hardened washers are not required except as specified in Section 410.3 G.6.d.

A sufficient number of bolts shall first be placed in the joint and snugged to insure that all faying surfaces are in firm contact, prior to tightening. Snug tight is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary wrench. Bolts shall be placed in any remaining holes and snugged tight as erection bolts or pins are removed. All bolts in the joint shall then be tightened the amount shown in Table 2 progressing systematically from the center most rigid part of the joint to its free edges. When tightening, the element not turned shall be held with a hand wrench to prevent rotation.

| <b>Table 2 Nut Rotation from Snugged Condition<sup>a,b</sup></b> |                                |  |  |
|--|--------------------------------|--|--|
| <b>Geometry of Outer Faces of Bolted Parts</b>                   |                                |  |  |
| Bolt Length Measured From Underside of Head to End of Bolt       | Both Faces Normal to Bolt Axis | One Face Normal to Bolt Axis and Other Face Sloped Not More Than 1:20, Bevel | Both Faces Sloped Not More Than 1:20 From Normal to Bolt Axis, Bevel Washers Not |

|  |          | Washer Not Used | Used     |
|--|----------|-----------------|----------|
| Up to and including 4 diameters                              | 1/3 turn | 1/2 turn        | 2/3 turn |
| Over 4 diameters but not exceeding 8 diameters               | 1/2 turn | 2/3 turn        | 5/6 turn |
| Over 8 diameters but not exceeding 12 diameters <sup>c</sup> | 2/3 turn | 5/6 turn        | 1 turn   |

<sup>a</sup> Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance should be plus or minus 30 degrees; for bolts installed by 2/3 turn and more, the tolerance should be plus or minus 45 degrees.

<sup>b</sup> Applicable only to connections in which all material within grip of the bolt is steel.

<sup>c</sup> No research work has been performed by the Research Council Riveted and Bolted Structural Joints to establish the turn-of-nut procedure when bolt lengths exceed 12 diameters. Therefore, the required rotation must be determined by actual tests in a suitable tension device simulating the actual conditions.

**Section 421.3 A – Page 213 – Delete the second sentence of the second paragraph and replace with the following:**

Backfill shall be compacted to 95% or greater of Maximum Dry Density in horizontal layers not to exceed six inches (150 mm) loose depth.

**Section 423.1 – Page 219 – Delete this section and replace with the following:**

**423.1 DESCRIPTION**

This work consists of the design, construction, and subsequent removal of all temporary works including, but not limited to; falsework, formwork, cofferdams, work berms and platforms, temporary traffic and stream diversions, and temporary retaining structures.

**Section 421.2 A – Page 213 – Delete the sieve analysis specification for the No. 200 (75 µm) sieve and replace with the following:**

No. 200 (75 µm) 0 - 18.0

**Section 421.2 B – Page 213 – Delete the sieve analysis specification for the No. 200 (75 µm) sieve and replace with the following:**

No. 200 (75 µm) 0 - 10.0

**Section 421.3 – Page 213 – Add the following to this section:**

**D. Extruded Insulation Board (Polystyrene):** No equipment will be allowed on the uncovered insulation board. The backfill covering the insulation board shall be spread and compacted in such a manner that the equipment used shall be operated on a minimum of 6 inches (150 mm) of backfill material at all times.

**Section 421.4 – Page 214 – Add the following to this section:**

**C. Extruded Insulation Board (Polystyrene):** Extruded insulation board (polystyrene) will be measured to the nearest square yard (square meter).

**Section 421.5 – Page 214 – Add the following to this section:**

**C. Extruded Insulation Board (Polystyrene):** Extruded insulation board (polystyrene) will be paid for at the contract unit price per square yard (square meter). Payment shall be full compensation for labor, equipment, and incidentals to furnish and install the extruded insulation board (polystyrene).

**Section 423.3 A – Page 219 – Add the following to the end of this section:**

All temporary works in streams or wetlands are required to be covered in the Corp of Engineers 404 Permit. At the time of the preconstruction meeting, the Contractor shall submit documentation for all temporary works for the purpose of complying with the 404 Permit requirements. The documentation shall include at a minimum:

1. A written description of the proposed temporary works including types of materials to be used, how the temporary works will be installed, removed, and what portion, if any, will remain in place after construction.
2. Details showing approximate size and location of the temporary works. Details shall include at a minimum, a Plan View and a Cross-Section View of the temporary works. Details shall provide sufficient dimensions such that the approximate size of the temporary works and location of the temporary works from a known point is shown.
3. Estimated quantities of all temporary fill material below the ordinary high water elevation. If the temporary fill is to be placed in a wetland, the estimated quantity shall be the amount of wetland loss, (in acres).

If during the course of construction there is a need for additional temporary works, the documentation shall be submitted to the Engineer at that time.

The Engineer will submit the documentation to the Corp of Engineers for approval. No construction of temporary works below the ordinary high water mark or in wetlands may begin until Corp of Engineer approval is attained by the Engineer.

**Section 423.3 B – Page 219 – Delete the first sentence and replace with the following two sentences:**

Falsework plans and design calculations for bridges shall be prepared by an Engineer registered in the State of South Dakota. Three (3) copies of the falsework plans and design calculations shall be submitted to the Bridge Construction Engineer for review at least 30 days prior to construction of falsework.

**Section 423.5 – Page 221 – Delete this section and replace with the following:**

**423.5 BASIS OF PAYMENT**

No payment will be made for temporary works. All costs involved in designing, constructing, and removing temporary works shall be incidental to the other contract items.

**Section 430.2 A. – Page 223 – Delete the last sentence of the second paragraph and replace with the following:**

The percentage of material passing a No. 200 (75µm) sieve shall not exceed 2.0 percent.

**Section 430.2 B – Page 223 – Delete this section and replace with the following:**

**B. Granular Bridge End Backfill:** The granular bridge end backfill material shall conform to Section 882.

**Section 430.3 C – Page 225 – Delete the second and third paragraphs and replace with the following:**

Granular bridge end backfill shall not be placed until at least 24 hours after completion of the deck pour. In addition, granular bridge end backfill shall not be placed until the abutments and sills, including wingwalls, have attained full design strength.

Granular bridge end backfill shall be placed in loose lifts not to exceed eight inches (200 mm) and compacted to 97% of maximum dry density. The moisture at the time of compaction shall be within  $\pm 4\%$  of optimum moisture. Maximum dry density and optimum moisture will be determined in accordance with SD 104.

**Section 430.3 C.1 through 6 – Page 225 and 226 – Delete and replace with the following:**

1. Each layer of granular bridge end backfill shall be placed in loose lifts not to exceed eight inches (200 mm). The placement and compaction of each layer must be inspected and approved by the Engineer prior to placement of the next layer.
2. Any equipment used to install the bridge end backfill over the geotextile fabric shall be operated in such a manner that the geotextile fabric is not damaged. To avoid damage to the geotextile fabric, the equipment used to place, spread, and compact the granular bridge end backfill over the geotextile fabric shall not be operated on less than six inches (150 mm) of material.

3. The geotextile fabric may be oriented in any direction. To minimize the horizontal deflection of the mechanically stabilized vertical face, it is extremely important to make sure that the geotextile fabric is taut and free of wrinkles during placement of the granular bridge end backfill.
4. Any geotextile fabric that is torn or punctured shall be repaired or replaced by the Contractor at no additional cost to the Department. The repair shall consist of a patch of the same type of geotextile fabric being placed over the ruptured area such that it overlaps the damaged area a minimum of 3 ft. (1 m) from any damaged edge. A sewn patch meeting the same requirements for seam strength as that of the fabric being repaired is allowed.
5. Seams that are perpendicular to face of the mechanically stabilized backfill may be constructed by overlapping the fabric a minimum of two feet (0.6 m). All other seams, as well as those in which the two foot (0.6 m) minimum overlap cannot be accomplished, shall be sewn. All seams shall be inspected by the Engineer and any deficient seams repaired by the Contractor prior to placement of the next layer of granular bridge end backfill. Geotextile fabric that is joined by sewn seams shall have strength properties at the seam equal to the specified strength requirements of the geotextile fabric. High strength polyester, polypropylene, or kevlar thread shall be used for sewn seams. Nylon threads shall not be used. The edges of the fabric shall be even and shall be completely penetrated by the stitch.
6. During periods of shipment and storage, the geotextile fabric shall be enclosed in a heavy duty opaque wrapping such that the fabric is protected from direct sunlight, ultraviolet rays, dirt or debris. The fabric shall not be subjected to temperatures greater than 140°F (60°C).

**Section 430.5 B – Page 227 – Delete the second sentence and replace with the following:**

Payment will be full compensation for all labor, equipment, materials, water, and all other items incidental to scarifying, reshaping and recompacting the area to be backfilled, furnishing and installing the polyethylene sheeting, drainage fabric, geotextile fabric, and furnishing, placing, and compacting the porous backfill and granular bridge end backfill to the limits shown on the plans.

**Section 450.2 – Page 231 – Add the following to this section:**

**F. High Density Polyethylene Pipe:** Section 990.

**Section 450.3 C – Page 231 – Delete and replace with the following:**

**C. Polyethylene Pipe Culverts:** Corrugated polyethylene pipe culverts and high density polyethylene pipe culverts shall be installed according to manufacturer instructions.

**Section 450.3 G – Page 232 – Delete and replace with the following:**

**G. Backfill Above Bedding Grade:** Moisture and density requirements for backfill shall be as specified in the plans and shall meet the requirements of Section 120. The backfill material shall be pre-moistened if necessary to obtain uniform moisture.

Selected embankment material shall be placed along the pipe in layers not exceeding six inches (150 mm) in depth and thoroughly compacted by mechanical compactors to the specified density before successive layers are placed. The width of the berms on each side of the pipe shall be twice as wide as the external diameter of the pipe or 12 feet (four meters), whichever is less. This method of backfilling shall be continued until the embankment is at least two feet (600 mm) over the top of the pipe.

In trench installations, backfill width shall be equal to trench width. The backfill shall be brought up evenly on both sides of the pipe for its full length. This method of backfilling shall be continued until the embankment is at least two feet (600 mm) over the top of the pipe.

**Section 460.3 A – Page 235 – Delete the first paragraph of this section and replace with the following:**

**Concrete Quality and Proportion:** The Contractor shall design and be responsible for the performance of all concrete mixes used in structures.

All mix designs and any modifications thereto, including changes in admixtures, shall be approved by the Concrete Engineer prior to use. Mix design data and test results shall be recorded on a DOT-24 and submitted to the Engineer.

The mix proportioning selected shall conform to the following requirements:

**Section 460.3 A – Page 236 – Delete the second sentence in Note 1 under Table 1.**

**Section 460.3 A – Page 235 – Delete the second sentence of the first paragraph on page 236 and replace with the following:**

The mix design shall be based upon obtaining an average concrete compressive strength 1200 psi above the specified minimum 28 day compressive strength.

**Section 460.3 A – Page 235 – Delete the last sentence of the second paragraph on page 236 and replace with the following:**

Trial batches shall be conducted in accordance with the American Concrete Institute Publication ACI 211.1, ACI 318, ASTM C192 and the following:

**Section 460.3 A – Page 235 – Delete the first paragraph on page 237 and replace with the following:**

Concrete mix designs previously used will be considered in compliance with the mix design requirements provided all of the following conditions are met:

**Section 460.3 A – Page 235 – Delete the second sentence of item 3 on page 237 and replace with the following:**

These test results and associated batch tickets shall be submitted to the Engineer.

**Section 460.3 A – Page 235 – Add the following to the list of items on page 237:**

4. All supporting information for the mix design including but not limited to, fresh concrete tests and material properties.

**Section 460.3 A – Page 235 – Delete the last two paragraphs of this section on page 237:**

**Section 460.3 B.2 – Page 237 – Delete the last paragraph of this section on page 238 and replace with the following:**

If the average compressive strength of the 28 day and the backup cylinder compressive strength is more than 500 psi (3.5 Mpa) below the specified 28 day compressive strength, the concrete represented by the cylinders shall be removed and replaced.

**Section 460.3 B.3 – Page 238 – Delete the last paragraph of this section and replace with the following:**

If the average core compressive strength is more than 500 psi (3.5 Mpa) below the specified 28 day compressive strength, the concrete represented by the cylinders shall be removed and replaced.

**Section 460.3 B.4 – Page 238 – Delete the last paragraph of this section on page 239 and replace with the following:**

If the average core compressive strength is more than 500 psi (3.5 Mpa) below the specified 28 day compressive strength, the concrete represented by the cylinders shall be removed and replaced.

**Section 460.3 B.5 – Page 239 – Delete the first sentence and replace with the following:**

If the Contractor utilizes the option to core as specified in Section 460.3 B.4, the Contractor shall arrange for an independent testing laboratory to perform the coring and compressive testing within 14 calendar days of notification of the failing compressive strength of the backup cylinder.

**Section 460.3 B.5 – Page 239 – Delete the last sentence of the second paragraph.**

**Section 460.3 B.5.a – Page 239 – Delete this section and replace with the following.**

- a. Include DOT project number, county, & PCN.

**Section 460.3 C.1 – Page 240 – Add the following to the list of items to be included on the printed ticket on page 241:**

W/C ratio

Aggregate Moistures (total moisture & absorption)

**Section 460.3 C.1 – Page 240 – Add the following after the last paragraph of this section on page 241:**

The W/C ratio shall be calculated using the following formula and rounded to the nearest 0.01:

$$W / C \text{ ratio} = \left[ \frac{\text{weight of free water} + \text{weight of batch water}}{\text{weight of cement} + \text{weight of supplementary cementitious material}} \right]$$

weight of free water = (% total moisture in aggregate - % absorption of aggregate) x weight of aggregate

weight of batch water = total weight of water added to the batch of concrete either at the plant or in the truck

The weight of free water shall be calculated for both the fine aggregate and the coarse aggregate.

**Section 460.3 D – Page 242 – Add the following to this section:**

6. The amount of batch water and aggregates added to the mix shall be adjusted accordingly using the results of the most recent two hour moisture tests. If automatic moisture sensing equipment is used, the Engineer may allow the use of the automatic moisture sensing results to make adjustments.

**Section 460.3 E – Page 243 – Delete the third paragraph and replace with the following:**

When a concrete batch is transported in a truck mixer or agitator and the batch is smaller than 60 percent of the rated capacity of the truck mixer or agitator, the following percentage of additional cementitious material at the same proportions as listed on the mix design shall be added to the batch:

**Section 460.3 E – Page 243 – Delete the paragraph below the table on the middle of page 243 and replace with the following:**

The above provisions regarding additional cementitious material shall also apply to the mixing of small batches in central plants. Additional cementitious material will not be required when the small batch is mixed in a drum that is sufficiently coated with mortar to withstand the loss of cementitious material. Sufficient mortar coating, as determined by the Engineer, may include mortar coating the drum from a previously mixed batch during continuous mixing operations. Additional cementitious material will be required if more than 30 minutes has passed from the mixing of the previous batch, if the drum has been cleaned following the previous batch, or if the mortar coating the drum has been disturbed following the previous batch.

**Section 460.3 K.1 – Page 247 – Delete and replace with the following:**

1. The coarse aggregate piles must be flushed with water for a minimum of 24 hours.

**Section 460.3 K – Page 248 – Delete the twelfth paragraph and replace with the following:**

Barrier curbs will not be allowed to be placed with slipform paving equipment.

**Section 460.3 M.4.c – Page 251 – Delete the second sentence of the first paragraph and replace with the following:**

Tining depth and spacing shall be measured according to SD 418. The metal-tine finish shall provide a groove width of 1/8" and a groove depth of 6/32 inch (5 mm) ±2/32 inch (3 mm).

**Section 465.2 A.3 – Page 265 – Add the following sentence to the end of the paragraph:**

Slump loss shall be tested in accordance with SD 423.

**Section 465.2 A.6 – Page 265 – Delete this section and replace with the following:**

6. The mix design shall establish a maximum water cementitious material ratio for the concrete mix (never to exceed 0.44)

The use of a water reducer will be required to achieve the above properties. Water reducers conforming to AASHTO M194 Type C (Accelerating) and Type E (Water-Reducing and Accelerating) will not be permitted.

**Section 480.3 C.1 – Page 280 – Delete the fifth paragraph and replace with the following:**

Welding of reinforcing steel shall not be allowed without written approval of the Bridge Construction Engineer. The request for approval shall list the bars to be welded, welding procedure, type of electrode, joint detail, and mill certificate of the reinforcing steel to be welded.

**Section 480.4 – Page 281 and 282 – Delete the English and Metric Bar Designation tables and replace with the following:**

**Bar Designation**

|                |       |       |       |       |       |       |       |        |        |        |        |
|----------------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|
| Size (English) | No. 3 | No. 4 | No. 5 | No. 6 | No. 7 | No. 8 | No. 9 | No. 10 | No. 11 | No. 14 | No. 18 |
| Weight (lb/ft) | 0.376 | 0.668 | 1.043 | 1.502 | 2.044 | 2.670 | 3.400 | 4.303  | 5.313  | 7.65   | 13.60  |
| Size (Metric)  | 10    | 13    | 16    | 19    | 22    | 25    | 29    | 32     | 36     | 43     | 57     |
| Weight (kg/m)  | 0.560 | 0.994 | 1.552 | 2.235 | 3.042 | 3.973 | 5.060 | 6.404  | 7.907  | 11.38  | 20.24  |

**Section 550.3 A.2 – Page 303 – Delete the second sentence of the last paragraph and replace with the following:**

When backfilling extra depth holes in accordance with Section 550.3 C.1.f.2, a grout admixture shall be added to the grout mixture in accordance with the manufacturer's recommendations.

**Section 550.3 C.1.b – Page 305 – Delete the third sentence of the first paragraph and replace with the following:**

After completion of the Type 1A removal, the Engineer will inspect the deck and mark remaining areas of unsound existing overlay.

**Section 550.3 C.1.c – Page 306 – Delete and replace with the following:**

- c. Type 1B Removal areas will be determined after Type 1A Removal (or Type 2A Removal if specified) has been accomplished. Type 1B Removal shall consist of removing delaminated or unsound concrete by chipping below the Type 1A Removal (or Type 2A Removal if specified) and extending down to the top of the top bar in the top mat of reinforcing steel. Concrete removed below the top of the top bar incidental to Type 1B Removal will be considered a part of the Type 1B Removal.

**Section 550.3 C.1.f.2 – Page 306 – Delete the first sentence and replace with the following:**

**Backfill of Extra Depth Holes:** When Type 1D removal is necessary, or when holes deeper than 4" (100mm) below the top of the scarified surface are encountered, they shall be backfilled as follows:

**Section 550.3 D.2 – Page 309 – Delete the fourth paragraph and replace with the following:**

Concrete placement will not be permitted after October 1 or before May 1 or when the air temperature is above 85°F (29°C) in the shade. It may be necessary to place concrete during evening or early morning hours and not during periods of low humidity and high wind to comply with this requirement.

**Section 550.3 E – Page 310 – Delete and replace with the following:**

- E. **Proportioning and Mixing Concrete Materials:** Proportioning and mixing shall conform to Section 460.3 F.

**Section 560.2 A – Page 317 – Add the following:**

- 6. **Cement:** Section 750. Type II cement shall be used, unless otherwise specified.

**Section 560.3 A – Page 317 – Add the following paragraph after the first paragraph:**

Precast concrete drop inlets shall conform to the requirements of Section 670.

**Section 560.3 A.1 – Page 317 – Delete and replace with the following:**

1. **Fabrication:** The Fabricator shall notify the Area Engineer prior to the fabrication of precast and prestressed concrete items.

**Section 560.3 A.2 – Page 317 – Delete the last sentence of the first paragraph and replace with the following:**

When a plant has been in operation and satisfactorily producing material, the Contractor will not be required to submit a concrete mix design for precast concrete, unless changes have been made to the pre-approved mix design or the material used in the mix design. Concrete mix designs shall be submitted for each project on all prestressed concrete products.

**Section 560.3 B.1 – Page 319 – Delete the second sentence of the fifth paragraph and replace with the following:**

A checked design includes the design calculations and check design calculations performed by an independent Engineer registered in the State of South Dakota.

**Section 560.3 B.2.b – Page 321 – Delete the second paragraph and replace with the following:**

Acceptance of the precast units shall be in accordance with Section 460.3 B except that the fabricator shall be responsible for the sampling, preparing, and properly curing of all concrete cylinders for concrete compressive strength in accordance with the Materials Manual. The precast units will be accepted when the minimum design concrete compressive strength requirements have been met. Accepted precast units represented by that test group of cylinders may be delivered to the project and will not require the 28 day cylinder test.

**Section 600.2 A.17 – Page 333 – Add the following sentence at the end of the paragraph:**

The concrete pad must be securely mounted and solidly supported under the laboratory to minimize vibration while operating the Marshall compactor.

**Section 600.3 – Page 336 – Delete the fourth and fifth sentence and replace with the following:**

On projects that a Type III lab is required, the Engineer may allow a Type I or II lab to be supplied until such a time the Engineer determines the Type III lab is required. If the Engineer allows a temporary Type I or II lab to be furnished, no additional payment for that lab will be made.

**Section 605.3 C – Page 339 – Delete the third sentence of the first paragraph and replace with the following:**

If fly ash is used, the minimum amount of cement to be replaced is 15 percent and the maximum amount is 20 percent at a 1:1 ratio by weight.

**Section 630.4 A – Page 355 – Delete this section and replace with the following:**

- A. **Beam Guardrail:** Each class and type will be measured to the nearest 0.1 foot (0.1 meter) along the centerline of the rail. The length in feet (meters) shall be the overall length center to center of end posts or to connections with bridges.

**Section 630.4 C – Page 355 – Delete this section and replace with the following:**

- C. **Remove Beam Guardrail:** Remove Beam Guardrail will be measured to the nearest 0.1 foot (0.1 meter) along the centerline of the rail.

**Section 630.5 A – Page 355 – Delete this section and replace with the following:**

- A. **Beam Guardrail:** Beam guardrail will be paid for at the contract unit price per 0.1 foot (0.1 meter) for each class and type installed. Payment will be full compensation for labor, materials, equipment, and incidentals required.

**Section 630.5 C – Page 356 – Delete this section and replace with the following:**

- C. **Remove Beam Guardrail:** Remove Beam Guardrail will be paid for at the contract unit price per 0.1 foot (0.1 meter). Payment will be full compensation for the backfill of holes and the removal of the guardrail including end terminals, beam guardrail, posts, blocks, and hardware from the project limits.

**Section 632.3 H.2.c – Page 361 – Delete and replace with the following:**

- c. Anchor bolts shall be provided with leveling nuts, top nuts, and jam nuts. Anchor bolts shall be tightened in accordance with Section 635.3 F.

**Section 633.3 D – Page 368 – In the grooving tolerance tables, replace “Depth of Groove” with the following:**

|                 |                             |           |
|-----------------|-----------------------------|-----------|
| Depth of Groove | <b>(English)</b><br>80 mils | + 10 mils |
| Depth of Groove | <b>(Metric)</b><br>2.032 mm | + 0.25 mm |

**Section 634.3 A – Page 372 – Delete the first sentence of the fourth paragraph and replace with the following:**

All workers within the right of way who are exposed either to traffic (vehicles using the highway for purposes of travel) or to construction equipment within the work area shall wear high-visibility safety apparel intended to provide conspicuity during both daytime and nighttime usage, and meeting the Performance Class 2 or 3 requirements of the ANSI/ISEA 107-2004 publication entitled “American National Standard for High-Visibility Safety Apparel and Headwear”.

**Section 634.3 A – Page 372 – Delete the first sentence of the fifth paragraph.**

**Section 634.3 C – Page 374 – Add the following paragraph after the first paragraph:**

For 2 lane roadways with average daily traffic volumes of 2500 or less, no passing zones may be identified using DO NOT PASS, PASS WITH CARE, and NO PASSING ZONE signs rather than pavement markings. The DO NOT PASS and NO PASSING ZONE signs shall be used to mark the beginning of each no passing zone, and the PASS WITH CARE signs to mark the end of each zone. These may be utilized in place of the pavement markings normally used to identify no passing zones for no longer than 2 weeks. The placement of the dashed centerline marking and these signs shall be required prior to nightfall.

**Section 635.3 C.3 – Page 380 – Add the following sentence at the end of the first paragraph:**

The contractor shall not use a machine requiring flowing water for installation of conduit under streets or roadways unless approved by the Engineer.

**Section 635.3 F – Page 381 – Delete and replace with the following:**

- F. **Anchor Bolts:** Anchor bolts shall be installed in accordance with the following requirements.
  1. **General:** Anchor bolts shall be provided with leveling nuts and top nuts. Anchor bolts for light towers shall be provided with leveling nuts, top nuts, and jam nuts.
  2. **Anchor Bolt Installation:** A steel template shall be used to accurately locate and hold the anchor bolts plumb and in proper alignment. This template shall be in place during placement of the concrete base and shall remain in place a minimum of 24 hours after the concrete placement has been completed. Out of position anchor bolts and anchor bolts greater than 1:40 out-of-plumb are cause for rejection of the base. Bending of the anchor bolts to straighten or move into position, or alterations of the pole base plate will not be permitted.
  3. **Anchor Bolt Tightening:**
    - a. All leveling nuts (bottom nuts) shall be brought to full bearing on the bottom of the base plate. The bottom of the leveling nuts must be kept as close to the concrete base as practical, and shall not be more than one inch above the top of the concrete base. Leveling nuts must be threaded onto the anchor bolt to provide at least ¼ inch (6 mm) projection of the bolt above the top nut or jam nut if required when in its tightened position.
    - b. A softened beeswax or equivalent shall be applied to the top nut bearing face and top nut internal threads prior to placement on the anchor bolt. All top nuts shall be tightened to a snug tight condition. Snug tight

is defined as the tightness attained by the full effort of a person using a wrench with a length equal to 14 times the diameter of the anchor bolt, except the minimum length shall be 18 inches. The use of adjustable wrenches will not be allowed. The full effort required to achieve a snug tight condition, shall be applied as close to the end of the wrench as possible. Pull firmly by leaning back and using full body weight (brace feet to prevent slipping) on the end of the wrench until the nut stops rotating. This snug tightening shall be accomplished in a minimum of two separate passes of tightening. The sequence of tightening in each pass shall be such that the opposite side nut, to the extent possible, shall be subsequently tightened until all the nuts in that pass have been snugged.

Snug tightness of both the top and leveling nuts shall be checked in the presence of Department personnel after the Contractor has completed nut snugging as described above, but prior to final tightening. Snug tightness of the nuts (top and leveling) shall be checked by applying a torque in a range from 20% to 30% of the verification torque. See Table 1 for verification and snug tight torque values.

**Table 1**

**Anchor Bolt Tightening**

| <b>Anchor Bolt Diameter (in)</b> | <b>Anchor Bolt Stress Area (sq in)</b> | <b>Yield Strength (ksi)</b> | <b>Minimum Tensile Strength (ksi)</b> | <b>Verification Torque (ft-lbs)</b> | <b>30% Snug Tight Torque (ft-lbs)</b> | <b>20% Snug Tight Torque (ft-lbs)</b> |
|----------------------------------|--|-----------------------------|---------------------------------------|-------------------------------------|---------------------------------------|---------------------------------------|
| 1.00                             | 0.61                                   | 36.0                        | 58.0                                  | 177                                 | 53                                    | 35                                    |
| 1.25                             | 0.97                                   | 36.0                        | 58.0                                  | 351                                 | 105                                   | 70                                    |
| 1.50                             | 1.41                                   | 36.0                        | 58.0                                  | 613                                 | 184                                   | 123                                   |
| 1.75                             | 1.90                                   | 36.0                        | 58.0                                  | 964                                 | 289                                   | 193                                   |
| 2.00                             | 2.50                                   | 36.0                        | 58.0                                  | 1449                                | 435                                   | 290                                   |
| 2.25                             | 3.25                                   | 36.0                        | 58.0                                  | 2120                                | 636                                   | 424                                   |
| 2.50                             | 4.00                                   | 36.0                        | 58.0                                  | 2899                                | 870                                   | 580                                   |
| 2.75                             | 4.93                                   | 36.0                        | 58.0                                  | 3930                                | 1179                                  | 786                                   |
| 3.00                             | 5.97                                   | 36.0                        | 58.0                                  | 5192                                | 1558                                  | 1038                                  |
| 1.00                             | 0.61                                   | 55.0                        | 75.0                                  | 274                                 | 82                                    | 55                                    |
| 1.25                             | 0.97                                   | 55.0                        | 75.0                                  | 545                                 | 163                                   | 109                                   |
| 1.50                             | 1.41                                   | 55.0                        | 75.0                                  | 951                                 | 285                                   | 190                                   |
| 1.75                             | 1.90                                   | 55.0                        | 75.0                                  | 1496                                | 449                                   | 299                                   |
| 2.00                             | 2.50                                   | 55.0                        | 75.0                                  | 2249                                | 675                                   | 450                                   |
| 2.25                             | 3.25                                   | 55.0                        | 75.0                                  | 3289                                | 987                                   | 658                                   |
| 2.50                             | 4.00                                   | 55.0                        | 75.0                                  | 4498                                | 1349                                  | 900                                   |
| 2.75                             | 4.93                                   | 55.0                        | 75.0                                  | 6098                                | 1830                                  | 1220                                  |
| 3.00                             | 5.97                                   | 55.0                        | 75.0                                  | 8056                                | 2417                                  | 1611                                  |
| 1.00                             | 0.61                                   | 75.0                        | 100.0                                 | 366                                 | 110                                   | 73                                    |
| 1.25                             | 0.97                                   | 75.0                        | 100.0                                 | 726                                 | 218                                   | 145                                   |
| 1.50                             | 1.41                                   | 75.0                        | 100.0                                 | 1268                                | 381                                   | 254                                   |
| 1.75                             | 1.90                                   | 75.0                        | 100.0                                 | 1994                                | 598                                   | 399                                   |
| 2.00                             | 2.50                                   | 75.0                        | 100.0                                 | 2999                                | 900                                   | 600                                   |
| 2.25                             | 3.25                                   | 75.0                        | 100.0                                 | 4386                                | 1316                                  | 877                                   |
| 2.50                             | 4.00                                   | 75.0                        | 100.0                                 | 5998                                | 1799                                  | 1200                                  |
| 2.75                             | 4.93                                   | 75.0                        | 100.0                                 | 8131                                | 2439                                  | 1626                                  |
| 3.00                             | 5.97                                   | 75.0                        | 100.0                                 | 10742                               | 3223                                  | 2148                                  |
| 1.00                             | 0.61                                   | 105.0                       | 125.0                                 | 457                                 | 137                                   | 91                                    |
| 1.25                             | 0.97                                   | 105.0                       | 125.0                                 | 908                                 | 272                                   | 182                                   |
| 1.50                             | 1.41                                   | 105.0                       | 125.0                                 | 1586                                | 476                                   | 317                                   |
| 1.75                             | 1.90                                   | 105.0                       | 125.0                                 | 2493                                | 748                                   | 499                                   |
| 2.00                             | 2.50                                   | 105.0                       | 125.0                                 | 3749                                | 1125                                  | 750                                   |
| 2.25                             | 3.25                                   | 105.0                       | 125.0                                 | 5482                                | 1645                                  | 1096                                  |
| 2.50                             | 4.00                                   | 105.0                       | 125.0                                 | 7497                                | 2249                                  | 1499                                  |
| 2.75                             | 4.93                                   | 105.0                       | 125.0                                 | 10164                               | 3049                                  | 2033                                  |

|      |      |       |       |       |      |      |
|------|------|-------|-------|-------|------|------|
| 3.00 | 5.97 | 105.0 | 125.0 | 13427 | 4028 | 2685 |
|------|------|-------|-------|-------|------|------|

- c. At this point, the top nut and leveling nut must be in full bearing on the base plate. If any gap exists between either nut (top or leveling) and the base plate, a beveled washer shall be added between the nut washer and the base plate to eliminate the gap. The beveled washer shall be stainless steel Type 304, the same diameter as the hardened washer, and beveled as required to eliminate the gap between the nut and the base plate. All nuts shall be retightened according to steps (a) and (b) above if beveled washers are added. All costs required to remove and re-erect the structure to install beveled stainless steel washers shall be at the Contractor's expense.
- d. Using a hydraulic wrench rotate all top nuts as indicated in Table 2. The additional turn of the nuts shall be accomplished by tightening all the nuts in two separate passes of equal incremental turns (i.e., for 1/3 turn use 1/6 turn each pass). The sequence of nut tightening in each pass shall be such that the opposite side nut, to the extent possible, shall be subsequently tightened until all the nuts in that pass have been turned. There shall be no rotation of the leveling nut during top nut tightening.

In lieu of a hydraulic wrench, torque wrenches and multipliers may be used to achieve the desired nut rotations and tightness.

- e. Tightness of the nuts shall be checked in the presence of Department personnel. Tightness of the nuts shall be checked within a minimum of 48 hours and a maximum of 96 hours after the nuts have been rotated as indicated in Section 635.3 F.3.d above. Tightness of the top nuts shall be checked by applying the verification torque to the nut. See Table 1 for verification torque.

**Table 2**

**Nut Rotation for Turn-Of-Nut Pretensioning**

| Anchor Rod Diameter<br>(in)*  | Nut Rotation from Snug-Tight Condition a, b |                              |
|---|---|------------------------------|
|   | F1554 Grade 36,<br>A307                     | F1554 Grade 55 and 105, A449 |
| < 1 ½   | 1/6 Turn                                    | 1/3 Turn                     |
| ≥ 1 ½   | 1/12 Turn                                   | 1/6 Turn                     |
| a. Nut rotation is relative to anchor rod. The tolerance is plus 20 degrees |   |                              |
| b. Applicable only to double-nut-movement joints.                           |   |                              |

Bottom leveling nuts shall be in contact with the base prior to applying the torque. An inability to achieve the verification torque indicates that the threads have stripped and the anchor bolt must be replaced. All costs for replacing anchor bolts shall be at the Contractor's expense.

- f. Install jam nut after verification torque has been applied to top nut. Lubricate threads of jam nut with beeswax or equivalent and tighten to a torque of 100 ft-lb (approximated without the use of a torque wrench).

**Section 635.3 H – Page 382 – Delete the first paragraph and replace with the following:**

Traffic signal conductors shall be continuous from the controller cabinets to the pole bases. Splicing of conductors will not be allowed in the junction boxes.

**Section 635.3 Q.3 – Page 384 – Delete and replace with the following:**

- 3. **Preformed Loops:** Each set of loop wires shall be tagged to identify loop. If installation of the loop is for future use the loop wires in the same lane shall be taped together. If installation is on a signal project, tagging shall be done and wires connected in series.

In new roadways, the preformed loops and lead-in conduits shall be placed in the base course, with the top of the conduit flush with the top of the base, and then covered with hot mix asphalt or Portland cement concrete pavement. Preformed loops and lead-in conduits shall be protected from damage prior to and during pavement placement.

In new reinforced concrete structure decks, the preformed loops shall be secured to the top of the uppermost layer of reinforcing steel using nylon wire ties. The loop shall be held parallel to the structure deck by using PVC or polypropylene spacers where necessary. Conduit for lead-in conductors shall be placed below the upper mat of reinforcing steel.

In existing pavement, the preformed loops shall be placed in a saw slot, 1-1/4 inches minimum width, cut into the existing pavement. The top of the conduit shall be 2 inches, minimum, below the top of existing surface. Sawed Slots shall be filled with an approved loop sealant.

On asphalt or concrete resurfacing projects, the preformed loops shall be placed in a saw slot, 1-1/4 inches minimum width, cut into the existing pavement. The top of the conduit shall be 2 inches, minimum, below the top of existing surface after any required surface removal is completed and prior to the placing of the new surface. Sawed Slots shall be filled with an approved loop sealant.

**Section 635.3 R.3 – Page 384 – Delete the first sentence in the first paragraph and replace with the following:**

All circular red, red arrow, circular yellow, yellow arrow, circular green, green arrow, and pedestrian indications shall be light emitting diode (LED) signal modules.

**Section 635.5 E – Page 386 – Delete and replace with the following:**

**D. Anchor Bolts:** Cost for anchor bolts shall be included in the contract unit price for the concrete for which they are incorporated with.

**Section 651.2 C – Page 391 – Delete the last sentence of this section and replace with the following:**

Not more than 25.0 percent by weight shall pass a No. 200 (75µm) sieve.

**Section 670.3 – Page 393 – Delete and replace with the following:**

**A. General Requirements:** Concrete for drop inlets shall be proportioned, mixed, hauled, and placed in accordance with Section 462.

When the foundation for a drop inlet is in new embankment, the embankment shall be constructed to an elevation at least one foot (300 mm) above the footing before the foundation for the drop inlet is prepared. The foundation shall be compacted as specified for the adjacent embankment.

Castings shall be set in full mortar beds or secured as specified. Castings shall be set accurately to the correct elevation so subsequent adjustment will not be necessary.

Inlet and outlet pipe connections shall be of the same size and kind and shall meet the same requirements as the pipe they connect. Pipe sections shall be flush on the inside of the structure wall and project outside sufficiently for proper connection with the next pipe section. Masonry shall fit neatly and tightly around the pipe. Grouting of the pipe connection may be required as directed by the Engineer if voids exist after form removal.

Drop inlets shall be either cast in place or precast. Precast drop inlets shall be defined as those drop inlets cast outside of the project limits. Drop inlets cast within the project limits will be considered cast in place.

**B. Cast in Place Drop Inlets:** The foundation excavated for drop inlets shall be thoroughly moistened immediately prior to placing concrete.

Steel reinforcement shall be placed in accordance with Section 480.

The finished surface of the concrete shall present a neat and smooth appearance. Concrete shall be protected and cured in accordance with Section 460.3, except the minimum curing time shall be 72 hours.

Upon completion and curing of the unit, the sheeting, bracing, forms, and falsework shall be removed and the excavation backfilled. The unit shall not be backfilled until the completion of the 72 hour curing period, or until the concrete reaches a minimum compressive strength of 3000 psi (21 MPa). Backfill shall be placed in layers not

exceeding six inches (150 mm) thick and compacted to the same degree as specified for the adjacent embankment. Installations shall be finished completed and left in a neat appearing condition.

**C. Precast Drop Inlets:** Precast drop inlets shall conform to the following requirements:

- 1. Notification:** The Contractor shall notify the Engineer 24 hours in advance of all concrete pours for inspection and observation of Contractor testing:
- 2. Design:** Precast drop inlets shall conform to the configurations of the standard plates. Variations from the standard plates may be accepted provided the AASHTO materials, design, fabrication specifications, and the requirements of this section are complied with.

Precast drop inlets shall be designed to specified load conditions. The Design Engineer of the drop inlets must be registered in the State of South Dakota. The design shall conform to the AASHTO design requirements for the depth of fill, including surfacing, etc., as well as live load or specified loading.

The Contractor shall furnish a checked design with the shop drawings. A checked design shall include the design calculations, and check design calculations performed by an independent Engineer registered in the State of South Dakota.

- 3. Shop Drawings:** Fifteen days prior to fabrication, the Contractor shall furnish shop drawings for Department review. The shop drawings shall consist of fabrication details including reinforcing steel and spacer placement and configurations, total quantities for the complete item, and all information for fabrication and erection.
- 4. Forms:** The forms shall be designed to withstand the fluid pressure of the concrete and the added forces due to vibration and impact without distortion. The forms shall be mortar tight and free from warp.

The form surface area in contact with the concrete shall be treated with an approved form oil or wax before the form is set in position. The forms shall be thoroughly cleaned of all other substances.

- 5. Concrete Cure:** The concrete shall be cured by low pressure steam, radiant heat, or as specified in Section 460.3 N. When curing in accordance with Section 460.3 N., the concrete temperature requirements of Section 460.3 O. shall apply.

Low pressure steam or radiant heat curing shall be done under an enclosure to contain the live steam or the heat and prevent heat and moisture loss. The concrete shall be allowed to attain initial set before application of the steam or heat. The initial application of the steam or heat shall be three hours after the final placement of concrete to allow the initial set to occur. When retarders are used, the waiting period before application of the steam or radiant heat shall be five hours. When the time of initial set is determined by ASTM C 403, the time limits described above may be waived.

During the waiting period, the minimum temperature within the curing chamber shall not be less than 50° F (10° C) and live steam or radiant heat may be used to maintain the curing chamber between 50° F (10° C) and 80° F (27° C). During the waiting period the concrete shall be kept moist.

Application of live steam shall not be directed on the concrete forms causing localized high temperatures. Radiant heat may be applied by pipes circulating steam, hot oil, hot water, or by electric heating elements. Moisture loss shall be minimized by covering exposed concrete surfaces with a plastic sheeting or by applying an approved liquid membrane curing compound to exposed concrete surfaces. The top surface of concrete members for use in composite construction shall be free of membrane curing compound residue unless suitable mechanical means for full bond development are provided.

During the initial application of live steam or radiant heat, the concrete temperature shall increase at an average rate not exceeding 40° F (22° C) per hour until the curing temperature is reached. The maximum concrete temperature shall not exceed 160° F (71° C). The maximum temperature shall be held until the concrete has reached the desired strength. After discontinuing the steam or radiant heat application, the temperature of the concrete shall decrease at a rate not to exceed 40° F (22° C) per hour until the concrete temperature is within 20° F (11° C) of the ambient air temperature. The Contractor will not be required to monitor this cool down temperature when the ambient air temperature is 20° F (11° C) or above.

The test cylinders shall be cured with the unit, or in a similar manner (similar curing method and concrete curing temperature, as approved by the Concrete Engineer) as the unit, until minimum compressive strength has been obtained.

- 6. Surface Finish and Patching:** If a precast or prestressed item shows stone pockets, honeycomb, delamination or other defects which may be detrimental to the structural capacity of the item, it will be subject to rejection at the discretion of the Engineer. Minor surface irregularities or cavities, which do not impair the service of the item, and which are satisfactorily repaired will not constitute cause for rejection. Repairs shall not be made until the Engineer has inspected the extent of the irregularities and has determined whether the item can be satisfactorily repaired. If the item is deemed to be repairable, the repair method and procedures shall be agreed upon by the Department and fabricator prior to the work commencing.

Depressions resulting from the removal of metal ties or other causes shall be carefully poointed with a mortar of sand and cement in the proportions, which are similar to the specific class of concrete in the unit. A sack rub finish is required on prestressed beams except for the bottom of the bottom flange and the top of the top flange. A sack rub finish is also required on sloped surfaces of box culvert end sections.

- 7. Fresh Concrete Testing:** The Contractor shall be responsible for performing all fresh concrete testing in accordance with the materials manual Materials Manual. Tests shall be documented on a DOT-54 form and submitted to the Engineer.
- 8. Concrete Compressive Strength:** The Contractor shall make a minimum of one group of test cylinders for each class of concrete for each day's production, not to exceed 150 cubic yard (125 cubic meters) per group of cylinders.

At a minimum, a group of test cylinders shall consist of the following:

- a.** Two test cylinders are required for the 28 day compression test.
- b.** Two additional cylinders will be required for determining concrete strength, when the Contractor desires to make delivery and obtain acceptance by the Department prior to the 28 day compression test.

Acceptance of the precast units shall be in accordance with Section 460.3 B. The precast units will be accepted when the minimum design concrete compressive strength requirements have been met. Accepted precast units represented by that test group of cylinders may be delivered to the project and will not require the 28 day cylinder test.

The Engineer will be responsible for breaking of all concrete cylinders for concrete compressive strength in accordance with the Materials Manual.

**Section 670.5 – Page 394 – Add the following paragraph after the first paragraph:**

Unless otherwise specified in the plans the cost for removal of existing pipe, if necessary, to facilitate the installation of new drop inlets shall be incidental to the associated drop inlet contract unit prices.

**Section 671.5 – Page 397 – Add the following paragraph to this section:**

Unless otherwise specified in the plans the cost for removal of existing pipe, if necessary, to facilitate the installation of new manholes shall be incidental to the associated manhole contract unit prices.

**Section 680.2 A – Page 399 – Delete the last sentence of the second paragraph and replace with the following:**

The percentage of material passing a No. 200 (75µm) sieve shall not exceed 2.0 percent.

**Section 720.4 – Page 405 – Delete this section and replace with the following:**

- A. Bank and Channel Protection Gabions:** Bank and channel protection gabions will be measured to the nearest 0.1 cubic yard (0.1 cubic meter). If a substitution is made, the dimensions of the bank and channel protection installed shall be equal to or greater than the dimensions specified. Payment will be based on plans quantity, unless changes are ordered in writing by the Engineer.

**B. Drainage Fabric:** Drainage fabric will be measured to the nearest square yard (square meter). The lap at joints will not be included in the measurement.

**Section 720.5 – Page 405 – Delete this section and replace with the following:**

**A. Bank and Channel Protection Gabions:** Bank and channel protection gabions will be paid for at the contract unit price per cubic yard (cubic meter). Payment will be full compensation for materials, equipment, labor, excavating, shaping and incidentals required.

**B. Drainage Fabric:** Drainage fabric will be paid for at the contract unit price per square yard (square meter). Payment will be full compensation for furnishing and installing the drainage fabric as specified. Payment will be for plan quantity unless changes are ordered in writing.

**Section 730.2 C – Page 407 – Delete the fourth sentence and replace with the following:**

If the seed is not planted within the 9 month period, the Contractor shall have the seed retested for germination, as described above, and a new certified test report shall be furnished prior to starting seeding operations.

**Section 734.3 – Page 423 – Add the following paragraph before the first paragraph:**

The Contractor shall designate an employee as Erosion Control Supervisor whose responsibility is the construction and maintenance of erosion and sediment control. This person shall be available to be reached by phone 24 hours a day, 7 days a week, and must be able to respond to emergency situations at the job site within 12 hours. The person so designated must have training and be certified by the South Dakota Department of Transportation in the area of erosion and sediment control. The name, phone number, and location of the person shall be provided to the Department at the preconstruction meeting.

**Section 734.3 B.2 – Page 424 – Delete the second sentence and replace with the following:**

The muck will be removed when the surface of the muck is at approximately one-third the height of the silt fence.

**Section 750 – Page 431 – Add the following after the second paragraph:**

In addition to the certification requirement specified in SD 416, when limestone is used, the manufacturer shall state in writing the amount thereof, the percentage of Calcium Carbonate in the limestone, and shall supply comparative test data on chemical and physical properties of the cement with and without the limestone. The comparative tests do not supersede the normal testing to confirm that the cement meets chemical and physical requirements.

**Section 800.2 D – Page 436 – Add the following sentence to the end of the fourth paragraph:**

Fine aggregate with a 14 day expansion value of 0.400 or greater shall not be used.

**Section 800.2 D – Page 436 – Add the following sentence to the end of the last paragraph:**

The expansion value of the blended sources will be used to determine the type of cement required.

**Section 800.2 F – Page 437 – Delete the last three sentences of the first paragraph and replace with the following:**

If the fineness modulus falls outside this limit the Concrete Engineer shall be notified. A new or adjusted mix design may be provided or approved. The uniformity of grading requirements do not apply to fine aggregate for Low slump Dense Concrete and Class M (I) concrete.

**Section 800.2 F – Page 437 – Delete the first sentence of the second paragraph and replace with the following:**

For determining the FM deviation from the design mix FM, the average of the five most recent FM test shall be used.

**Section 800.2 F – Page 437 – Delete the first sentence of the last paragraph and replace with the following:**

Additionally for Portland Cement Concrete Paving conforming to Section 380; the FM of the fine aggregate, as established by the mix design, will be from 2.40 to 3.10 (wide band).



**TABLE 1**

| REQUIREMENTS                      | CLASS D         |         | CLASS E     |         | CLASS G     |         | CLASS S     |         |
|-----------------------------------|-----------------|---------|-------------|---------|-------------|---------|-------------|---------|
|                                   | TYPE 1          | TYPE 2  | TYPE 1      | TYPE 2  | TYPE 1      | TYPE 2  | TYPE 1      | TYPE 2  |
| SIEVE                             | PERCENT PASSING |         |             |         |             |         |             |         |
| 1" (25.0 mm)                      | 100             |         | 100         |         | 100         |         |             |         |
| 3/4" (19.0 mm)                    | 97-100          | 100     | 97-100      | 100     | 97-100      | 100     |             |         |
| 1/2" (12.5 mm)                    | 75-95           | 97-100  | 75-95       | 97-100  | 75-95       | 97-100  | 86-100      | 100     |
| 3/8" (9.50 mm)                    |                 |         |             |         |             |         | 66-80       | 80-100  |
| No. 4 (4.75 mm)                   | 45-75           | 60-80   | 45-75       | 60-80   | 45-75       | 60-80   | 24-34       | 24-45   |
| No. 8 (2.36 mm)                   | 30-55           | 40-60   | 30-55       | 40-60   | 30-55       | 40-60   | 10-20       | 10-22   |
| No. 16 (1.18 mm)                  | 20-45           | 25-50   | 20-45       | 25-50   | 20-45       | 25-50   |             |         |
| No. 40 (425 µm)                   | 10-30           | 15-35   | 10-30       | 15-35   | 10-30       | 15-35   |             |         |
| No. 200 (75 µm)                   | 3.0-7.0         | 4.0-8.0 | 3.0-7.0     | 4.0-8.0 | 3.0-7.0     | 4.0-8.0 | 4.0-8.0     | 2.0-5.0 |
| Processing Required               | Crushed         |         | Crushed     |         | Crushed     |         | Crushed     |         |
| Liquid Limit (max)                | 25              |         | 25          |         | 25          |         | 25          |         |
| Plasticity Index, (max)           | 3               |         | Non-Plastic |         | Non-Plastic |         | Non-Plastic |         |
| L.A. Abra. Loss. (max)            | 45%             |         | 40%         |         | 35%         |         | 40%         |         |
| Sodium Sulfate (Soundness) (Max.) |                 |         |             |         |             |         |             |         |
| +4 (4.75 mm) sieve                | 15%             |         | 15%         |         | 12%         |         | 12%         |         |
| -4 (4.75 mm) sieve                | 15%             |         | 15%         |         | 12%         |         | 12%         |         |
| Lightweight Particles (Max.)      |                 |         |             |         |             |         |             |         |
| +4 (4.75 mm) sieve                | 4.5%            |         | 3.0%        |         | 1.0%        |         | 1.0%        |         |
| -4 (4.75 mm) sieve                | 4.5%            |         | 3.0%        |         | 1.0%        |         | 1.0%        |         |
| Crushed Particles (Min.)          |                 |         |             |         |             |         |             |         |
| +4 (4.75 mm) sieve                | 50% 1-FF        |         | 70% 2-FF    |         | 90% 2-FF    |         | 90% 2-FF    |         |
| * - 4 Manufactured Fines          | NA              |         | 20% Min.    |         | 70% Min.    |         | 95% Min.    |         |

\* - Manufactured fines shall be manufactured solely from material retained on the 3/4 inch (19mm) sieve, unless the aggregate material is produced from a ledge rock source.

**Section 880.2 B.1 – Page 456 – Delete the second sentence and replace with the following:**

The material shall be fine enough that when pulverized for testing, 90 percent by dry weight will pass a No. 40 (425 µm) sieve and 60.0 percent by dry weight will pass a No. 200 (75µm) sieve.

**Section 880.2 B.2 – Page 456 – Delete the sieve analysis specification for the No. 200 (75 µm) sieve and replace with the following:**

Passing a No. 200 (75 µm) sieve ..... 65.0-100%

**Section 882.2 – Page 459 – Delete Table 1 and replace with the following:**

Table 1

| REQUIREMENT           | Subbase         | Gravel Cushion | Granular Bridge End Backfill | Aggregate Base Course | Limestone Ledge Rock |                | Gravel Surfacing |
|-----------------------|-----------------|----------------|------------------------------|-----------------------|----------------------|----------------|------------------|
|                       |                 |                |                              |                       | Base Course          | Gravel Cushion |                  |
| SIEVE                 | PERCENT PASSING |                |                              |                       |                      |                |                  |
| 2" (50 mm)            | 100             |                |                              |                       |                      |                |                  |
| 1" (25.0 mm)          | 70-100          |                | 100                          | 100                   | 100                  |                |                  |
| 3/4" (19.0 mm)        |                 | 100            | 80-100                       | 80-100                | 80-100               | 100            | 100              |
| ½" (12.5 mm)          |                 |                | 68-91                        | 68-91                 | 68-90                |                |                  |
| No. 4 (4.75 mm)       | 30-70           | 50-75          | 42-70                        | 46-70                 | 42-70                | 46-70          | 50-78            |
| No. 8 (2.36 mm)       | 22-62           | 38-64          | 29-58                        | 34-58                 | 29-53                | 29-53          | 37-67            |
| No. 40 (425 µm)       | 10-35           | 15-35          | 10-35                        | 13-35                 | 10-28                | 10-28          | 13-35            |
| No. 200 (75 µm)       | 0.0-15.0        | 3.0-12.0       | 0.0-5.0                      | 3.0-12.0              | 3.0-12.0             | 3.0-12.0       | 4.0-15.0         |
| Liquid Limit Max      |                 | 25             | 25                           | 25                    | 25                   | 25             |                  |
| Plasticity Index      | 0-6             | 0-6            | 0-6                          | 0-6                   | 0-3                  | 0-3            | 4-12             |
| L.A. Abra. Loss, max. | 50              | 40             | 40                           | 40                    | 40                   | 40             | 40               |
| Foot Notes            |                 | 2              | 1,2                          | 1,2                   |                      |                |                  |
| Processing Required   | crushed         | crushed        | crushed                      | crushed               | crushed              | crushed        | crushed          |

**Section 890.2 G – Page 465 – In the table, under TESTS ON RESIDUE FROM DISTILLATION TESTS, add the following after Elastic Recovery @ 50°F (10°C):**

(see Note 4)

**Section 890.2 G – Page 465 – Add the following after Note 3:**

Note 4: The Elastic Recovery test shall be in accordance with AASHTO T301, except that the residue will be obtained by distillation, not oven evaporation. The distillation temperature shall be as recommended by the emulsion manufacturer.

**Section 972.2 B – Page 479 – Delete the second paragraph and replace with the following:**

For bolts that are 1" (M24) (incl.) in diameter and less, the maximum hardness for AASHTO M164 (ASTM A325) bolts shall be 33 Rc.

**Section 972.2 C – Page 483 – Add the following paragraph before the second to last paragraph:**

Jam nuts shall conform to ASTM A563 Grade A.

**Section 972.2 C – Page 483 – Delete the first sentence of the last paragraph and replace with the following:**

Bolts and nuts shall be hot dipped galvanized in accordance with ASTM F2329 or mechanically galvanized in accordance with ASTM B695. Washers shall be hot dipped galvanized in accordance with ASTM F2329 or mechanically galvanized in accordance with ASTM B695.

**Section 972.2 D – Page 484 – Delete the fourth note under the table as denoted by “\*\*\*\*” and replace with the following:**

\*\*\*\* Anchor bolts conforming to ASTM F1554 Grade 55 (380) shall satisfy Supplemental Requirement S4. Anchor bolts conforming to ASTM F1554 Grade 105 (725) shall satisfy Supplemental Requirement S5.

**Section 980.1 A.1 – Page 485 – Delete this section and replace with the following:**

**1. Quantitative Requirements:** The finished paint shall meet the following quantitative requirements:

|   | <u>WHITE</u>                            | <u>YELLOW</u>           |
|---|---|-------------------------|
| <u>Lead</u> , parts per million max.<br>ASTM D 3335 or X-ray fluorescence   | 100                                     | 100                     |
| <u>Pigment</u> , percent by weight  | 60.0 - 62.5                             | 58.5 – 61.0             |
| <u>Pigment</u> , percent by weight;<br>when tested in accordance with ASTM D 3723 (See Note 1)  | 60.0 - 62.5                             | 56.1 - 58.6             |
| Note 1: The residual extracted pigment upon analysis shall conform to the following quantitative compositional requirements when tested in accordance with ASTM D 1394 or ASTM D 4764.  |   |                         |
| Titanium Dioxide ASTM D 476 Type<br>II Rutile 92% min. TiO <sub>2</sub> tested in accordance with<br>ASTM D 1394 or ASTM D 4764   | 1.00 lb/gal min.                        | 0.20 lb/gal min.        |
| <u>Total Solids</u> , percent by weight;<br>min. when tested in accordance with ASTM D 3723   | 77.0                                    | 76.1                    |
| <u>Non-volatile Vehicle</u> , percent by<br>weight vehicle; min. when tested in accordance with FTMS 141c<br>(Method 4051.1)  | 42.5                                    | 42.5                    |
| <u>Consistency</u> . Krebs-Stormer<br>Shearing rate 200 r.p.m. Grams  | 190 to 300                              | 190 to 300              |
| Equivalent K.U.<br>when tested in accordance with ASTM D 562 (See Note 2)   | 80 to 95                                | 80 to 95                |
| Note 2: The consistency of the paint shall be within the stated specification when determined a minimum 48 hours after packaging the material.  |   |                         |
| <u>Weight per Gallon</u> , pounds minimum<br>when tested in accordance with<br>ASTM D 1475 (See Note 3)   | Rohm & Haas 13.85<br>Dow DT 250NA 13.75 | 13.30<br>13.20          |
| Note 3: In addition to compliance with the minimum, the weight per gallon shall not vary more than $\pm 0.3$ lbs / gal. between batches.  |   |                         |
| <u>Fineness of Dispersion</u><br>Hegman Scale, min. when tested in accordance<br>with ASTM D 1210   | 2 min.<br>"B" Cleanliness"              | 2 min<br>B" Cleanliness |
| <u>Drying Time</u> , No Pick-Up, Minutes,<br>max. when tested in accordance with ASTM D711, except the wet film<br>thickness shall be $12.5 \pm 0.5$ mils. The applied film shall be immediately<br>placed in a laboratory drying chamber maintaining the relative humidity of<br>$65 \pm 3\%$ , the temperature $73.5 \pm 3.5^{\circ}\text{F}$ ( $23 \pm 2^{\circ}\text{C}$ ), and air flow less than one<br>foot (1') per minute. | 12max.                                  | 12max.                  |
| <u>Drying Time</u> , Dry-through, Minutes   | 120max.                                 | 120max.                 |

max. when tested in accordance with ASTM 1640, except the wet film thickness shall be  $12.5 \pm 0.5$  mils. The applied film shall be immediately placed in a laboratory drying chamber maintaining the relative humidity at  $90 \pm 3\%$ , and the temperature  $23 \pm 2^\circ\text{C}$ . The pressure exerted will be the minimum needed to maintain contact between the thumb and film. A reference-control paint will be run in conjunction with the candidate paint. Rohm and Haas formulation will be referenced-control paint.

Note 4: If either the candidate or reference-control paint exceeds the 120 minute maximum, then the candidate paint shall not exceed the dry time of the reference-control paint by more than 15 minutes.

|  |             |             |
|--|-------------|-------------|
| <u>Field Drying Time</u> , Track-Free, minutes max.  | 2           | 2           |
| When applied under the following conditions, the line shall show no visual tracking when viewed from 50 feet after driving a passenger vehicle over the line at a speed of 25-35 mph:<br>Fifteen mils wet film thickness<br>Six lbs. of glass beads per gal. of paint<br>Paint temperature at nozzle between 70 to 120°F<br>Pavement dry, pavement temperature 50 to 120°F<br>Relative humidity of 85% maximum |             |             |
| <u>Directional Reflectance</u> , minimum.<br>when applied at a wet film thickness of 15 mils and when tested in accordance with ASTM E 1347 (Illuminate C 2°)  | 85          | 50          |
| <u>pH</u> , minimum.<br>when tested in accordance with ASTM E70  | 9.80        | 9.80        |
| <u>Dry Opacity</u> , Contrast ratio, min.<br>when applied at a wet film thickness of 6 to 7 mils and when tested in accordance with FTMS 141c (Method 4121 Illuminate C 2°)  | 0.955       | 0.880       |
| <u>Volatile Organic Content (VOC)</u> , max.<br>in accordance with ASTM D 3960   | 115 g/liter | 115 g/liter |
| <u>Flash Point</u> , closed cup, min.  | 115°F       | 115°F       |

Color: The paint shall meet the color specification limits and luminance factors listed in Tables 1 & 2 when tested in accordance with ASTM E1347 or ASTM E1349. The paint shall not discolor in sunlight and shall maintain the colors and luminance factors throughout the life of the paint. No Bayferrox 3950, iron oxides or other color enhancers will be permitted to achieve the color chromaticity coordinates.

Table 1\*

| Color  | Chromaticity Coordinates (corner points) |       |       |       |       |       |       |       | Min. Luminance Factor (Y %) |
|--------|--|-------|-------|-------|-------|-------|-------|-------|-----------------------------|
|        | X  | Y     | X     | Y     | X     | Y     | X     | Y     |                             |
| White  | 0.355                                    | 0.355 | 0.305 | 0.305 | 0.285 | 0.325 | 0.335 | 0.375 | 35                          |
| Yellow | 0.560                                    | 0.440 | 0.490 | 0.510 | 0.420 | 0.440 | 0.460 | 0.400 | 25                          |

\* Daytime Color Specification Limits and Luminance Factors for Pavement Markings Material with CIE 2° Standard Observer and 45/0 (0/45) Geometry and CIE Standard Illuminant D65

Table 2\*\*

| Color  | Chromaticity Coordinates (corner points) |       |       |       |       |       |       |       |
|--------|--|-------|-------|-------|-------|-------|-------|-------|
|        | 1  |       | 2     |       | 3     |       | 4     |       |
|        | X  | Y     | X     | Y     | X     | Y     | X     | Y     |
| White  | 0.480                                    | 0.410 | 0.430 | 0.380 | 0.405 | 0.405 | 0.455 | 0.435 |
| Yellow | 0.575                                    | 0.425 | 0.508 | 0.415 | 0.473 | 0.453 | 0.510 | 0.490 |

\*\* Nighttime Color Specification Limits for Pavement Marking Retroreflective Material With CIE 2° Standard Observer, Observation Angle = 1.05°, Entrance Angle + 88.76° and CIE Standard Illuminant A.

**Section 981.1 – Page 489 – Delete this section and replace with the following:**

Glass beads for use with pavement marking paint shall be moisture resistant and shall meet the requirements of AASHTO M 247, Type I. The glass beads shall be without floatation properties. The glass beads shall have dual surface treatment consisting of a moisture resistant silicone treatment, and silane adherence surface treatment. The glass beads shall have a minimum of 80% true spheres. Roundness shall be tested in accordance with SD 510.

**Section 983.1 – Page 499 – Delete the third sentence of the first paragraph:**

**Section 983.1 B – Page 499 – Delete this section in it's entirety.**

**Section 983.2 B – Page 500 – Delete this section in it's entirety.**

**Section 985.1 D – Page 506 – Delete the last two sentences of the first paragraph and replace with the following:**

Vertical reinforcement shall be deformed unless otherwise noted and shall conform to the requirements of ASTM A 615/AASHTO M 31 Grade 60 (400). Circular ties, stirrups, and spiral reinforcing may be fabricated from deformed bars conforming to the requirements of ASTM A 615/AASHTO M31 Grade 60 (400). Spiral reinforcing may also be fabricated from cold drawn wire conforming to ASTM A 82 or hot rolled plain bars conforming to ASTM A 615/AASHTO M 31 Grade 60 (400).

**Section 985.1 G.4 – Page 508 – Delete the first sentence and replace with the following:**

Conductor insulation shall be colored in accordance with ICEA S-95-658, Method 1, Table K-2.

**Section 985.1 G.5 – Page 508 – Delete the first sentence and replace with the following:**

Jackets shall be polyvinyl chloride meeting UL requirements for Class 12 jackets and ICEA S-95-658, Section 4.

**Section 985.1 I.1.b – Page 508-509 – Delete the last sentence in the paragraph:**

**Section 985.1 N – Page 514 – Delete the second sentence in the fifth paragraph and replace with the following:**

The flash control circuit shall ensure that remote transfer to flashing from normal stop and go operations occurs during the end of the mainline green interval in the cycle.

**Section 985.1 N.1 and 2 – Page 515 – Delete these two sections and replace with the following sentence:**

The controller furnished shall meet current NEMA TS2 standards for controllers.

**Section 985.1 Q.7 – Page 516 – Delete and replace with the following:**

7. Backplates for Signal Heads: Unless otherwise stated on the plans, backplates may be either 0.050 inch (1.27 mm) thick aluminum or 0.125 inch (3.18 mm) thick polycarbonate. The polycarbonate backplates must be made up from no more than two pieces.

**Section 990.1 – Page 517 – Add the following to this section:**

**G. High Density Polyethylene Pipe:** High Density Polyethylene pipe, couplings, and fittings shall conform to the requirements of AASHTO M 294.

**Section 990.1 A.2.a – Page 517 – Delete and replace with the following:**

- a. Portland cement shall conform to Section 750.

**Section 990.1 A.2.h – Page 517 – Delete and replace with the following:**

- h. Flexible watertight gaskets shall conform to AASHTO M 198.

**Section 990.1 A.3 – Page 517 – Delete and replace with the following:**

3. **Concrete:** The concrete in special sections shall have a minimum compressive strength of 4000 psi (28 MPa). Special sections are those sections of concrete pipe not covered by the class requirement of AASHTO M 170, M 206, or M 207. The strength shall be determined by test cylinders or by cores.

**Section 1010.1 A – Page 519 – Add the following to the end of the first paragraph:**

Bar reinforcement shall be deformed, unless otherwise noted.

**Section 1010.1 C – Page 519 – Delete the second paragraph and replace with the following:**

Dowel bars for concrete pavements shall be epoxy coated and shall conform to AASHTO M 254 Type B except the film thickness shall be from 5 to 12 mils (0.13 to 0.30 mm) after cure. The steel cores shall be plain round bars conforming to AASHTO M 31 Grade 40 or 60, M 227 Grade 70 minimum, or M 255 Grade 75 minimum. The bars shall be the diameter shown in the plans, free from burring or other deformation restricting slippage in the concrete.

**Section 1010.1 C – Page 519 – Add the following sentence after the first sentence of the third paragraph:**

The cut ends do not have to be coated.

\* \* \* \* \*



