DEPARTMENT OF TRANSPORTATION

Planning & Engineering
Office of Project Development
700 E Broadway Avenue
Pierre, South Dakota 57501-2586
O: 605.773.3275 | F: 605.773.2614
dot.sd.gov

September 11, 2024

ADDENDUM NO. 1

RE: Item #3, September 18, 2024 Letting - IM 0902(189)98, PCN 09Q9, Pennington County - Replace Sewer Lines

TO WHOM IT MAY CONCERN:

The following addenda to the plans shall be inserted and made a part of your proposal for the referenced project.

SPECIAL PROVISIONS: Please remove the Index of Special Provisions and replace with attached Index of Special Provisions revised 9/10/24. "Detailed Specifications" was added.

Please add the "Detailed Specifications" dated 7/19/24 after the "Special Provision for Contract Time", dated 7/18/24.

SDEBS BID PROPOSAL: *The electronic bid proposal for this contract has been revised to include the changes associated with this addendum. Bidders must log in to the SDEBS to retrieve and incorporate these changes into their bid.*

Bid Items were added:
Bid Item 633E1220 "High Build Waterborne Pavement Marking Paint, 4" White"
Bid Item 633E1222 "High Build Waterborne Pavement Marking Paint, 4" Yellow"
Bid Item 633E1260 "High Build Waterborne Pavement Marking Paint, 24" White"

Bid Items were removed:
Bid Item 633E1100 "Epoxy Pavement Marking Paint, 4" White"
Bid Item 633E1105 "Epoxy Pavement Marking Paint, 4" Yellow"
Bid Item 633E1130 "Epoxy Pavement Marking Paint, 24" White"

PLANS: Please destroy sheets 2 and 4 and replace with the enclosed sheets, dated 9-10-24.

Sheet 2: **Bid Items were added:**
Bid Item 633E1220 "High Build Waterborne Pavement Marking Paint, 4" White"
Bid Item 633E1222 "High Build Waterborne Pavement Marking Paint, 4" Yellow"
Bid Item 633E1260 "High Build Waterborne Pavement Marking Paint, 24" White"

Bid Items were removed:
Bid Item 633E1100 "Epoxy Pavement Marking Paint, 4" White"
Bid Item 633E1105 "Epoxy Pavement Marking Paint, 4" Yellow"
Bid Item 633E1130 "Epoxy Pavement Marking Paint, 24" White"

Sheet 4: HIGH BUILD WATERBORNE PAVEMENT MARKING PAINT note was added, and STRIPING note was removed.

Sincerely,

Sam Weisgram
Engineering Supervisor

SW/cj

CC: Todd Seaman, Rapid City Region Engineer
Mike Carlson, Rapid City Area Engineer

REV 9/10/24

INDEX OF SPECIAL PROVISIONS

PROJECT NUMBER(S): IM 0902(189)98 PCN: 09Q9

TYPE OF WORK: REPLACE SEWER LINES

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.

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.

Kara Palmer is the official in charge of the Hot Springs Career Center for Pennington County.

THE FOLLOWING ITEMS ARE INCLUDED IN THIS PROPOSAL FORM:

Special Provision for Contract Time, dated 7/18/24.

Detailed Specifications

Section 7S - Supplemental Conditions
Section 01 33 00- Submittal Procedures
Section 01 78 00 - Closeout Submittals
Section 31 23 00.00 20 - Excavation and Fill
Section 33 01 30.16 - TV Inspection of Sewer Lines
Section 33 30 00 - Sanitary Sewerage
Geotechnical Report

Special Provision for Acknowledgment and Certification Regarding Article 3, Section 12 of the South Dakota Constitution, dated 8/24/23.
Special Provision for Buy America, dated 5/1/24.
Special Provision for Liability Insurance, dated 4/21/22.
Special Provision for Responsibility for Damage Claims, dated 4/21/22.
Special Provision for Restriction of Boycott of Israel, dated 1/31/20.
Special Provision for Contractor Administered Preconstruction Meeting, dated 12/18/19.
Fuel Adjustment Affidavit, DOT form 208 dated 7/15.
Standard Title VI Assurance, dated 3/1/16.
Special Provision For Disadvantaged Business Enterprise, dated 2/9/24.
Special Provision For EEO Affirmative Action Requirements on Federal and Federal-Aid Construction Contracts, dated 2/5/24.
Special Provision For Required Contract Provisions Federal-Aid Construction Contracts, Form FHWA 1273 (Rev. October 23, 2023), dated 10/18/23.

Required Contract Provisions Federal-Aid Construction Contracts, Form FHWA 1273 (Rev. 10/23/23).

Special Provision Regarding Minimum Wage on Federal-Aid Projects, dated 10/24/19.

Wage and Hour Division US Department of Labor Washington DC. - US Dept. of Labor Decision Number SD20230032, dated 3/10/23.

Special Provision for Supplemental Specifications to 2015 Standard Specifications for Roads and Bridges, dated 9/7/22.

Special Provision for Price Schedule for Miscellaneous Items, dated 12/6/23.

DETAILED SPECIFICATIONS

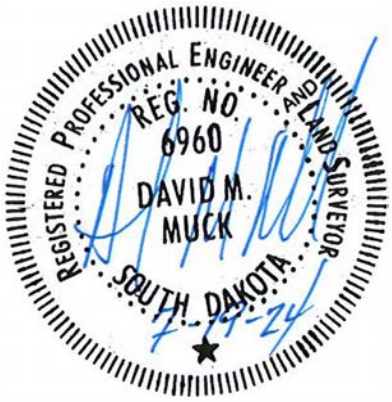
PROJECT: Wasta Rest Area Sanitary Sewer Repair
Project IM 0902(189)98 PCN 09Q9

LOCATION: Wasta, South Dakota

OWNER: South Dakota Department of Transportation

ENGINEER: Avid4 Engineering, Inc.
1805 Samco Road
Rapid City, SD 57702

CERTIFICATION: I hereby certify that these detailed specifications were prepared and assembled under my direct supervision and that I am a Professional Engineer registered in the State of South Dakota.



CONTENTS:

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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

1.01 The following terms have the meanings indicated below, which are applicable to both singular and plural thereof:

A. “Avid4” – Avid4 Engineering, Inc. at 1805 Samco Road, Rapid City SD 57702.

B. "Resident Project Representative" - the authorized representative of Avid4 who is assigned to the construction Site or any part thereof.

ARTICLE 2 –AVID4’S STATUS DURING CONSTRUCTION

2.01 OWNER'S REPRESENTATIVE:

A. Avid4 will be Owner's representative during the construction period. The duties and responsibilities and the limitations of Avid4’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 Avid4.

2.02 VISITS TO SITE:

A. Avid4 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. Avid4’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, Avid4 will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defects and deficiencies in the Work.

2.03 LIMITATIONS ON AVID4'S RESPONSIBILITIES:

A. Neither Avid4’s authority to act under this ARTICLE 2 or elsewhere in the Contract Documents nor any decision made by Avid4 in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of Avid4 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 Avid4 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 Avid4 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. Avid4 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. Avid4 and Owner will not be responsible for Contractor's failure to perform or furnish the Work in accordance with the Contract Documents.

D. Avid4 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 Avid4 or his representative will not act to relieve Contractor of any responsibility or of any guarantee of his performance. Neither will observation by Avid4 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 Avid4, Resident Project Representative, and assistants.

ARTICLE 3 – OWNERSHIP AND REUSE OF DOCUMENTS

3.01 All Contract Documents and copies thereof furnished by Avid4 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 Avid4 on request upon completion of the Work.

3.02 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 Avid4; and they shall not reuse any of the documents on extensions of the Project or any other project without written consent of Owner and Avid4 and specific written verification or adaptation by Avid4.

ARTICLE 4 – RESERVED

ARTICLE 5 - INSURANCE

5.01 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

6.01 PERSONAL INJURY AND PROPERTY DAMAGE:

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Avid4 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 Avid4 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.

6.02 PATENT FEES AND ROYALTIES:

Contractor shall indemnify and hold harmless Owner, Avid4, 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 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Submittal Descriptions (SD)

Submittal requirements are specified in the technical sections. Examples and descriptions of submittals identified by the Submittal Description (SD) numbers and titles follow:

SD-01 Preconstruction Submittals

For Owner approved Division 01 preconstruction submittals that are required prior to or commencing with the start of work shall be submitted within 30 calendar days of contract award unless specified elsewhere in the specifications. For contractor approved Division 01 submittals that are required prior to or commencing with the start of work shall be submitted within 45 calendar days of contract award unless specified elsewhere in the specifications.

Preconstruction Submittals include schedules and a tabular list of locations, features, and other pertinent information regarding products, materials, equipment, or components to be used in the work.

Certificates Of Insurance

Surety Bonds

List Of Proposed Subcontractors

List Of Proposed Products

Submittal Register

Schedule Of Prices Or Earned Value Report

Work Plan

Quality Control (QC) plan

Permits

Environmental Protection Plan

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. Unless specified in another section, testing must have been within three years of date of contract award for the project.

Report that includes findings of a test required to be performed on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report that includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports

Daily logs and checklists

Final acceptance test and operational test procedure

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that the product, system, or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor. The document purpose is to further promote the orderly progression of a portion of the work by documenting procedures, acceptability of methods, or personnel qualifications.

Confined space entry permits

Text of posted operating instructions

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Submittals required for Guiding Principle Validation (GPV) or Third Party Certification (TPC).

Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.1.2 Approving Authority

Office or designated person authorized to approve the submittal.

1.1.3 Work

As used in this section, on-site and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction. In exception, excludes work to produce SD-01 submittals.

1.2 SUBMITTALS

Approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or “S” classification are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submittal Register; G

1.3 SUBMITTAL CLASSIFICATION

1.3.1 Owner Approved (G)

Within the terms of the Contract Clause SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, submittals are considered to be "shop drawings."

1.3.2 For Information Only

Submittals not requiring Owner approval will be for information only. Within the terms of the Contract Clause SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, they are not considered to be "shop drawings."

1.4 PREPARATION

1.4.1 Transmittal Form

Use the AF Form 3000 transmittal form for submitting both Owner-approved and information-only submittals. Submit in accordance with the instructions on the reverse side of the form. Properly complete this form by filling out all the heading blank spaces and identifying each item submitted. Exercise care to ensure proper listing of the specification paragraph and sheet number of the contract drawings pertinent to the data submitted for each item. If submission is in electronic form, the transmittal form and all submitted items shall be combined into a single PDF file.

1.4.2 Submittal Format

1.4.2.1 Format of SD-01 Preconstruction Submittals

When the submittal includes a document that is to be used in the project, or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

1.4.2.2 Format for SD-02 Shop Drawings

Provide shop drawings not less than 8 1/2 by 11 inches nor more than 30 by 42 inches, except for full-size patterns or templates. Prepare drawings to accurate size, with scale indicated, unless another form is required. Ensure drawings are suitable for reproduction and of a quality to produce clear, distinct lines and letters, with dark lines on a white background.

a. Include the nameplate data, size, and capacity on drawings. Also include applicable federal, military, industry, and technical society publication references.

b. Dimension drawings, except diagrams and schematic drawings. Prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

Present shop drawings sized 8 1/2 by 11 inches as part of the bound volume for submittals. Present larger drawings in sets. Submit an electronic copy of drawings in PDF format.

1.4.2.2.1 Drawing Identification

Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph IDENTIFYING SUBMITTALS.

Number drawings in a logical sequence. Each drawing is to bear the number of the submittal in a uniform location next to the title block. Place the Owner contract number in the margin, immediately below the title block, for each drawing.

1.4.2.3 Format of SD-03 Product Data

Present product data submittals for each section. Include a table of contents, listing the page and catalog item numbers for product data.

Indicate, by prominent notation, each product that is being submitted; indicate the specification section number and paragraph number to which it pertains.

1.4.2.3.1 Product Information

Supplement product data with material prepared for the project to satisfy the submittal requirements where product data does not exist. Identify this material as developed specifically for the project, with information and format as required for submission of SD-07 Certificates.

Provide product data in units used in the Contract documents. Where product data are included in preprinted catalogs with another unit, submit the dimensions in contract document units, on a separate sheet.

1.4.2.3.2 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Engineer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.4.2.3.3 Data Submission

Collect required data submittals for each specific material, product, unit of work, or system into a single submittal that is marked for choices, options, and portions applicable to the submittal. Mark each copy of the product data identically. Partial submittals will not be accepted for expedition of the construction effort.

Submit the manufacturer's instructions before installation.

1.4.2.4 Format of SD-04 Samples

1.4.2.4.1 Sample Characteristics

Furnish samples in the following sizes, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately the same size as specified:

a. Sample of Equipment or Device: Full size.

b. Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.

c. Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.

d. Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.

e. Sample Volume of Nonsolid Materials: Pint. Examples of nonsolid materials are sand and paint.

f. Color Selection Samples: 2 by 4 inches. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified. Sizes and quantities of samples are to represent their respective standard unit.

g. Sample Panel: 4 by 4 feet.

h. Sample Installation: 100 square feet.

1.4.2.4.2 Sample Incorporation

Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples are to be in undamaged condition at the time of use.

Recording of Sample Installation: Note and preserve the notation of any area constituting a sample installation, but remove the notation at the final clean-up of the project.

1.4.2.4.3 Comparison Sample

Samples Showing Range of Variation: Where variations in color, finish, pattern, or texture are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range. Mark each unit to describe its relation to the range of the variation.

When color, texture, or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

1.4.2.5 Format of SD-05 Design Data

Provide design data and certificates on 8 1/2 by 11 inch paper. Provide a bound volume for submittals containing numerous pages.

1.4.2.6 Format of SD-06 Test Reports

Provide reports on 8 1/2 by 11 inch paper.

By prominent notation, indicate each report in the submittal. Indicate the specification number and paragraph number to which each report pertains.

1.4.2.7 Format of SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inch paper.

1.4.2.8 Format of SD-08 Manufacturer's Instructions

Present manufacturer's instructions submittals for each section as a complete, bound volume. Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry, and technical-society publication references. If supplemental information is needed to clarify the manufacturer's data, submit it as specified for SD-07 Certificates.

Submit the manufacturer's instructions before installation.

1.4.2.8.1 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Engineer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.4.2.9 Format of SD-09 Manufacturer's Field Reports

Provide reports on 8 1/2 by 11 inch paper.

By prominent notation, indicate each report in the submittal. Indicate the specification number and paragraph number to which each report pertains.

1.4.2.10 Format of SD-10 Operation and Maintenance Data (O&M)

Provide operation and maintenance data on 8 1/2 by 11 inch paper in a complete bound volume.

1.4.2.11 Format of SD-11 Closeout Submittals

When the submittal includes a document that is to be used in the project or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

1.4.3 Source Drawings for Shop Drawings

1.4.3.1 Source Drawings

The entire set of source drawing files (DWG) will not be provided to the Contractor. Request the specific Drawing Number for the preparation of shop drawings. Only those drawings requested to prepare shop drawings will be provided. These drawings are provided only after award.

1.4.3.2 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction data for the referenced project. Any other use or reuse is at the sole risk of the Contractor and without liability or legal exposure to the Owner. The Contractor must make no claim, and waives to the fullest extent permitted by law any claim or cause of action of any nature against the Owner, its agents, or its subconsultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Owner harmless against all damages, liabilities, or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic source drawing files are not construction documents. Differences may exist between the source drawing files and the corresponding construction documents. The Owner makes no representation regarding the accuracy or completeness of the electronic source drawing files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. The Contractor is responsible for determining if any conflict exists. In the event that a conflict arises between the signed and sealed construction documents prepared by the Owner and the furnished source drawing files, the signed and sealed construction documents govern. Use of these source drawing files does not relieve the Contractor of the duty to fully comply with the contract documents, including and without limitation the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic source drawing files for use in producing construction data related to this contract, remove all previous indication of ownership (seals, logos, signatures, initials and dates).

1.4.4 Electronic File Format

Provide submittals in electronic format, with the exception of material samples required for SD-04 Samples items. Compile the submittal file as a single, complete document, to include the Transmittal Form described within. Name the electronic submittal file specifically according to its contents, and coordinate the file naming convention with the Engineer. Electronic files must

be of sufficient quality that all information is legible. Use PDF as the electronic format, unless otherwise specified or directed by the Engineer. Generate PDF files from original documents with bookmarks so that the text included in the PDF file is searchable and can be copied. If documents are scanned, optical character resolution (OCR) routines are required. Index and bookmark files exceeding 30 pages to allow efficient navigation of the file. When required, the electronic file must include a valid electronic signature or a scan of a signature.

E-mail electronic submittal documents smaller than 10MB to an e-mail address as directed by the Engineer. Provide electronic documents over 10MB on an optical disc or through an electronic file sharing system, such as secure ftp site or DOD SAFE located at the following website: safe.apps.mil. Use of the Owner web application must be initiated by the Owner, unless the Contractor has a Owner CAC card. This Owner web application restricts the number of days files are available to download.

1.5 QUANTITY OF SUBMITTALS

Submittals are to be transmitted electronically, unless directed otherwise.

1.5.1 Number of SD-04 Samples

a. Submit two samples, or two sets of samples showing the range of variation, of each required item. One approved sample or set of samples will be retained by the approving authority and one will be returned to the Contractor.

b. Submit one sample panel or provide one sample installation where directed. Include components listed in the technical section or as directed.

c. Submit one sample installation, where directed.

d. Submit one sample of nonsolid materials.

1.6 INFORMATION ONLY SUBMITTALS

Submittals without a "G" designation must be certified by the QC manager and submitted to the Engineer for information-only. Approval of the Engineer is not required on information only submittals. The Engineer will mark "receipt acknowledged" on submittals for information and will return only the transmittal cover sheet to the Contractor. Normally, submittals for information only will not be returned. However, the Owner reserves the right to return unsatisfactory submittals and require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Engineer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Owner laboratory or for check testing by the Owner in those instances where the technical specifications so prescribe.

1.7 PROJECT SUBMITTAL REGISTER

A sample Project Submittal Register showing submittals required by the specifications is attached to this section as "Submittal Register."

1.7.1 Submittal Management

Prepare and maintain a submittal register, as the work progresses. Do not change data that is output in columns (c), (d), (e), and (f) as delivered by Owner; retain data that is output in columns (a), (g), (h), and (i) as approved. As an attachment, provide a submittal register showing items of equipment and materials for which submittals are required by the specifications. This list may not be all-inclusive and additional submittals may be required.

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD Number and type, e.g., SD-02 Shop Drawings) required in each specification section.

Column (e): Lists one principal paragraph in each specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting the project requirements.

Thereafter, the Contractor is to track all submittals by maintaining a complete list, including completion of all data columns and all dates on which submittals are received by and returned by the Owner.

1.7.2 Preconstruction Use of Submittal Register

Submit the submittal register. Include the QC plan and the project schedule. Verify that all submittals required for the project are listed and add missing submittals. Coordinate and complete the following fields on the register submitted with the QC plan and the project schedule:

Column (a) Activity Number: Activity number from the project schedule.

Column (g) Contractor Submit Date: Scheduled date for the approving authority to receive submittals.

Column (h) Contractor Approval Date: Date that Contractor needs approval of submittal.

Column (i) Contractor Material: Date that Contractor needs material delivered to Contractor control.

1.7.3 Contractor Use of Submittal Register

Update the following fields with each submittal throughout the contract.

Column (b) Transmittal Number: List of consecutive, Contractor-assigned numbers.

Column (j) Action Code (k): Date of action used to record Contractor's review when forwarding submittals to QC.

Column (l) Date submittal transmitted.

Column (q) Date approval was received.

1.7.4 Approving Authority Use of Submittal Register

Update the following fields:

Column (b) Transmittal Number: List of consecutive, Contractor-assigned numbers.

Column (l) Date submittal was received.

Column (m) through (p) Dates of review actions.

Column (q) Date of return to Contractor.

1.7.5 Delivery of Copies

Submit an updated electronic copy of the submittal register to the Engineer with each invoice request. Provide an updated Submittal Register monthly regardless of whether an invoice is submitted.

1.8 VARIATIONS

Variations from contract requirements require Engineer approval and will be considered where advantageous to the Owner.

1.8.1 Considering Variations

Discussion of variations with the Engineer before submission of a variation submittal will help ensure that functional and quality requirements are met and minimize rejections and resubmittals. For variations that include design changes or some material or product substitutions, the Owner may require an evaluation and analysis by a licensed professional engineer hired by the contractor.

Specifically point out variations from contract requirements in a transmittal letter. Failure to point out variations may cause the Owner to require rejection and removal of such work at no additional cost to the Owner.

1.8.2 Proposing Variations

When proposing variation, deliver a submittal, clearly marked as a "VARIATION" to the Engineer, with documentation illustrating the nature and features of the variation including any necessary technical submittals and why the variation is desirable and beneficial to Owner. If lower cost is a benefit, also include an estimate of the cost savings. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

The Engineer will indicate an approval or disapproval of the variation request; and if not approved as submitted, will indicate the Owner's reasons therefore. Any work done before such approval is received is performed at the Contractor's risk.

Specifically point out variations from contract requirements in a transmittal letter. Failure to point out variations may cause the Owner to require rejection and removal of such work at no additional cost to the Owner.

1.8.3 Warranting that Variations are Compatible

When delivering a variation for approval, the Contractor warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

1.8.4 Review Schedule Extension

In addition to the normal submittal review period, a period of 14 calendar days will be allowed for the Owner to consider submittals with variations.

1.9 SCHEDULING

Schedule and submit concurrently, product data and shop drawings covering component items forming a system or items that are interrelated. Submit pertinent certifications at the same time. No delay damages or time extensions will be allowed for time lost in late submittals.

a. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work so that work will not be delayed by submittal processing. The Contractor is responsible for additional time required for Owner reviews resulting from required resubmittals. The review period for each resubmittal is the same as for the initial submittal.

b. Submittals required by the contract documents are listed on the submittal register. If a submittal is listed in the submittal register but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the Engineer does not relieve the Contractor of supplying submittals required by the contract documents but that have been omitted from the register or marked "N/A."

c. Resubmit the submittal register and annotate it monthly with actual submission and approval dates. When all items on the register have been fully approved, no further resubmittal is required.

Engineer review will be completed within 20 days after the date of submission.

1.10 OWNER APPROVING AUTHORITY

When the approving authority is the Engineer, the Owner will:

a. Note the date on which the submittal was received.

b. Review submittals for approval within the scheduling period specified and only for conformance with project design concepts and compliance with contract documents.

c. Identify returned submittals with one of the actions defined in paragraph REVIEW NOTATIONS and with comments and markings appropriate for the action indicated.

Upon completion of review of submittals requiring Owner approval, stamp and date submittals. An electronic copy of the submittal will be retained by the Engineer and an electronic copy of the submittal will be returned to the Contractor.

1.10.1 Review Notations

Submittals will be returned to the Contractor with the following notations:

a. Submittals marked "approved" or "accepted" authorize proceeding with the work covered.

b. Submittals marked "approved as noted" or "approved, except as noted, resubmittal not required," authorize proceeding with the work covered provided that the Contractor takes no exception to the corrections.

c. Submittals marked "not approved," "disapproved," or "revise and resubmit" indicate incomplete submittal or noncompliance with the contract requirements or design concept. Resubmit with appropriate changes. Do not proceed with work for this item until the resubmittal is approved.

d. Submittals marked "not reviewed" indicate that the submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by Contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by Contractor or for being incomplete, with appropriate action, coordination, or change.

e. Submittals marked "receipt acknowledged" indicate that submittals have been received by the Owner. This applies only to "information-only submittals" as previously defined.

1.11 DISAPPROVED SUBMITTALS

Make corrections required by the Engineer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications, give notice to the Engineer as required under the FAR clause titled CHANGES. The Contractor is responsible for the dimensions and design of connection details and the construction of work. Failure to point out variations may cause the Owner to require rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, make such revisions and resubmit in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

1.12 APPROVED SUBMITTALS

The Engineer's approval of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing, and other information are satisfactory.

Approval or acceptance by the Owner for a submittal does not relieve the Contractor of the responsibility for meeting the contract requirements or for any error that may exist, because under the Quality Control (QC) requirements of this contract, the Contractor is responsible for ensuring information contained with in each submittal accurately conforms with the requirements of the contract documents.

After submittals have been approved or accepted by the Engineer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.13 APPROVED SAMPLES

Approval of a sample is only for the characteristics or use named in such approval and is not be construed to change or modify any contract requirements. Before submitting samples, provide assurance that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

Match the approved samples for materials and equipment incorporated in the work. If requested, approved samples, including those that may be damaged in testing, will be returned to the Contractor, at its expense, upon completion of the contract. Unapproved samples will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make as that material. The Owner reserves the right to disapprove any material or equipment that has previously proved unsatisfactory in service.

Samples of various materials or equipment delivered on the site or in place may be taken by the Engineer for testing. Samples failing to meet contract requirements will automatically void previous approvals. Replace such materials or equipment to meet contract requirements.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

TITLE:	Project M 090-E452 and M 090W-452
JOB NAME:	Wasta Rest Area Sanitary Sewer Repair
LOCATION:	Wasta, South Dakota
CONTRACT NO:	
CONTRACTOR:	

SUBMITTAL REGISTER

									CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
	(a)	(b)	(c)	(d)			(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
Line	Activity #	Transmittal #	Specification Section	SD #	Submittal Description	Item Submitted	Paragraph #	Classification: GOVT or A/E Reviewer	Submit	Approval Needed By	Material Needed By	Action Code	Date Of Action	Date FWD to APPR / Auth Date RCD From CONTR	Date FWD To Other Revwr	Date RCD From Other Reviewer	Action Code	Date Of Action	Mailed To CONTR/ Date RCD From APPR Authority	Remarks
1			01 00 00	1	Preconstruction Submittals	Traffic Control Plan														
2			01 33 00	1	Preconstruction Submittals	Submittal Register														
3			01 78 00	3	Product Data	Warranty Management Plan														
4			01 78 00	3	Product Data	Warranty Tags														
5			01 78 00	8	Manufacturer's Instructions	Instructions														
6			01 78 00	10	Operation and Maintenance Data	Operation and Maintenance Manuals														
7			01 78 00	11	Closeout Submittals	Redline Drawings														
8			01 78 00	11	Closeout Submittals	Record Drawings														
9			01 78 00	11	Closeout Submittals	DD Form 1354 Checklist														
10			01 78 00	11	Closeout Submittals	Survey Data														
11			31 23 00.00 20	1	Preconstruction Submittals	Shoring and Sheeting Plan														
12			31 23 00.00 20	1	Preconstruction Submittals	Dewatering work plan														
13			31 23 00.00 20	6	Test Reports	Borrow Site Testing														
14			31 23 00.00 20	6	Test Reports	Fill and backfill														
15			31 23 00.00 20	6	Test Reports	Select material														
16			31 23 00.00 20	6	Test Reports	Density tests														
17			31 23 00.00 20	6	Test Reports	Moisture Content Tests														
18			31 23 00.00 20	6	Test Reports	Results Of Tracer Wire Continuity Testing														
19			Std 393	3	Product Data	Sealants														
20			Std 393	4	Samples	Blocking Media/Backup Materials														
21			Std 393	6	Test Reports	Sealants														
22			Std 393	8	Manufacturer's Instructions	Sealants														
23			Std 882	3	Product Data	Plant, Equipment, and Tools														
24			Std 882	6	Test Reports	Initial Tests														
25			Std 882	6	Test Reports	In-Place Tests														
26			Std 821	3	Product Data	Curing Materials														
27			Std 1010	3	Product Data	Dowel Bars														
28			Std 1010	3	Product Data	Reinforcement														
29			Std 1010	3	Product Data	Epoxy Resin														
30			Std 860	3	Product Data	Expansion Joint Filler														
31			Std 380	5	Design Data	Mix Design Report														
32			Std 380	6	Test Reports	Concrete Slump Tests														
33			Std 380	6	Test Reports	Concrete Uniformity														
34			Std 380	6	Test Reports	Flexural Strength														
35			Std 380	6	Test Reports	Air Content														
36			Std 380	7	Certificates	Batch Tickets														
37			Std 380	7	Certificates	NRMCA Certificate Of Conformance														
38			Std 380	7	Certificates	Cementitious Materials														
39			Std 380	8	Manufacturer's Instructions	Diamond Grinding Plan														

TITLE:	Project M 090-E452 and M 090W-452
JOB NAME:	Wasta Rest Area Sanitary Sewer Repair
LOCATION:	Wasta, South Dakota
CONTRACT NO:	
CONTRACTOR:	

SUBMITTAL REGISTER

									CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
	(a)	(b)	(c)	(d)			(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
Line	Activity #	Transmittal #	Specification Section	SD #	Submittal Description	Item Submitted	Paragraph #	Classification: GOVT or A/E Reviewer	Submit	Approval Needed By	Material Needed By	Action Code	Date Of Action	Date FWD to APPR / Auth Date RCD From CONTR	Date FWD To Other Revwr	Date RCD From Other Reviewer	Action Code	Date Of Action	Mailed To CONTR/ Date RCD From APPR Authority	Remarks
40			Std 633	3	Product Data	Surface Preparation Equipment List														
41			Std 633	3	Product Data	Application Equipment List														
42			Std 633	3	Product Data	Exterior Surface Preparation														
43			Std 633	3	Product Data	Safety Data Sheets														
44			Std 980	3	Product Data	Waterborne Paint														
45			Std 980	6	Test Reports	Waterborne Paint														
46			Std 980	6	Test Reports	Test Reports														
47			Std 980	7	Certificates	Qualifications														
48			Std 980	7	Certificates	Waterborne Paint														
49			Std 633	8	Manufacturer's Instructions	Waterborne Paint														
50			Std 732	3	Product Data	Wood Cellulose Fiber Mulch														
51			Std 734	3	Product Data	Sediment Control Wattle														
52			Std 731	3	Product Data	Fertilizer														
53			Std 730	7	Certificates	Seed														
54			33 01 30.16	1	Preconstruction Submittals	Traffic Control Plan														
55			33 01 30.16	1	Preconstruction Submittals	Disposal Plan														
56			33 01 30.16	3	Product Data	Cleaning Products														
57			33 01 30.16	7	Certificates	CCTV Technician's Qualifications														
58			33 01 30.16	7	Certificates	Pre-TV Inspection														
59			33 01 30.16	7	Certificates	Post-TV Inspection														
60			33 01 30.16	7	Certificates	Warranty-TV Inspection														
61			33 01 30.16	7	Certificates	RE-TV Inspection														
62			33 01 30.16	11	Closeout Submittals	Records of Disposals														
63			Notes	3	Product Data	Valves														
64			Notes	3	Product Data	Valve Boxes														
65			Notes	3	Product Data	Fire Hydrants														
66			Notes	7	Certificates	Valves														
67			Notes	7	Certificates	Epoxy Coating														
68			33 30 00	1	Preconstruction Submittals	Contractor's License														
69			33 30 00	2	Shop Drawings	Installation Drawings														
70			33 30 00	2	Shop Drawings	Precast Concrete Manholes														
71			33 30 00	3	Product Data	Precast Concrete Manholes														
72			33 30 00	3	Product Data	Frames, Covers, and Gratings														
73			33 30 00	3	Product Data	Gravity Pipe														
74			33 30 00	3	Product Data	Pressure Pipe														
75			33 30 00	3	Product Data	PVC Pipe Couplings														
76			33 30 00	3	Product Data	Chimney Seal														
77			33 30 00	3	Product Data	Manhole Corrosion Liner														
78			33 30 00	6	Test Reports	Precast Concrete Sewer Manhole Test														
79			33 30 00	6	Test Reports	Hydrostatic Sewer Test														

TITLE:	Project M 090-E452 and M 090W-452
JOB NAME:	Wasta Rest Area Sanitary Sewer Repair
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CONTRACT NO:	
CONTRACTOR:	

SUBMITTAL REGISTER

									CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
	(a)	(b)	(c)	(d)		(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
Line	Activity #	Transmittal #	Specification Section	SD #	Submittal Description	Item Submitted	Paragraph #	Classification: GOVT or A/E Reviewer	Submit	Approval Needed By	Material Needed By	Action Code	Date Of Action	Date FWD to APPR / Auth Date RCD From CONTR	Date FWD To Other Revwr	Date RCD From Other Reviewer	Action Code	Date Of Action	Mailed To CONTR/ Date RCD From APPR Authority	Remarks
80			33 30 00	6	Test Reports	Negative Air Pressure Test														
81			33 30 00	6	Test Reports	Low-Pressure Air Tests														
82			33 30 00	6	Test Reports	Tests For Pressure Lines														
83			33 30 00	6	Test Reports	Deflection Testing														
84			33 30 00	7	Certificates	Portland Cement														
85			33 30 00	7	Certificates	Gaskets														

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SECTION 01 78 00

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Redline Drawings

Redline drawings are the marked-up drawings, maintained by the Contractor on-site, that depict actual conditions and deviations from the Contract Documents. These deviations and additions may result from coordination required by, but not limited to: contract modifications; official responses to submitted Requests for Information (RFI's); direction from the Engineer; design that is the responsibility of the Contractor; and differing site conditions. Maintain the as-builts throughout construction as red-lined hard copies on site. These files serve as the basis for the creation of the record drawings.

1.1.2 Record Drawings

The record drawings are the final compilation of actual conditions reflected in the redline drawings as completed in a final published format.

1.2 SOURCE DRAWING FILES

Request the full set of electronic drawings, in the source format, for Record Drawing preparation, after award and at least 30 days prior to required use.

1.2.1 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction data for the referenced project. Any other use or reuse shall be at the sole risk of the Contractor and without liability or legal exposure to the Owner. The Contractor must make no claim and waives to the fullest extent permitted by law, any claim or cause of action of any nature against the Owner, its agents or sub consultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Owner harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic CAD drawing files are not construction documents. Differences may exist between the CAD files and the corresponding construction documents. The Owner makes no representation regarding the accuracy or completeness of the electronic CAD files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. In the event that a conflict arises between the signed and sealed construction documents prepared by the Owner and the furnished Source drawing files, the signed and sealed construction documents govern. The Contractor is responsible for determining if any conflict exists. Use of

these Source Drawing files does not relieve the Contractor of duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic source drawing files for use in producing construction data related to this contract, remove all previous indicia of ownership (seals, logos, signatures, initials and dates).

1.3 SUBMITTALS

Owner approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Owner. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Warranty Management Plan

Warranty Tags

SD-08 Manufacturer's Instructions

Instructions

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

SD-11 Closeout Submittals

Redline Drawings; G

Record Drawings; G

DD Form 1354 Checklist; G

Survey Data

1.4 WARRANTY MANAGEMENT

1.4.1 Warranty Management Plan

Develop a warranty management plan which contains information relevant to FAR 52.246-21 Warranty of Construction. At least 30 days before the planned pre-warranty conference, submit one copy of the warranty management plan. Include within the warranty management plan all required actions and documents to assure that the Owner receives all warranties to which it is entitled. The plan narrative must contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below must include due

date and whether item has been submitted or was accomplished. Submit warranty information, made available during the construction phase, to the Engineer for approval prior to each monthly pay estimate. Assemble approved information in a binder and turn over to the Owner upon acceptance of the work. The construction warranty period must begin on the date of project acceptance and continue for a one year warranty period. Conduct 12-month warranty inspection, measured from time of acceptance; with the Contractor, Engineer and the Department. The warranty management plan must include, but is not limited to, the following:

a. Roles and responsibilities of personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.

b. For each warranty, the name, address, telephone number, and e-mail of each of the guarantor's representatives nearest to the project location.

c. A list and status of delivery of Certificates of Warranty for extended warranty items.

1.4.2 Performance Bond

The Performance Bond must remain effective throughout the construction and warranty period.

a. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Engineer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Owner while performing the work, including, but not limited to administrative expenses.

b. In the event sufficient funds are not available to cover the construction warranty work performed by the Owner at the Contractor's expense, the Engineer will have the right to recoup expenses from the bonding company.

c. Following oral or written notification of required construction warranty repair work, respond in a timely manner. Written verification will follow oral instructions. Failure to respond will be cause for the Engineer to proceed against the Contractor.

1.4.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Engineer, meet with the Engineer to develop a mutual understanding with respect to the requirements of this section. At this meeting, establish and review communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Engineer for the execution of the construction warranty In connection with these requirements and at the time of the Contractor's quality control completion inspection, furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact must be located within the local service area of the warranted construction, be continuously available, and be responsive to Owner inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.

1.4.4 Warranty Tags

At the time of installation, tag each warranted item with a durable, oil and water resistant tag approved by the Engineer. Attach each tag with a copper wire and spray with a silicone waterproof coating. Also, submit two record copies of the warranty tags showing the layout and design. The date of acceptance and the QC signature must remain blank until the project is accepted for beneficial occupancy. Show the following information on the tag.

Type of product/material	
Model number	
Serial number	
Contract number	
Warranty period from/to	
Inspector's signature	
Construction Contractor	
Address	
Telephone number	
Warranty contact	
Address	
Telephone number	
Warranty response time priority code	
WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.	

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 REDLINE DRAWINGS

Provide and maintain two black line print copies of the PDF contract drawings for Redline Drawings. Maintain the redlines throughout construction as red-lined hard copies on site or red-lined PDF files. Submit Redline Drawings within 30 days after Final Inspection.

3.1.1 Markup Guidelines

Make comments and markup the drawings complete without reference to letters, memos, or materials that are not part of the As-Built drawing. Show what was changed, how it was changed, where item(s) were relocated and change related details. These working as-built markup prints must be neat, legible and accurate as follows:

a. Use base colors of red, green, and blue. Color code for changes as follows:

(1) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes.

(2) Deletions (Red) - Over-strike deleted graphic items (lines), lettering in notes and leaders.

(3) Additions (Green) - Added items, lettering in notes and leaders.

b. Provide a legend if colors other than the "base" colors of red, green, and blue are used.

c. Add and denote any additional equipment or material facilities, service lines, incorporated under As-Built Revisions if not already shown in legend.

d. Use frequent written explanations on markup drawings to describe changes. Do not totally rely on graphic means to convey the revision.

e. Use legible lettering and precise and clear digital values when marking prints. Clarify ambiguities concerning the nature and application of change involved.

f. Wherever a revision is made, also make changes to related section views, details, legend, profiles, plans and elevation views, schedules, notes and call out designations, and mark accordingly to avoid conflicting data on all other sheets.

g. For deletions, cross out all features, data and captions that relate to that revision.

h. For changes on small-scale drawings and in restricted areas, provide large-scale inserts, with leaders to the applicable location.

i. Indicate one of the following when attaching a print or sketch to a markup print:

1) Add an entire drawing to contract drawings

2) Change the contract drawing to show

3) Provided for reference only to further detail the initial design.

j. Incorporate all shop and fabrication drawings into the markup drawings.

3.1.2 Redline Drawings Content

Show on the redline drawings, but not limited to, the following information:

a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, show by offset dimensions to two permanently fixed surface features the end of each run including each change in direction on the record drawings. Locate valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Also record the average depth below the surface of each run.

b. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.

c. Changes in details of design or additional information obtained from working drawings specified to be prepared or furnished by the Contractor; including but not limited to shop drawings, fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment, and foundations.

d. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.

e. Changes or Revisions which result from the final inspection.

f. Where contract drawings or specifications present options, show only the option selected for construction on the working redline markup drawings.

g. If borrow material for this project is from sources on Owner property, or if Owner property is used as a spoil area, furnish a contour map of the final borrow pit/spoil area elevations.

h. Changes in location of equipment and architectural features.

i. Modifications.

j. Actual location of anchors, construction and control joints, etc., in concrete.

k. Unusual or uncharted obstructions that are encountered in the contract work area during construction.

l. Location, extent, thickness, and size of stone protection.

3.2 RECORD DRAWINGS

The Contractor shall submit a draft of the Record Drawings in Standard 11x17 size, on paper for review within 21 calendar days of the project final inspection. Within 14 calendar days following approval of the draft, the Contractor shall submit the final Record Drawings; one (1) copy of Standard B (11"x17") size drawings on paper, a CD ROM containing Auto CAD 2006 (or newer version) Record Drawings, and CD ROM containing one (1) copy of the plans and specifications in PDF format. The drawings shall indicate, in addition to all changes and correction, the actual location of all subsurface utility lines.

3.3 OPERATION AND MAINTENANCE MANUALS

Provide project operation and maintenance manuals organized into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch (51-mm), 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

a. Emergency instructions

b. Spare parts list

c. Copies of warranties (address and telephone number of authorized representative

d. Wiring diagrams

e. Recommended "turn-around" cycles

f. Inspection and maintenance procedures

g. Shop drawings and Product data

h. Operating instructions.

Provide two hard copies and an electronic copy of the Operation and Maintenance Manual files. Submit to the Engineer for approval within 30 calendar days after Final Inspection.

3.4 OPERATIONS AND MAINTENANCE INSTRUCTIONS

The Contractor shall arrange for each Installer of equipment that requires regular maintenance to meet with Owner personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Instructions shall be scheduled for a Tuesday, Wednesday or Thursday. Contractor shall arrange the day and time of the instruction with the project inspector. Include a detailed review of the following items: Maintenance manuals; Record documents; Spare parts and materials; Tools; Lubricants; Fuels; Identification systems; Control sequences; Hazards; Cleaning; Warranties; Maintenance agreements; and other information as necessary or requested.

As part of the instruction for operating equipment, demonstrate the following procedures: Startup; Shutdown; Emergency operations; Noise and vibration adjustments; Safety procedures; Economy and efficiency adjustments; Effective energy utilization; and other items as necessary or requested.

3.5 CLEANUP

Leave premises "broom clean." Clean equipment and fixtures to a sanitary condition. Clean filters of operating equipment. Clean debris from roofs, gutters, downspouts and drainage systems. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site.

-- End of Section --

SECTION 31 23 00.00 20

EXCAVATION AND FILL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C600	(2017) Installation of Ductile-Iron Mains and Their Appurtenances

ASTM INTERNATIONAL (ASTM)

ASTM C136/C136M	(2019) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D698	(2012; E 2014; E 2015) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))
ASTM D1140	(2017) Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing
ASTM D1556/D1556M	(2015; E 2016) Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D1557	(2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D1883	(2016) Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils
ASTM D2216	(2019) Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D2321	(2020) Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D2487	(2017; E 2020) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D4318	(2017; E 2018) Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D6938	(2017a) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety -- Safety and Health Requirements Manual

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SW-846.3-3	(1999, Third Edition, Update III-A) Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

1.2 DEFINITIONS

1.2.1 Controlled Low-Strength Material (CLSM) - Flowable Fill

Flowable fill used on this project shall be limited to excavations below existing utilities with limited access for compaction equipment and for overexcavation/undercutting of existing pavements. Contractor to obtain approval from the Engineer prior to use on the project site.

a. Flowable fill refers to a cementitious slurry consisting of a mixture of fine aggregate or filler, water, and cementitious material(s), which is used as a fill or backfill in lieu of compacted earth. This mixture is capable of filling all voids in irregular excavations and hard to reach places, is self-leveling, and hardens in a matter of a few hours without the need for compaction in layers. Flowable fill is sometimes referred to as controlled density fill (CDF), controlled low strength material (CLSM), lean concrete slurry, and unshrinkable fill.

b. Flowable fill materials shall be used only as a structural fill should existing pavements become undermined during trenching activities, and as approved by the Engineer. Unless otherwise noted, flowable fill material installed as a substitution for structural earth fill, shall be designed to be removed by the use of hand tools. The materials and mix design for the flowable fill should be designed to produce a comparable compressive strength to the surrounding soil after hardening, making excavation at a later time possible to produce the compressive strength indicated for the placed location.

c. Flowable fill shall be manufactured by a ready-mix concrete producer with a minimum of 1-year of experience in the production of similar products.

d. Materials:

(1) For each type of material required for the work in this Section, provide primary materials that are the products of one manufacturer.

(2) If not otherwise specified here, materials shall comply with recommendations of ACI 229 "Controlled Low-Strength Materials."

1.2.2 Degree of Compaction

Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557, for general soil types, abbreviated as percent laboratory maximum density.

1.2.3 Hard Materials

Weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.2.4 Pipe Zone

That portion of the trench from top of the pipe or select backfill, if specified, to the bottom of the pipe.

1.2.5 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers.

1.3 SUBMITTALS

Approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Shoring and Sheeting Plan

Dewatering work plan

Submit 15 days prior to starting work.

SD-03 Product Data

Tracer Wire; G

Tracer Wire Access Box; G

SD-05 Design Data

Controlled Low-Strength Material; G

SD-06 Test Reports

Borrow Site Testing; G

Fill and backfill test

Select material test

Density tests

Moisture Content Tests

Results Of Tracer Wire Continuity Testing

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

1.4 DELIVERY, STORAGE, AND HANDLING

Perform in a manner to prevent contamination or segregation of materials.

1.5 CRITERIA FOR BIDDING

Base bids on the following criteria:

a. Surface elevations are as indicated.

h. Blasting will not be permitted. Remove material in an approved manner.

1.6 REQUIREMENTS FOR OFF SITE SOIL

Soils brought in from off site for use as backfill shall be tested for petroleum hydrocarbons, BTEX, PCBs and HW characteristics (including toxicity, ignitability, corrosivity, and reactivity). Backfill shall not contain concentrations of these analytes above the appropriate State and/or EPA criteria, and shall pass the tests for HW characteristics. Determine petroleum hydrocarbon concentrations by using appropriate State protocols. Determine BTEX concentrations by using EPA SW-846.3-3 Method 5035/8260B. Perform complete TCLP in accordance with EPA SW-846.3-3 Method 1311. Perform HW characteristic tests for ignitability, corrosivity, and reactivity in accordance with accepted standard methods. Perform PCB testing in accordance with accepted standard methods for sampling and analysis of bulk solid samples. Provide borrow site testing for petroleum hydrocarbons and BTEX from a grab sample of material from the area most likely to be contaminated at the borrow site (as indicated by visual or olfactory evidence), with at least one test from each borrow site. For each borrow site, provide borrow site testing for HW characteristics from a composite sample of material, collected in accordance with standard soil sampling techniques. Do not bring material onsite until tests results have been received and approved by the Engineer.

1.7 QUALITY ASSURANCE

1.7.1 Shoring and Sheeting Plan

Submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheeting of excavations. Drawings shall include material sizes and types, arrangement of members, and the sequence and method of installation and removal. Calculations shall include data and references used.

1.7.2 Dewatering Work Plan

Submit procedures for accomplishing dewatering work.

1.7.3 Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Perform work adjacent to utilities as indicated in accordance with procedures outlined by utility company. Excavation made with power-driven equipment is not permitted within two feet of known utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Engineer. Report damage to utility lines or subsurface construction immediately to the Engineer.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Satisfactory Materials

Any materials classified by ASTM D2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, CL, ML, CL-ML, CH, MH free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, and frozen, deleterious, or objectionable materials. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material. The Engineer shall be notified of any contaminated materials.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM, GP-GM, GW-GM, SW-SM, SP-SM, and SM shall be identified as cohesionless only when the fines are nonplastic (plasticity index equals zero). Materials classified as GM and SM will be identified as cohesive only when the fines have a plasticity index greater than zero.

2.1.4 Expansive Soils

Soils that have a plasticity index equal to or greater than 18 when tested in accordance with ASTM D4318.

2.1.5 Common Fill

Approved, unclassified soil material with the characteristics required to compact to the soil density specified for the intended location.

2.1.6 Backfill and Fill Material

ASTM D2487, classification GW, GP, GM, GC, SW, SP, SM, with a maximum ASTM D4318 liquid limit of 35 , maximum ASTM D4318 plasticity index of 12 , and a maximum of 25 percent by weight passing ASTM D1140, No. 200 sieve.

2.1.7 Select Material

Provide materials classified as GW, GP, or by ASTM D2487 where indicated. The plasticity index shall not be greater than 12 percent when tested in accordance with ASTM D4318, and not more than 35 percent by weight shall be finer than No. 200 sieve when tested in accordance with ASTM D1140.

Bearing Ratio: At 0.1 inch penetration, the bearing ratio shall be 30 percent at 95 percent ASTM D1557 maximum density as determined in accordance with ASTM D1883 for a laboratory soaking period of not less than 4 days.

2.1.8 Topsoil

Provide as specified in Section 32 92 19 SEEDING.

2.2 UTILITY BEDDING MATERIAL

Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with AWWA C600, Type 5, except as specified herein. Backfill to top of pipe shall be compacted to 95 percent of ASTM D698 maximum density. Plastic piping shall have bedding to 3 inches above top of pipe. Provide ASTM D2321 materials as follows:

a. Class I: Angular, 0.25 to 1.0 inches, graded crushed limestone .

b. Class II (Stabilization Rock): Angular, 1.5 to 3.0 inches, graded crushed limestone.

2.3 BORROW

Obtain borrow materials required in excess of those furnished from excavations from sources approved by the Engineer.

2.4 NON-DETECTABLE BURIED WARNING AND IDENTIFICATION TAPE

Polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inch minimum width, color coded as specified below for the

intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

Warning Tape Color Codes	
Red:	Electric
Yellow:	Gas, Oil; Dangerous Materials
Orange:	Telephone and Other Communications
Blue:	Potable Water Systems
Green:	Sewer Systems

2.5 DETECTION WIRE FOR NON-METALLIC PIPING

Provide detection wire (tracer wire) over each separate run of nonmetallic pipe, terminated at each end in a flush-mounted access box.

2.5.1 Tracer Wire

Tracer wire shall be #10 AWG UL listed single conductor, stranded copper with 600 volt HMWPE (45-mil) insulation. Insulation color shall be blue for water lines and green for sewer lines. Tape for attachment of tracer wire to pipe to have aggressive adhesive intended for direct burial service. Standard duty duct tape is not an acceptable product. Tracer wire splice kits intended for direct bury with electrical spring connector (wire nut) pigtail type connector with silicone gel insulation filled resin tube. Splice kit sized for appropriate size and number of wires to be connected. Solderless, crimp on, heavy duty ring tongue terminals sized for wire and terminal board hardware. Wire fork end type terminals are not acceptable.

2.5.2 Tracer Wire Access Box

Flush-mounted access boxes shall be sized based on number of wires terminated in box.

a. For up to two wires with 45-mil insulation, minimum 4-inch diameter by 18-inch long plastic body with cast iron collar and lockable lid. Unfinished lid marked with "TW", "TWAB" or "Tracer". Minimum 4-wire, non-conductive, 1/4-inch thick, 3-inch by 4-inch terminal board with 1/4-inch diameter, series 316 stainless steel, nickel-plated brass or bronze hardware for wire terminations mounted to underside of lid.

b. For more than two wires with 45-mil insulation, minimum 55-pound, minimum 10-inch inside diameter by 12-inch long concrete access box with minimum 12-pound cast iron, bolt down lid. Lid marked with "TW", "TWAB" or "Tracer". Provide minimum 4-wire, non-conductive, 1/4-inch thick, 3-inch by 4-inch terminal board with 1/4-inch diameter, series 316 stainless steel, nickel-plated brass or bronze hardware for wire terminations.

2.6 CONTROLLED LOW-STRENGTH MATERIAL (CLSM)

2.6.1 Materials for CLSM

a. Provide flowable fill containing, at a minimum, cementitious materials and water. Cementitious materials shall be Portland cement, pozzolanic materials, or other self-cementing materials, or combinations thereof, at the Contractor's option and following approval by the Engineer's Representative (COR). The flowable fill mix design may also contain fine aggregate or filler, and/or chemical admixtures in any proportions such that the final product meets the strength, flow consistency and shrinkage requirements included in this specification, as approved by the COR.

b. Portland Cement:

(1) ASTM C150/C150M, Type II.

(2) Meeting South Dakota DOT standards.

c. Mixing Water:

(1) Fresh, clean, and potable.

(2) Meeting South Dakota DOT standards as water for use in Portland Cement Concrete.

d. Air-Entraining Admixture: ASTM C260/C260M.

e. Chemical Admixtures: ASTM C494/C494M.

f. Aggregate: ASTM C33/C33M.

2.6.2 CLSM Mix Design

a. Mix design shall produce a consistency that will result in a flowable product at the time of placement which does not require manual means to move it into place.

b. Flowable fill shall have a minimum strength of 100 psi according to ASTM C39/C39M at 28 days after placement.

c. Flowable fill shall have a minimum subsidence and bleed water shrinkage. Evaporation of bleed water shall not result in shrinkage of more than 1/8 inch per foot of flowable fill depth (for mixes containing high fly ash content). Measurement of a final Bleeding shall be as measured in Section 10 of ASTM C940 "Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory."

d. Flowable fill shall have a unit weight of 115-145 lbs/feet3 measured at the point of placement after a 60 minute ready-mix truck ride. In the absence of strength data the cementitious content shall be a maximum of 150 lbs/cy.

e. Flowable fill shall have an in-place yield of at least 98 percent of design yield for permanent type, a maximum of 110 percent of design yield for removable types at 1 year.

f. Provide equipment as recommended by the manufacturer and comply with manufacturer's recommendations for the addition of additives, whether at the production plant or prior to placement at the Site.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Shoring and Sheeting

Provide shoring, bracing, cribbing, trench boxes, underpinning, and sheeting where indicated. In addition to Section 25 A and B of EM 385-1-1 and other requirements set forth in this contract, include provisions in the shoring and sheeting plan that will accomplish the following:

a. Prevent undermining of pavements, foundations and slabs.

b. Prevent slippage or movement in banks or slopes adjacent to the excavation.

3.1.2 Drainage and Dewatering

Provide for the collection and disposal of surface and subsurface water encountered during construction.

3.1.2.1 Drainage

So that construction operations progress successfully, completely drain construction site during periods of construction to keep soil materials sufficiently dry. The Contractor shall establish/construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, dikes, swales, and other drainage features and equipment as required to maintain dry soils, prevent erosion and undermining of foundations. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained.

3.1.2.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least one feet below the working level.

3.1.3 Underground Utilities

Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall contact the Base Civil Engineer for assistance in locating existing utilities.

3.1.4 Machinery and Equipment

Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair, or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

3.2 SURFACE PREPARATION

3.2.1 Clearing and Grubbing

Unless indicated otherwise, remove trees, stumps, logs, shrubs, brush and vegetation and other items that would interfere with construction operations within the clearing limits. Remove stumps entirely. Grub out matted roots and roots over 2 inches in diameter to at least 18 inches below existing surface.

3.2.2 Stripping

Strip suitable soil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material unsuitable for use as topsoil shall be stockpiled and used for backfilling. Locate topsoil so that the material can be used readily for the finished grading. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide borrow materials suitable for use as topsoil. Protect topsoil and keep in segregated piles until needed.

3.2.3 Unsuitable Material

Remove vegetation, debris, decayed vegetable matter, sod, mulch, and rubbish underneath paved areas or concrete slabs.

3.3 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type required at the intended location. Keep excavations free from water. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed. Refill with satisfactory material and compact to 95 percent of ASTM D1557 maximum density. Unless specified otherwise, refill excavations cut below indicated depth with satisfactory material and compact to 95 percent of ASTM D1557 maximum density. Satisfactory material removed below the depths indicated, without specific direction of the Engineer, shall be replaced with satisfactory materials to the indicated excavation grade; except as specified for spread footings. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Engineer.

3.3.1 Pipe Trenches

Excavate to the dimension indicated. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding placement. Tamp if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length. Rock, where encountered, shall be excavated to a depth of at least 6 inches below the bottom of the pipe.

3.3.2 Excavation for Appurtenances

Provide excavation for manholes, catch-basins, inlets, or similar structures of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Clean rock or loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. When concrete is to be placed in an excavated area, take special care not to disturb the bottom of the excavation. Do not excavate to the final grade level until just before the concrete is to be placed.

3.3.3 Hard Material Excavation

Remove hard material to elevations indicated in a manner that will leave foundation material in an unshattered and solid condition. Roughen level surfaces and cut sloped surfaces into benches for bond with concrete. Protect shale from conditions causing decomposition along joints or cleavage planes and other types of erosion. Removal of hard material beyond lines and grades indicated will not be grounds for a claim for additional payment unless previously authorized by the Engineer. Excavation of the material claimed as rock shall not be performed until the material has been cross sectioned by the Contractor and approved by the Engineer. Common excavation shall consist of all excavation not classified as rock excavation.

3.3.4 Excavated Materials

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Paragraph "DISPOSITION OF SURPLUS MATERIAL."

3.3.5 Final Grade of Surfaces to Support Concrete

Excavation to final grade shall not be made until just before concrete is to be placed. Only excavation methods that will leave the foundation rock in a solid and unshattered condition shall be used. Approximately level surfaces shall be roughened, and sloped surfaces shall be cut as indicated into rough steps or benches to provide a satisfactory bond. Shales shall be protected from slaking and all surfaces shall be protected from erosion resulting from ponding or flow of water.

3.4 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Engineer. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum

depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to plus or minus 3 percent of optimum moisture. Minimum subgrade density shall be as specified herein.

3.4.1 Proof Rolling

Proof rolling shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. In addition to the compaction specified, proof roll areas of subgrade to be receive pavement or gravel surfacing by application of a 15-ton pneumatic-tired roller, a double-axle dump truck loaded with 212 cubic feet of soil, a double-axle water truck loaded with a minimum of 3000 gallons of water, or other heavy equipment as approved by the Engineer in a systematic manner to ensure coverage over the area. A coverage is defined as the application of one set of tire prints in each lane of travel or as directed by the Engineer over the designated area at speeds between 2 1/2 to 3 1/2 miles per hour. In the areas designated, apply proof rolling to the top of the subgrade material. Maintain water content of the subgrade material as specified in Paragraph COMPACTION from start of compaction to completion of proof rolling. Notify the Engineer a minimum of 3 days prior to proof rolling. Proof rolling shall be performed in the presence of the Engineer. Rutting or pumping of material shall be undercut to a depth as directed by the Engineer and replaced with satisfactory material. Then recompact and proof roll to meet these specifications.

3.4.2 Construction

Shape subgrade to line, grade, and cross section, and compact as specified. Include plowing, disking, and any moistening or aerating required to obtain specified compaction for this operation. Remove soft or otherwise unsatisfactory material and replace with satisfactory excavated material or other approved material as directed. Excavate rock encountered in the cut section to a depth of 6 inches below finished grade for the subgrade. Bring up low areas resulting from removal of unsatisfactory material or excavation of rock to required grade with satisfactory materials, and shape the entire subgrade to line, grade, and cross section and compact as specified. After rolling, the surface of the subgrade for roadways or airfields shall not show deviations greater than 1/2-inch when tested with a 12-foot straightedge applied both parallel and at right angles to the centerline of the area. Do not vary the elevation of the finish subgrade more than 0.05 foot from the established grade and cross section.

3.5 FILLING AND BACKFILLING

Place backfill adjacent to any and all types of structures, in successive horizontal layers of loose material not more than 8 inches in depth. Compact to at least 90 percent laboratory maximum density for cohesive materials and 95 percent laboratory maximum density for cohesionless materials, to prevent wedging action or eccentric loading upon or against the structure. Backfill material must be within the range of minus 3 to plus 3 percent of optimum moisture content at the time of compaction.

Prepare ground surface on which backfill is to be placed and provide compaction requirements for backfill materials in conformance with the applicable portions of paragraphs GROUND SURFACE PREPARATION. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

Site fill materials, including engineered fill below foundations and slabs, should be placed in 6- to 12-inch loose lifts and compacted to the densities and moisture contents outlined in soil compaction criteria table. Any additional moisture required to achieve compaction in a layer should be added and the entire lift mixed to obtain uniform moisture content.

Final testing of the footing subgrade and other fills in "structural areas" to be performed (in addition to testing during placement) immediately before concrete placement to determine the integrity of the materials. Severe changes in the condition of these materials can occur after initial preparation as the result of rain, snow, drying, freezing, excessive heat, and construction activities. Any subgrade or foundation material that becomes disturbed, desiccated or does not conform to the moisture content and compaction requirements indicated in soil compaction criteria table should either be removed and replaced or reworked to meet these specifications.

3.5.1 Common Fill Placement

Provide for general site. Use satisfactory materials. Place in 8 inch loose lifts. Compact areas not accessible to rollers or compactors with mechanical hand tampers. Aerate material excessively moistened by rain to a satisfactory moisture content. Finish to a smooth surface by blading, rolling with a smooth roller, or both.

3.5.2 Backfill and Fill Material Placement

Provide for paved areas and under concrete slabs, except where select material is provided. Place in 8-inch loose lifts. Do not place over wet or frozen areas. Place backfill material adjacent to structures as the structural elements are completed and accepted. Backfill against concrete only when approved. Place and compact material to avoid loading upon or against the structure.

3.5.3 Select Material Placement

Provide under structures not pile supported. Place in 8-inch loose lifts. Do not place over wet or frozen areas. Backfill adjacent to structures shall be placed as structural elements are completed and accepted. Backfill against concrete only when approved. Place and compact material to avoid loading upon or against structure.

3.5.4 Backfill and Fill Material Placement Over Pipes and at Walls

Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade. The backfill material up to an elevation 12 inches above utility lines shall be free from stones larger than 2 inches in any dimension. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall.

3.5.5 Trench Backfilling

Backfill as rapidly as construction, testing, and acceptance of work permits. Place and compact backfill under structures and paved areas in 8 inch loose lifts to top of trench. At no time should more than 300 feet of trench be open.

Backfill trenches to the grade shown. Backfill the trench to 2 feet above the top of pipe prior to performing the required pressure tests.

3.5.5.1 Replacement of Unyielding Material

Replace unyielding material removed from the bottom of the trench with select granular material or initial backfill material.

3.5.5.2 Replacement of Unstable Material

Replace unstable material removed from the bottom of the trench or excavation with select granular material placed in layers not exceeding 6 inches loose thickness.

3.5.5.3 Bedding and Initial Backfill

Provide bedding of the type and thickness shown. Place initial backfill material and compact it with approved tampers to a height of at least one foot above the utility pipe or conduit. Bring up the backfill evenly on both sides of the pipe for the full length of the pipe. Take care to ensure thorough compaction of the fill under the haunches of the pipe. Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with AWWA C605, Type 5, except as specified herein. Compact backfill to top of pipe to 95 percent of ASTM D698 maximum density and moisture conditioned between -1% and +3%. Provide Class I and, if necessary, Class II (Stabilization Rock) bedding.

3.5.5.4 Final Backfill

Fill the remainder of the trench, except for special materials for roadways and airfields, with satisfactory material. Place backfill material and compact as follows:

3.5.5.4.1 Roadway and Airfields

Place backfill up to the required elevation as specified. Do not permit water flooding or jetting methods of compaction.

3.5.5.4.2 Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas

Deposit backfill in layers of a maximum of 8 inches loose thickness and compact in accordance with the soil compaction criteria table. Do not permit compaction by water flooding or jetting. Apply this requirement to all other areas not specifically designated above.

3.5.5.4.3 Backfill for Appurtenances

After the manhole, catchbasin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 7 days, place backfill in such a manner that the structure is not damaged by

the shock of falling earth. Deposit the backfill material, compact it as specified for final backfill, and bring up the backfill evenly on all sides of the structure to prevent eccentric loading and excessive stress.

3.5.5.4.4 Application of Flowable Fill

a. Secure pipes and other members to be backfilled beneath with flowable fill. Ensure that there are no exposed metallic pipes, conduits, or other items that will be in contact with the flowable fill after placement. If so, apply manufacturer's recommended coating to protect metallic objects before placing the flowable fill. Protection of metallic objects is subject to the approval of the Engineer.

b. Protect exposed surfaces of flowable fill from premature drying, wash by rain or running water, wind, mechanical injury, and excessively hot or cold temperature. Curing method shall be subject to approval by the Engineer.

3.5.5.5 Special Requirements for Water Lines

Excavate trenches to a depth that provides a minimum cover of 6 feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.

3.6 EARTH EMBANKMENTS

Construct earth embankments from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. Place the material in successive horizontal layers of loose material not more than 8 inches in depth. Spread each layer uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, plow, disk, or otherwise break up each layer; moisten or aerate as necessary; thoroughly mix; and compact to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Backfill and fill material must be within the range of -3 to +3 percent of optimum moisture, unless modified by project-specific geotechnical recommendations.

Compaction requirements for the upper portion of earth embankments forming subgrade for pavements are identical with those requirements specified in paragraph SUBGRADE PREPARATION. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.7 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved borrow materials shall be obtained as specified herein.

3.8 BURIED WARNING AND IDENTIFICATION TAPE

Provide buried utility lines with utility identification tape. Bury tape 12 inches above the top of pipe.

3.9 BURIED DETECTION (TRACER) WIRE

Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe. Attach wire centered on the top of pipe in such manner that it will not be displaced during construction operations. At a minimum, tape wire with full circumferential wraps every 5 feet along the pipe. Do not attach tracer wire directly to metallic fittings and do not wrap tracer wire around bolts. Terminate wires in access boxes with ring tongue terminals attached to the terminal board. Leave sufficient slack to extend the terminal board 18 inches minimum above grade. Install tracer wire access boxes at locations shown on the drawings, but not more 500 feet apart. Access boxes should be installed in protected locations, next to fire hydrants or other structures, if possible, and as shown on the drawings. If necessary, make splices with approved splice kits and indicate locations on the red line drawings.

3.10 COMPACTION

Determine in-place density of existing subgrade; if required density exists, no compaction of existing subgrade will be required.

3.10.1 General Site

Compact underneath areas designated for vegetation and areas outside the 5 foot line of the paved area or structure to 90 percent of ASTM D1557.

3.10.2 Structures, Spread Footings, and Concrete Slabs

Compact top 12 inches of subgrade to 95 percent of ASTM D1557. Compact common fill, fill and backfill material, and select material to 95 percent of ASTM D1557.

3.10.3 Adjacent Area

Compact areas within 5 feet of structures to 90 percent of ASTM D1557.

3.10.4 Paved Areas

Compact top 12 inches of subgrades to 95 percent of ASTM D1557. Compact fill and backfill materials to 95 percent of ASTM D1557.

3.10.5 Airfield Pavements

Compact top 24 inches below finished pavement or top 12 inches of subgrades, whichever is greater, to 100 percent of ASTM D1557; compact fill and backfill material to 100 percent of ASTM D1557.

3.10.6 Utility Trenches

Backfill within the utility trench shall be placed in 8-inch loose lifts and compacted to 95 percent of ASTM D1557 above the pipe zone.

3.11 FINISH OPERATIONS

3.11.1 Grading

Finish grades as indicated within one-tenth of one foot. Grade areas to drain water away from structures. Maintain areas free of trash and debris. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

3.11.2 Topsoil and Seed

Provide as specified in Section 32 92 19 SEEDING.

3.11.3 Protection of Surfaces

Protect newly backfilled, graded, and topsoiled areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

3.12 DISPOSITION OF SURPLUS MATERIAL

Surplus material and excavated soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber shall be removed and properly disposed of in accordance with all applicable laws and regulations.

3.13 FIELD QUALITY CONTROL

3.13.1 Sampling

Take the number and size of samples required to perform the following tests.

3.13.2 Testing

Perform one of each of the following tests for each material used. Provide additional tests for each source change.

3.13.2.1 Fill and Backfill Material Testing

Test fill and backfill material in accordance with ASTM C136/C136M for conformance to ASTM D2487 gradation limits; ASTM D1140 for material finer than the No. 200 sieve; ASTM D4318 for liquid limit and for plastic limit; ASTM D698 or ASTM D1557 for moisture density relations, as applicable.

3.13.2.2 Select Material Testing

Test select material in accordance with ASTM C136/C136M for conformance to ASTM D2487 gradation limits; ASTM D1140 for material finer than the No. 200 sieve; ASTM D698 or ASTM D1557 for moisture density relations, as applicable.

3.13.2.3 Density Tests

Test density in accordance with ASTM D1556/D1556M, or ASTM D6938. When ASTM D6938 density tests are used, verify density test results by performing an ASTM D1556/D1556M density test at a

location already ASTM D6938 tested as specified herein. Test each lift at randomly selected locations every 1000 square feet of existing grade in fills for structures and concrete slabs, and every 1000 square feet for other fill areas and every 1000 square feet of subgrade in cut. Include density test results in daily report.

Additionally, make at least two field density tests of subgrade for each paved or gravel street crossing patch.

Bedding and backfill in trenches: One test per 200 linear feet of trench horizontally and every 2 feet vertically. Engineer is responsible for trench compaction testing.

3.13.2.4 Moisture Content Tests

Moisture content tests shall be taken simultaneously with each density test when performed in accordance with ASTM D6938.

In the stockpile, excavation or borrow areas, a minimum of two tests per day per type of material or source of materials being placed is required during stable weather conditions. During unstable weather, tests shall be made as dictated by local conditions and approved moisture content shall be tested in accordance with ASTM D2216. Include moisture content test results in daily report.

3.13.2.5 Tracer Wire Continuity Test

Test tracer wire for continuity after service connections have been completed and prior to final pavement or restoration. Acceptable tracer wire continuity testing methods consist of the following:

a. Electrical continuity (four wire) type testing that demonstrates voltage (potential) changes at end of line from temporary connection to a DC current source at far end of the tracer wire.

b. Verification of a voltage measurement to a test battery with the tracer wire as one side of the two-wire circuit.

c. Use of commercially-available cable continuity verification testing equipment utilized in accordance with the test equipment manufacturer's written instructions.

d. Use of typical pipe locating equipment is not an acceptable continuity verification test method.

3.13.2.5.1 Potential Testing Outcomes and Reporting

The following outcomes may result from the tracer wire continuity testing. Repair all unacceptable tracer wire spans to a condition acceptable to the Engineer. Report results of tracer wire continuity testing in a tabular format on 8 1/2-inch by 11-inch paper including written description of test procedures, test results, and actions take to correct deficiencies.

a. Similar or equal voltage (potential) change observed at the far end and start of tracer wire span is an indication of an electrically continuous tracer wire with no accidental shorts - ACCEPTABLE.

b. No potential change at the far end of the span being tested indicates a possible break in the tracer wire - UNACCEPTABLE.

c. A difference between potential measurement valve at the start of the test span and the measured value at the far end of the test span may be an indication of an accidental electrical contact or short to one or more metallic fittings. The greater the potential difference, the more likelihood of a short or the larger the surface area shorted to - UNACCEPTABLE, see paragraph e. below.

d. Typically measured potential values at the start and end of a tracer wire span should be approximately 10 to 12 volts or higher at each end, if the source is a fully-charged 12 volt battery - ACCEPTABLE.

e. If potentials below 10 volts are measured, conduct additional testing with a cable-type locator and A-frame to locate and correct possible tracer wire insulation damage or accidental shorts to other metallic structures.

f. Repair all insulation damage or breaks found and retest tracer wire span.

-- End of Section --

SECTION 33 01 30.16

TV INSPECTION OF SEWER LINES

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 CCTV Video

CD or DVD storage media containing the recorded video.

1.1.2 Cleaning

To remove soil or solid deposited materials from a pipe segment when the pipe is less than half full of deposited materials.

1.1.3 Defects

Defects in the pipe, manholes, structures, and services include cracks, separation of joints, collapsed pipe, grade irregularities, leaks, roots, grease buildup, offset joints, reverse grades, obstructions, delamination, missing pipe, restrictions, fractures and similar structural irregularities.

1.1.4 Entry Point

The leading edge of the access point or the manhole or structure wall where the pipe segment begins. Only the pipe is video inspected from manhole or structure wall to manhole or structure wall and does not include any portion of the manhole or structure.

1.1.5 Exit Point

The point where the downstream access manhole or structure wall is encountered. Only the pipe is video inspected from manhole or structure wall to manhole or structure wall and does not include any portion of the manhole or structure.

1.1.6 Heavy Cleaning

To remove soil or solid deposited materials from a pipe segment when the materials in the pipe are between half full to full.

1.1.7 Hydraulically Propelled Cleaning Tools

Tools that depend upon water pressure to provide their cleaning force.

1.1.8 National Association of Sewer Service Companies (NASSCO)

National Association of Sewer Service Companies (NASSCO) identifies the generally accepted industry standards for CCTV inspection, observation coding, and certification.

1.1.9 Pipe Segment

The length of pipe from entry point to exit point along the main or service.

1.1.10 Pipeline Assessment and Certification Program (PACP)

A CCTV Inspection standardization certification and observation coding system sponsored by NASSCO.

1.1.11 Point Repair

The location of a failure where a repair is has occurred.

1.1.12 Post-Installation CCTV (Post-TV)

Post-TV inspection is used to determine if sanitary or storm sewer construction has been completed in accordance with the contract documents.

1.1.13 Pre-Installation CCTV (Pre-TV)

Pre-TV inspection is a video inspection of existing sewer lines to confirm cleaning activities, locations of service connections, and identify defects in the existing sewer system infrastructure prior to any work being performed.

1.1.14 Re-TV Inspection

Upon the completion of repairs made after performing a Post-TV Inspection or Warranty TV inspection, the mains or services are re-inspected by performing a Re-TV inspection. Also, refers to rework for a TV-Inspection that has video interruptions, gaps, or is not continuous.

1.1.15 TV Inspection Log

Information collected and recorded by the CCTV operator for each CCTV inspection effort and includes pertinent information for the respective inspection section; such as, date of inspection, location of site, CCTV technician, direction of CCTV inspection with manhole or structure identifiers, weather conditions, pipe size(s), pipe materials, conditions found, locations where the conditions were found.

1.1.16 Warranty CCTV (Warranty-TV)

Warranty-TV inspection is used to determine the slip lining of sanitary or storm sewers does not have any defects present, remains in compliance with project specifications and Post-TV inspection.

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Disposal Plan

Submit a disposal plan prior to performing any work that might generate waste materials. Include a complete description of the materials that are expected to be encountered and their proposed disposal sites. No changes to the disposal plan will be made without prior written acceptance by the Engineer.

1.2.2 Sewage Handling Permit

Prior to commencing application of herbicide, obtain and maintain a valid State sewage handling permit and permits required by local jurisdictions. Submit a copy of this permit to the Engineer prior to beginning any cleaning or pump and haul operations.

1.3 SUBMITTALS

Approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Traffic Control Plan; G

Disposal Plan; G

Sewage Handling Permit; G

SD-03 Product Data

Cleaning Products; G

SD-07 Certificates

CCTV Technician's Qualifications; G

Pre-TV Inspection; G

Post-TV Inspection; G

Warranty-TV Inspection; G

RE-TV Inspection; G

SD-11 Closeout Submittals

Records of Disposals

1.4 QUALITY CONTROL

1.4.1 CCTV Technician's Qualifications

Provide a CCTV technician with three years of total experience with the CCTV technology. Submit a current PACP Operator certification for personnel performing closed circuit television inspection and pipeline assessments.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

TV inspection of sewer pipelines encompasses cleaning, heavy cleaning, CCTV inspection and video recording of the existing sanitary or storm sewer mains included in the contract documents. This work includes by-pass pumping or diversion of sanitary sewer, sound reduction enclosure of by-pass pump, inspection logs, video requirements, permits, traffic control and the legal disposal of materials removed from the mains.

It includes the mechanical equipment used to clean and dispose of the materials found in sewer pipes and structures, CCTV cameras and recording devices used to record the internal conditions of non-pressurized sewer piping.

2.2 EQUIPMENT

2.2.1 Cleaning Equipment

Utilize mechanically powered equipment necessary for the proper rodding, bucketing, brushing, root cutting, and flushing of the sewers, including a heavy duty power rodding machine that is compatible with the cleaning to be performed.

2.2.1.1 Rodding

Provide rodding equipment capable of rodding distances of up to 1000 feet in one set-up and having the following capabilities:

a. The ability to spin the rod either clockwise or counter-clockwise, and be able to be pushed straight out or pulled back without rotating the machine.

b. The capability of pulling pipe-size swabs or brushes back through the pipeline for cleaning and flushing purposes.

2.2.1.2 Bucket Machine

Provide heavy-duty bucket machines for use on dragline work to clean the pipeline with buckets, brushes, scrapers, swabs or other similar devices in order to effectively remove debris and provide a clean sewer for the CCTV inspection, repair, or lining activities.

2.2.1.3 Hydraulic Flusher

Provide hydraulic high-pressure sewer cleaners used for sewer cleaning, specifically designed and constructed for such cleaning, that have a minimum usable water capacity of 600 gallons and a pump capable of delivering at least 30 gallons per minute (gpm) at 100 psi and having the following capabilities:

a. Pressure regulator nozzle capable of adjustment from 1 psi to 1500 psi.

b. Constructed for ease of use and safety of operation with two or more high-velocity nozzles capable of producing a scouring action from 15 to 45 degrees in lines designated to be cleaned.

c. A high-velocity gun for washing and scouring the manhole or structure walls and floor capable of producing flows from a fine spray to a solid stream.

d. Carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel.

2.2.1.4 Sanitary Sewer Cleaning Equipment

Provide movable dam type hydraulically propelled equipment constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sanitary sewer and having the following capabilities:

a. A movable dam equal in diameter to the pipe being cleaned.

b. A flexible scraper around the periphery to ensure the removal of grease.

Sewer cleaning balls or other equipment, which cannot be collapsed, are not allowed when cleaning sanitary sewer.

2.2.2 CCTV Equipment

Provide a video system capable of producing a sharply focused, well-lit and color balanced picture in accordance with the following requirements:

2.2.2.1 Pipe Inspection Camera and Associated Equipment

a. Provide a pipe inspection camera system that produces a video using a pan and tilt, radial viewing, that pans a minimum of 275 degrees and rotates 360 degrees. Illumination sensitivity of 3 Lux or less and a minimum of 460 lines of resolution is required.

b. Utilize video cameras specifically designed and constructed for CCTV inspection.

c. Provide a camera that is operative in 100 percent humidity conditions.

d. Provide a camera with an accurate footage counter that displays on the monitor the exact distance of the camera to the nearest 1/10 of a foot.

e. Provide a camera with a height adjustment so that the camera lens is typically centered in the pipe, or higher depending on water levels in the pipe.

f. Provide equipment that will produce digital color images and allows the CCTV technician to remotely balance the iris and color to produce a clear and true video of the pipeline.

g. Provide lighting for the camera that is suitable to provide a clear color picture of the entire periphery of the pipe.

h. Provide a reflector in front of the camera as necessary to enhance the lighting on dark or large diameter pipes.

i. Provide an accompanying computer and recording device capable of projecting and recording the facility location, project name, Contractor's name, date, line size, material type, line identification, manhole or structure ID numbers and ongoing footage counter onto the video screen.

2.3 MATERIALS

2.3.1 Cleaning Products

Select cleaning products that do not present a health and safety concern, are allowed for use in the sewer system according to Federal and State regulations, will not adversely affect the water quality of the water being conveyed in the sewer system, are suitable for the wastewater treatment plant and the climatic conditions at the project site. Submit manufacturer's label and SDS for the cleaning products proposed for use.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Traffic Control

a. Submit a detailed Traffic Control Plan to the Engineer at least 10 days in advance when the manholes used to perform the TV inspection are located in or adjacent to the road. Comply with all applicable State Highway, Local and Installation requirements when preparing the traffic control plan.

b. Provide labor, signs, barricades, cones, arrow boards, flaggers, and any additional equipment necessary to complete the work.

3.1.2 Sewer Line Cleaning

Immediately prior to conducting CCTV activities, thoroughly clean the segment of sewer pipe to be video inspected. Clean the segments using hydraulically propelled, high-velocity jet, or mechanically powered equipment.

a. During cleaning and preparation operations, undertake precautions to protect the sewer system and property from damage. Restore property damaged as a result of such cleaning and preparation operations to pre-existing conditions.

b. During the course of normal cleaning operations immediately report pre-existing damage such as broken or missing pipe to the Engineer.

c. When hydraulically propelled cleaning tools or tools which retard the flow in the sewer line are utilized, take precautions to ensure that the water pressure created does not damage or cause flooding on the adjacent site.

d. Maintain access to fire hydrants for the purpose of fire protection at all times.

e. If cleaning of an entire sewer section cannot be successfully performed from one manhole or structure, set up the equipment on the other entry or exit point and attempt cleaning again.

f. If successful cleaning cannot be performed from the opposite end or the equipment fails to traverse the entire pipeline section, cease cleaning those specific sewer sections, notify the Engineer and CCTV inspect both sides of the pipeline section to determine the cause of the blockage.

3.1.2.1 Sanitary Sewer Cleaning

Minimize the interruptions to the existing flows to perform the cleaning of the sewers. Prevent sewage backups and immediately clear back-ups resulting from the cleaning operations. When possible, utilize the flow in the sewer system to provide the necessary pressure for the hydraulic cleaning devices. Return sewage diverted during cleaning operations to the sanitary system and do not discharge onto any surface, or into any water body or storm drain system.

3.1.3 Flow Control

Reduce the flow depth to allow a minimum of 80 percent of the pipe wall to be displayed at all times during inspection so that defects, features, and other notable information can be collected.

3.1.3.1 Flow Reduction

Flow depth reduction can be accomplished by:

a. Providing bypass pumping.

b. High-pressure jet nozzle.

c. Plugging or by pulling the camera with a swab.

d. Performing the CCTV inspection during periods of minimal flow.

3.1.3.2 Floating the Camera

Video inspection performed while floating the camera is not acceptable. Lower water levels as indicated in paragraph FLOW CONTROL.

3.1.4 Root Removal

Remove roots in the designated sewer sections and manholes. Ensure complete removal of roots to the joints. Use mechanical equipment that can be operated remotely, such as rodding machines, bucket machines, winches using root cutters and porcupines, and equipment such as high-velocity jet cleaners. Capture and remove roots from the sewer line at the downstream manhole or structure.

3.1.5 Material Removal and Disposal

Remove sludge, dirt, roots, grease, and other solid or semi-solid material resulting from cleaning operations at the downstream manhole or structure of the section being cleaned.

3.1.5.1 Dams or Weirs

When hydraulic cleaning equipment is used, place dam or weir in the downstream manhole or structure to trap such materials. Do not allow material to pass from pipeline section to pipeline section, which could cause stoppages, accumulations of sand in wet wells, or damage to pumping equipment.

3.1.5.2 Sludge and Debris Storage

Under no circumstances is sludge or other debris removed during these operations to be stored, dumped or spilled into streets, ditches, storm drains, or other sanitary sewer systems.

a. Dispose of solids and semi-solids resulting from the cleaning operations no less often than the end of each work day in accordance with the approved Disposal Plan.

b. Under no circumstances will debris be allowed to accumulate on the work site beyond the end of each work day, except in totally enclosed containers and as acceptable by the Engineer.

c. Continuously maintain the haul route and work areas neat, clean, and reasonably free of odor. Cleanup any spill which occurs during the transport of cleaning or surface preparation by-products. Perform the cleanup of any such material pursuant to this Contract and in accordance with applicable law and environmental regulations.

d. Immediately notify the Engineer of any spill and begin clean up any such spill or waste.

e. Contractor is responsible for any costs incurred or penalties imposed as a result of the spill, dump or discard.

f. Under no circumstances is this material to be discharged into the waterways or any place other than where authorized to do so in accordance with the approved Disposal Plan.

3.1.5.3 Hauling of Waste Material

Provide vehicles hauling such waste material that meet the following requirements:

a. Provide transport vehicles of the type(s) approved for this application by the jurisdictions where those vehicles will be operated in the performance of activities associated with this Contract.

b. Provide transport vehicles with watertight bodies equipped and fitted with seals and covers to prohibit material spillage or drainage.

c. Clean vehicles to prevent deposits of material on roadways.

d. Load vehicles within legal weight limits and operate safely within traffic speed regulations.

e. The routes used for the conveyance of this material on a regular basis is subject to approval by the local governing bodies having jurisdiction over such routes.

3.2 APPLICATION

3.2.1 Inspection of Sewer Lines

Inspection of sewer lines applies to Pre-TV inspection, Post-TV inspection, RE-TV inspection and Warranty-TV inspection. Perform inspections of sewer lines in the presence of the Engineer.

3.2.1.1 Communication

Set up hand operated radios, telephones, or other means of communication between the entry and exit points being inspected to ensure uninterrupted communication between members of the CCTV crew when manually operated winches are used to pull the television camera through the line.

3.2.1.2 Flush Main

Introduce a minimum of 1000 gallons of clear, potable water into the upstream manhole or structure or access structure of the mains to be CCTV inspected just prior to inserting the camera. The Contractor is responsible for collecting and disposing of the water in accordance with the approved disposal plan.

3.2.1.3 Camera Operation

Set counter to 0.00 feet at the entry point, which is the beginning manhole or structure wall. Move the camera through the line in either direction at a moderate speed, stopping to permit proper documentation of the sewer's condition or service connection locations. In no case will the camera be operated at a speed greater than 30 feet per minute. Slowly pan and tilt the camera at the beginning and ending manhole, structure connections, service connections, joints, visible defects, and pipe arterial transitions. Provide a full 360 degree view of the pipe, joints, and service connections.

Utilize manual winches, power winches, cable, powered rewinds or other devices that do not obstruct the camera view or interfere with camera operation or CCTV inspection of the pipe conditions as the camera is moved through the sewer line.

3.2.1.3.1 Recording Defects

During CCTV inspection, temporarily stop the camera at each defect or feature along the line.

3.2.1.4 Documentation of CCTV Inspection

Documentation of CCTV inspection applies to Pre-TV inspection, Post-TV inspection, RE-TV inspection and Warranty-TV inspection.

Utilize a data logger and reporting system that is PACP compliant to make a video and audio recording of the CCTV inspections. Submit video recordings, inspection logs, and digital photographs as indicated in the following sub-paragraphs.

3.2.1.4.1 Video Recordings

Provide a color video showing the completed work and document the inspection on a digital recorder. Capture inspection video in either MPEG-4 or Windows Media Video (WMV) format with a minimum

resolution of 352 x 240 pixels and an interlaced frame rate at a minimum of 24 frames per second. Save video on CD or DVD. However, the CCTV inspection video of a segment must be wholly contained on a single CD or DVD. The video recording must meet the following requirements:

a. Provide a continuous and uninterrupted recorded video for the pipe segment being examined. Include the official project title, Contracting party, Contractor's name, street name, manhole or structure ID numbers, direction of video and flow, date and time video was recorded, continuous counter text, pipe size and material, material changes in the pipe segment, audio and text call outs of laterals, fixtures and problem areas in the recorded video.

b. Include an audio track recorded by the CCTV technician during the actual inspection work with a description of the parameters of the line being inspected on the video recordings.

c. Include the location, pipe diameter, pipe material, defects, service lateral locations and any unusual conditions found in PACP format.

d. Submit labeled CDs or DVDs of the video inspections.

e. Without exception, CCTV inspections must be continuous without video interruption or gaps for pipe segments.

f. Clean, flush, and RE-TV pipe segments with video interruptions or gaps.

3.2.1.4.2 TV Inspection Logs

Submit computer generated records that clearly show the location and orientation in relation to an adjacent manhole or structure of each infiltration point observed during the inspection.

Record other points of significance such as locations and orientations of service connections, missing or broken pipe, roots, the presence of grease, scale or corrosion, bellies, fractures, cracks, and other discernible features using PACP designations.

3.2.1.4.3 Digital Photographs

Submit JPEG images at a minimum resolution of 640 x 480 pixels. Save digital photographs in JPEG file format on CD or DVD. Document noted defects and lateral connections as color digital files and hard copy print-outs. Photo logs are to accompany each photo submitted.

3.2.2 Pre-TV Inspection

Immediately after cleaning has been performed, complete a Pre-TV inspection, in accordance with paragraph INSPECTION OF SEWER LINES. Submit Pre-TV inspection documentation in accordance with paragraph DOCUMENTATION OF CCTV INSPECTION.

3.2.3 Post-TV Inspection

Immediately after visual, deflection, pressure and leak testing and service reconnections are complete on a pipe segment, complete Post-TV inspection accordance with paragraph INSPECTION OF SEWER LINES. Submit Post-TV inspection documentation in accordance with paragraph DOCUMENTATION

OF CCTV INSPECTION. Provide post installation inspection documentation within 10 working days of installation.

3.2.3.1 Post-TV Defects

If defects are found in the mains or services during the Post-TV inspection make repairs according to the specifications. RE-TV all repairs in accordance with paragraph INSPECTION OF SEWER LINES. Provide additional RE-TV inspections of complete pipe segments as follows:

a. Perform a RE-TV inspection of the complete pipe segment. If no additional defects are found in the Re-TV inspections, then the Post-TV inspection is complete.

b. If defects are found in these additional inspections make repairs according to the specifications and provide Re-TV inspection for the complete pipe segment.

c. If defects are found in these additional inspections make repairs according to the specifications and Re-TV the repaired pipe segments until no Post-TV defects are found.

3.2.4 Warranty-TV Inspection

Submit Warranty-TV Inspection no later than 30 days prior to the expiration of the warranty. Comply with paragraphs TV INSPECTION OF SEWER LINES and DOCUMENTATION OF CCTV INSPECTION. Complete Warranty-TV inspections in the presence of the Engineer. The Engineer has the option to select the pipe segments for the Warranty-TV inspection. Comply with the following requirements:

a. Provide a complete pipe segment Warranty-TV inspection of pipe segments where a liner repair was performed during Post-TV Inspection.

b. Provide a complete pipe segment Warranty-TV inspection of pipe segments where a point repair was performed.

c. Provide a Warranty-TV inspection of at least one full pipe segment of each size and type of slip lining installed.

d. Provide a Warranty-TV inspection of at least 10 percent of the total length of all pipe segments as coordinated with the Engineer.

All of Warranty-TV inspections above may be included to satisfy the percentage of total length requirement. If no defects are found in the mains and services in the above minimum pipe segments inspected, then the Warranty-TV inspection is complete.

3.2.4.1 Warranty-TV Defects

If defects are found in the mains or services during the Post-TV inspection make repairs according to the specifications. RE-TV all repairs. Provide additional Warranty-TV inspections of complete pipe segments as follows:

a. Warranty-TV inspect an additional 15 percent of the footage based on the length of the total project. If no additional defects are found in the additional Warranty-TV inspections, then the Warranty-TV inspection is complete.

b. If defects are found in these additional inspections make repairs according to the specifications, RE-TV all repairs and provide Warranty-TV inspections for the remaining pipe segments in the project.

c. If defects are found in these additional inspections make repairs according to the specifications and Re-TV the repaired pipe segments.

3.2.5 RE-TV Inspection

After repairs are made to a main or service, complete RE-TV inspection accordance with paragraph INSPECTION OF SEWER LINES and DOCUMENTATION OF CCTV INSPECTION.

3.3 CLOSEOUT ACTIVITIES

3.3.1 Sewer Cleaning

Submit copies of Records of Disposals indicating the disposal site, date, amount, and a brief description of the materials disposed.

-- End of Section --

SECTION 33 30 00

SANITARY SEWERAGE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104/A21.4	(2016) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110/A21.10	(2012) Ductile-Iron and Gray-Iron Fittings for Water
AWWA C111/A21.11	(2017) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C153/A21.53	(2019) Ductile-Iron Compact Fittings for Water Service
AWWA C600	(2017) Installation of Ductile-Iron Mains and Their Appurtenances
AWWA C605	(2021) Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
AWWA C900	(2016) Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)

ASTM INTERNATIONAL (ASTM)

ASTM A48/A48M	(2003; R 2021) Standard Specification for Gray Iron Castings
ASTM A536	(1984; R 2019; E 2019) Standard Specification for Ductile Iron Castings
ASTM C94/C94M	(2021a) Standard Specification for Ready-Mixed Concrete
ASTM C150/C150M	(2021) Standard Specification for Portland Cement
ASTM C270	(2019a; E 2019) Standard Specification for Mortar for Unit Masonry

ASTM C443	(2020) Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C478	(2018) Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
ASTM C923	(2008; R 2013; E 2016) Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM C1244	(2020) Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
ASTM D1784	(2020) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D1785	(2015; E 2018) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120
ASTM D2241	(2015) Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2321	(2020) Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D2412	(2021) Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D2466	(2017) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2467	(2015) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D3034	(2016) Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	(2020) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3350	(2021) Polyethylene Plastics Pipe and Fittings Materials
ASTM F477	(2014; R 2021) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F714	(2021a) Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter

ASTM F894	(2019) Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-6	(1998) Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe

1.2 SUBMITTALS

Approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor's License; G

SD-02 Shop Drawings

Installation Drawings; G

Precast Concrete Manholes; G

SD-03 Product Data

Precast Concrete Manholes

Frames, Covers, and Gratings

Gravity Pipe

Pressure Pipe

PVC Pipe Couplings; G

Chimney Seal; G

Manhole Corrosion Liner; G

SD-06 Test Reports

Precast Concrete Sewer Manhole Test; G

Hydrostatic Sewer Test; G

Negative Air Pressure Test; G

Low-Pressure Air Tests; G

Tests For Pressure Lines; G

Deflection Testing

SD-07 Certificates

Portland Cement

Gaskets

1.3 QUALITY CONTROL

1.3.1 Installer Qualifications

Install specified materials by a licensed underground utility Contractor licensed for such work in the state where the work is to be performed. Verify installing Contractor's License is current and state certified or state registered.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery and Storage

Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

1.4.1.1 Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.4.1.2 Cement, Aggregate, and Reinforcement

As specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

1.4.2 Handling

Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs. Carry, do not drag, pipe to trench. Store solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install the plastic pipe in accordance with the manufacturer's recommendation and discard those materials if the storage period exceeds the recommended shelf life. Discard solvents in use when the recommended pot life is exceeded.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Sanitary Sewer Gravity Pipeline

Provide mains and laterals of polyvinyl chloride (PVC) plastic pipe. Provide building connections of polyvinyl chloride (PVC) plastic pipe. Provide new and modify existing exterior sanitary gravity sewer piping and appurtenances. Provide each system complete and ready for operation. The exterior sanitary gravity sewer system includes equipment, materials, installation, and workmanship as specified herein more than 5 feet outside of building walls.

2.1.2 Sanitary Sewer Pressure Lines

Provide pressure lines of polyvinyl chloride (PVC) plastic pressure pipe unless specified otherwise.

2.2 MATERIALS

Provide materials conforming to the respective specifications and other requirements specified below. Submit manufacturer's product specification, standard drawings or catalog cuts.

2.2.1 Gravity Pipe

2.2.1.1 PVC Gravity Sewer Piping

2.2.1.1.1 PVC Gravity Pipe and Fittings

Provide pipe conforming to ASTM D3034, SDR 35, with ends suitable for elastomeric gasket joints.

2.2.1.1.2 PVC Gravity Joints and Jointing Material

Provide joints conforming to ASTM D3212. Gaskets are to conform to ASTM F477.

2.2.1.1.3 PVC Pipe Couplings

Provide couplings conforming to ASTM D3034, SDR 35, gasket joints or shielded couplings with stainless steel shear ring and clamp bands and gasket all conforming to ASTM C1173 intended to resist heavy earth loads and shear forces. Couplings sized and compatible with connecting pipe material type.

2.2.1.1.4 Sewer Cleanouts

PVC cleanouts to be constructed of materials conforming to section PVC GRAVITY PIPE AND FITTINGS and as detailed on the drawings. Cleanout includes gasketed PVC wye, PVC riser and solvent weld, threaded plug adapter with threaded plug. If cleanout is located in a paved surface, provide a heavy-duty, cast gray iron frame and cover sized to allow for removal of the plastic threaded plug.

2.2.2 Pressure Pipe

2.2.2.1 PVC Pressure Pipe and Associated Fittings

Pipe, couplings and fittings are to be manufactured of materials conforming to ASTM D1784, Class 12454B.

2.2.2.1.1 Pipe and Fittings Less Than 4 inch Diameter

2.2.2.1.1.1 Solvent Cement Joint

Provide pipe conforming to dimensional requirements of ASTM D1785 or ASTM D2241 with joints meeting the requirements of 150 psi working pressure and 200 psi hydrostatic test pressure. Fittings for solvent cement jointing are to conform to ASTM D2466 or ASTM D2467.

2.2.2.1.2 Pipe and Fittings 4 inch Diameter And Larger

Provide pipe conforming to AWWA C900 and be plain end or gasket bell end, Pressure Class 150 (DR 18), with cast-iron-pipe-equivalent OD. Fittings are to be gray-iron or ductile-iron conforming to AWWA C110/A21.10 or AWWA C153/A21.53 and AWWA C111/A21.11 with a cement-mortar lining conforming to AWWA C104/A21.4, standard thickness. Fittings for pipe to pipe push-on joint ends are to conform with AWWA C900.

2.2.2.2 High Density Polyethylene Pipe (HDPE)

ASTM F894, Class 63, size 18 inch through 120 inch. ASTM F714, size 4 inch through 48 inch, will have pipe stiffness greater than or equal to 1170/D for cohesionless material pipe trench backfills. For all PE pipes, the polyethylene are to be certified by the resin producer as meeting the requirements of ASTM D3350, cell Class 334433C or higher. Fittings for High Density Polyethylene Pipe are to meet the same material specifications as the pipe class. Joints for HDPE meeting ASTM F894 will be rubber gasket joints conforming to ASTM F477. HDPE meeting ASTM F714 will have fused joints in accordance with manufacturer's instruction.

2.2.3 Cement Mortar

Provide cement mortar conforming to ASTM C270, Type M with Type II cement.

2.2.4 Portland Cement

Submit certificates of compliance stating the type of cement used in manufacture of precast manholes. Provide Portland cement conforming to ASTM C150/C150M, Type II for concrete used in manholes and type optional for cement used in concrete cradle, concrete encasement, and thrust blocking.

2.2.5 Portland Cement Concrete

Provide Portland cement concrete conforming to ASTM C94/C94M, compressive strength of 4000 psi at 28 days. Protect concrete in place from freezing and moisture loss for 7 days.

2.2.6 Precast Concrete Manholes

Provide precast concrete manholes, risers, base sections, and tops conforming to ASTM C478 and manufactured at a precast facility certified by the American Concrete Pipe Association and approved for supplying products to the South Dakota Department of Transportation. Manholes to be 48 inches in diameter, unless noted otherwise on the drawings, with a minimum thickness of 6 inches for the floor and walls. Base and first riser are to be monolithic. Top section to be eccentric-cone type with a 27 inch opening, unless otherwise indicated on the drawings. Provide pre-cast, U-shaped invert channels with a depth equal to the diameter of the pipe exiting the manhole. Internal lift system to be used and grouted flush after setting. Lifting holes penetrating the walls will not be allowed.

2.2.7 Gaskets and Connectors

Provide gaskets for joints between manhole sections conforming to ASTM C443. Resilient connectors for making joints between manhole and pipes entering manhole are to conform to ASTM C923.

2.2.8 External and Internal Preformed Rubber Joint Seals

An external or internal preformed rubber joint seal (chimney seal) is an accepted method of sealing cast iron covers to precast concrete sections to prevent ground water infiltration into sewer systems. All finished and sealed manholes constructed in accordance with paragraph entitled "Manhole Construction" are to be tested for leakage in the same manner as pipelines as described in paragraph entitled "Leakage Tests." Seals shall consist of a flexible, pleated rubber sleeve and stainless steel adjustable bands with locking system conforming to ASTM C923.

2.2.9 Frames, Covers, and Gratings for Manholes

Provide heavy-duty type frames and covers designed for H20 loading conditions. Frame and cover are to be cast gray iron, ASTM A48/A48M, Class 35B or cast ductile iron, ASTM A536, Grade 65-45-12. Frames and covers are to be circular without vent holes. Size are to be for 24 inch opening or as indicated on the plans with a minimum height of 7 inches and matching pavement thickness up to 10 inches. Stamp or cast the words "Sanitary Sewer" into covers so that it is plainly visible. Covers to include a pre-installed, glued-in oil resistant Nitrile gasket continuous around the perimeter. Covers to have two concealed pick holes. Grade adjusting rings to be precast concrete of the same diameter as the frame and cover in 2 inch or 4 inch thickness.

2.2.10 Concrete Manhole Corrosion Liner

When indicated on the drawings, provide corrosion resistant interior liner on concrete manholes.

2.2.10.1 Epoxy Liner

System to be a zero VOC, 100 percent solids epoxy polymer formulated to protect from hydrogen sulfide, sulfuric acid, MIC and other treatment chemicals in municipal wastewater. Apply to all interior surfaces in accordance with manufacturer's recommendations.

2.2.10.2 HDPE Liner

HDPE composite liner wet-cast into concrete manhole. Provide 100 percent coverage of all interior surfaces. Monolithic base unit and riser sections with flexible rubber gasketed joints providing leakproof seal.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Installation Drawings

Submit Installation Drawings showing complete detail, both plan and side view details with proper layout and elevations.

3.2 INSTALLATION

Backfill after inspection by the Engineer. Before, during, and after installation, protect plastic pipe and fittings from any environment that would result in damage or deterioration to the material. Keep a copy of the manufacturer's instructions available at the construction site at all times and follow these instructions unless directed otherwise by the Engineer.

3.2.1 Connections to Existing Lines

Obtain approval from the Engineer before making connection to existing line. Conduct work so that there is minimum interruption of service on existing line.

3.2.2 General Requirements for Installation of Pipelines

These general requirements apply except where specific exception is made in the following paragraphs entitled "Special Requirements."

3.2.2.1 Location

Terminate the work covered by this section at a point approximately 5 feet from the building, unless otherwise indicated. Install pressure sewer lines beneath water lines only, with the top of the sewer line being at least 18 inches below bottom of water line. When these separation distances can not be met, contact the Engineer for direction.

3.2.2.1.1 Sanitary Sewer Manholes

No water piping shall pass through or come in contact with any part of a sanitary sewer manhole.

3.2.2.2 Earthwork

Perform earthwork operations in accordance with Section 31 23 00.00 20 EXCAVATION AND FILL.

3.2.2.3 Pipe Laying and Jointing

Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches. Lay nonpressure pipe with the bell ends in the upgrade direction. Adjust spigots in bells to give a uniform space all around. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for installation of joint material. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose. Construct branch connections by use of regular fittings or solvent cemented saddles as approved. Provide saddles for PVC pipe conforming to Table 4 of ASTM D3034.

3.2.3 Special Requirements

3.2.3.1 Sewer Piping Parallel With Water Piping

Where the location of the sewer line is not clearly defined by dimensions on the drawings, do not lay sewer line closer than 10 feet, horizontally, from any water line.

a. Normal Conditions: Lay sewer piping at least 10 feet horizontally from water piping whenever possible. Measure the distance from outside edge to outside edge of pipe or outside edge of manhole. When local conditions prevent horizontal separation, install sewer piping in a separate trench with the bottom of the water piping at least 18 inches above the top of the sewer piping.

b. Unusual Conditions: When local conditions prevent vertical separation, construct sewer piping of AWWA C900 PVC water piping and perform hydrostatic sewer test, without leakage, prior to backfilling. Alternatively, when shown on the drawing or with Engineer approval, encase the water and/or sewer piping in concrete, ASTM C94/C94M, providing 6 inches of cover around the entire pipe for a distance of 10 feet in both directions from the crossing. When local conditions prevent separation, test sewer manholes to ensure watertight construction.

3.2.3.2 Sewer Piping Crossing Water Piping

Provide at least 18 inches above the top (crown) of the sewer piping and the bottom (invert) of the water piping whenever possible. Measure the distance edge-to-edge. Where water lines cross under gravity sewer lines, construct sewer line of AWWA compliant PVC water piping with rubber-gasketed joints and no joint located within 10 feet, horizontally, of the crossing.

a. Normal Conditions: Provide a separation of at least 18 inches between the bottom of the water piping and the top of the sewer piping in cases where water piping crosses above the sewer piping.

b. Unusual Conditions: When local conditions prevent a vertical separation described above, construct sewer piping passing over or under water piping with AWWA C900 PVC piping and perform hydrostatic sewer test, without leakage, prior to backfilling. Construct sewer crossing with a minimum 20 feet length of the AWWA compliant PVC piping, centered at the point of the crossing so that joints are equidistant and as far as possible from the water piping. Protect water piping passing under sewer piping by providing vertical separation of at least 18 inches between the bottom of the sewer piping and the top of the water piping; adequate structural support for

the sewer piping to prevent excessive deflection of the joints and the settling on or damage to the water piping. Alternatively, when shown on the drawing or with Engineer approval, encase the water and/or sewer piping in concrete, ASTM C94/C94M, providing 6 inches of cover around the entire pipe for a distance of 10 feet in both directions from the crossing unless a waiver has been obtained from the SDDANR.

3.2.3.3 Installation of PVC Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of ASTM D2321 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of ASTM D2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

3.2.3.4 Installation of PVC Pressure Pipe

Unless otherwise specified, install pipe and fittings in accordance with AWWA C605. AWWA C605 includes requirements such as excavation, installation, and placement of appurtenances.

3.2.3.4.1 Pipe Less Than 4 Inch Diameter

3.2.3.4.1.1 Solvent-Weld Joints

Comply with the manufacturer's instructions.

3.2.3.4.2 Pipe 4 inch Diameter And Larger

Make push-on joints with AWWA C900 pipe with integral elastomeric gasket. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel. For push-on joint connections to fittings, cut spigot end of pipe off square, marked to match the manufacturer's insertion line and beveled to match factory supplied bevel. Use an approved lubricant recommended by the pipe manufacturer for push-on joints. Assemble push-on joints for pipe-to-pipe joint connections in accordance with the requirements of AWWA C605. Assemble push-on joints for connection to fittings in accordance with the requirements of AWWA C605 for joining PVC pipe to fittings and accessories and with the applicable requirements of AWWA C600 for joint assembly. Make mechanical-joints or flanged joints with the gaskets, glands, bolts, nuts, and internal stiffeners specified for this type joint and assemble in accordance with the requirements of AWWA C605 for joining PVC pipe to fittings and accessories or with the applicable requirements of AWWA C600 for ductile iron joint assembly, and with the recommendations of Appendix A to AWWA C111/A21.11. Cut off spigot end of pipe for mechanical-joint or flanged joint connections and do not bevel.

3.2.3.4.3 Pipe Anchorage

Provide concrete thrust blocks (reaction backing) for pipe anchorage. Size and position thrust blocks as indicated. Use concrete conforming to ASTM C94/C94M having a minimum compressive strength of 4,000 psi at 28 days.

3.2.4 Concrete Work

Cast-in-place concrete is included in Section 03 30 00 CAST-IN-PLACE CONCRETE. Support the pipe on a concrete cradle, or encased in concrete where indicated or directed.

3.2.5 Manhole Construction

Construct base slab of cast-in-place concrete or use precast concrete base sections. Place a minimum of 4 inches of granular pipe bedding material as a leveling course under the base slab/section. Make inverts in cast-in-place concrete and precast concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent sewer sections. For changes in direction of the sewer and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit. For cast-in-place concrete construction, either pour bottom slabs and walls integrally or key and bond walls to bottom slab. No parging will be permitted on interior manhole walls. For precast concrete construction, make joints between manhole sections with the gaskets specified for this purpose; install in the manner specified for installing joints in concrete piping. Parging will not be required for precast concrete manholes. Perform cast-in-place concrete work in accordance with the requirements specified under paragraph entitled "Concrete Work" of this section. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer. Where a new manhole is constructed on an existing line, remove existing pipe as necessary to construct the manhole. Cut existing pipe so that pipe ends are approximately flush with the interior face of manhole wall, but not protruding into the manhole. Use resilient connectors as previously specified for pipe connectors to concrete manholes. Set top of frame and cover flush with finished surface when occurring in pavement. Otherwise, set top of frame and cover 4 inches above finish surface, unless indicated otherwise on the drawings. When indicated in the contract documents, install a corrosion liner in the manhole to cover 100 percent of the interior surfaces of the manhole.

3.2.6 Miscellaneous Construction and Installation

3.2.6.1 Connecting to Existing Manholes

Connect pipe to existing manholes such that finish work will conform as nearly as practicable to the applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping. Center the connection on the manhole. Holes for the new pipe are to be of sufficient diameter to allow packing cement mortar around the entire periphery of the pipe but no larger than 1.5 times the diameter of the pipe. Cut the manhole in a manner that will cause the least damage to the walls. Fit an elastomeric water stop gasket over the pipe or place a bentonite-based water stop around the periphery of the hole cut in the manhole prior to inserting the pipe and grouting the void. Demolish and remove existing concrete invert and bench, as necessary, to allow for installation of new pipe. Construct new concrete invert and bench by applying bonding agent to roughened concrete and placing new concrete.

3.2.7 Installations of Wye Branches

Install wye branches in an existing sewer using a method which does not damage the integrity of the existing sewer. Do not cut into piping for connections except when approved by the Engineer. When the connecting pipe cannot be adequately supported on undisturbed earth or tamped backfill, support on a concrete cradle as directed by the Engineer. Provide and install concrete required because of

conditions resulting from faulty construction methods or negligence without any additional cost to the Owner. Do not damage the existing sewer when installing wye branches in an existing sewer.

3.2.8 Installations of Cleanouts

Install cleanouts and riser extensions from sewer pipes to grade at locations shown on the drawings and as specified herein. Size cleanouts and risers to match the connected sewer pipe. Install piping so cleanouts open in the direction of flow in the sewer pipe. Install cleanouts at all changes in horizontal direction greater than 45 degrees and at distances not greater than 75 feet for 4 inch cleanouts and not greater than 100 feet for 6 inch cleanouts. For cleanouts located in paved surfaces, install a heavy-duty, cast iron frame and grate over the cleanout, sized to allow for removal of the plastic threaded plug.

3.3 FIELD QUALITY CONTROL

The Engineer will conduct field inspections and witness field tests specified in this section. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.

3.3.1 Tests

Perform field tests and provide labor, equipment, and incidentals required for testing.

3.3.1.1 Hydrostatic Sewer Test

When unusual conflicts are encountered between sanitary sewer and waterlines a hydrostatic pressure sewer test will be performed in accordance with the applicable AWWA standard for the piping material or AWWA C600 without leakage.

3.3.1.2 Leakage Tests for Nonpressure Lines

Test lines for leakage by low-pressure air tests. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

3.3.1.2.1 Negative Air Pressure Test

3.3.1.2.1.1 Precast Concrete Manholes

Test precast concrete sewer manhole test in accordance with ASTM C1244. The allowable vacuum drop is located in ASTM C1244. Make calculations in accordance with the Appendix to ASTM C1244. The following is a summary of the test procedure:

a. All lift holes shall be plugged.

b. All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

c. The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.

d. A vacuum of 10 inches of mercury shall be drawn on the manhole and then the vacuum line shall be throttled to maintain the 10-inch vacuum for at least two minutes. After the two minutes, the valve on the vacuum line of the test head shall be closed, and the vacuum pump shut off. The time shall then be measured for the vacuum to drop to 9 inches of mercury.

e. The manhole shall pass if the time for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury meets or exceeds the values indicated in Table 1.

f. Two accurate vacuum pressure test gauges shall be installed to monitor the test. Vacuum pressure gauges shall have graduation marks, at minimum, for every 0.2 inch of mercury and be capable of interpreting pressure readings within 0.1 inch of mercury. The pressure reading deviation between the two pressure gauges shall not be greater than 0.1 inch of mercury. During the vacuum pressure test the pressure loss indicated between the two gauges shall not deviate by more than 0.05 inch of mercury between the two gauges.

g. If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a satisfactory test is obtained.

Table 1
MINIMUM VACUUM TEST TIMES FOR
VARIOUS MANHOLE DIAMETERS PER DEPTH OF MANHOLE

Manhole Depth (Feet)	48 inch Dia. MH (Seconds)	60 inch Dia. MH (Seconds)	72 inch Dia. MH (Seconds)
8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113

Table 1 MINIMUM VACUUM TEST TIMES FOR VARIOUS MANHOLE DIAMETERS PER DEPTH OF MANHOLE			
30	74	98	121
>30	as per plans		

3.3.1.2.2 Low-Pressure Air Tests

3.3.1.2.2.1 PVC Pipelines

Test PVC pipe in accordance with UBPPA UNI-B-6. The allowable pressure drop is located in UBPPA UNI-B-6. Make calculations in accordance with the Appendix to UBPPA UNI-B-6. The following is a summary of the test procedure:

a. The pressurizing equipment shall include a regulator or relief valve set no higher than nine psig to avoid over pressurization.

b. Low pressure shall be introduced into the line until the internal pressure reaches four psig, and the supply throttled to maintain four psig for at least two minutes. The supply shall then be shut off or disconnected. The pressure shall be allowed to drop to about three and one-half psig at which timing shall commence and the time accurately measured for a one psig pressure drop per Table 2.

c. If the test section fails to meet the requirements, necessary repairs shall be made by an approved method. The section shall then be retested until a satisfactory test is obtained.

Table 2		
Pipe Diameter (Inches)	Time of Test (Seconds/LF)	Minimum Time of Test (Seconds)
4	0.380	226
6	0.854	340
8	1.520	454
10	2.374	566
12	3.418	680

3.3.1.3 Tests for Pressure Lines

Test pressure lines in accordance with the applicable standard specified in this paragraph, except for test pressures. For hydrostatic pressure test, use a hydrostatic pressure 50 psi in excess of the

maximum working pressure of the system, but not less than 100 psi, holding the pressure for a period of not less than one hour. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test.

3.3.1.3.1 PVC Pressure Pipe

Test PVC pressure pipe in accordance with the requirements of AWWA C605 for hydrostatic and leakage tests. The quantity of water that must be supplied during testing is not to exceed the quantity of water calculated in accordance with AWWA C605 to maintain the specified test pressure within 5 psi.

3.3.1.4 Deflection Testing

Perform a deflection test on entire length of installed plastic pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads determined in accordance with ASTM D2412 but not earlier than 30 days after installation of the pipeline. Deflection of pipe in the installed pipeline under external loads is not to exceed 4.5 percent of the average inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection measuring device.

3.3.1.4.1 Pull-Through Device

This device is to be a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Space circular sections on the shaft so that the distance from external faces of front and back sections will equal or exceed the diameter of the circular section. Pull-through device may also be of a design promulgated by the Uni-Bell Plastic Pipe Association, provided the device meets the applicable requirements specified in this paragraph, including those for diameter of the device, and that the mandrel has a minimum of 9 arms. Ball, cylinder, or circular sections are to conform to the following:

a. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.

b. Homogeneous material throughout, is to have a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.

c. Center bored and through-bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of not less than 70,000 psi, with eyes or loops at each end for attaching pulling cables.

d. Suitably back each eye or loop with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.

3.3.1.4.2 Deflection Measuring Device

Sensitive to 1.0 percent of the diameter of the pipe being tested and be accurate to 1.0 percent of the indicated dimension. Prior approval is required for the deflection measuring device.

3.3.1.4.3 Pull-Through Device Procedure

Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions.

3.3.1.4.4 Deflection measuring device procedure

Measure deflections through each run of installed pipe. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, replace pipe which has excessive deflection and completely retest in same manner and under same conditions.

3.3.2 Inspection

Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; the light must show a practically full circle of light through the pipeline when viewed from the adjoining end of line.

Gravity sanitary sewer main shall be video inspected in accordance with Section 33 01 30.16 TV INSPECTION OF SEWER LINES.

-- End of Section --

Report of Geotechnical Exploration
SANITARY SEWER REPLACEMENT – WASTA REST AREAS
Wasta, South Dakota

AET Project No. P-0031683

Date:
April 12, 2024

Prepared for:

Avid4 Engineering
1805 Samco Road
Rapid City, South Dakota 57702

Geotechnical • Materials
Forensic • Environmental
Building Technology
Petrography/Chemistry

American Engineering Testing
1745 Samco Road
Rapid City, South Dakota 57702
TeamAET.com • 800.792.6364

April 12, 2024

Avid4 Engineering
1805 Samco Road
Rapid City, South Dakota 57702

Attn: Mr. Dave Muck, PE/LS, CFM

RE: Revised Geotechnical Exploration and Review
Sanitary Sewer Replacement – Wasta Rest Areas
Wasta, South Dakota
AET Project No. P-0031683

Greetings Dave,

American Engineering Testing, Inc. (AET) is pleased to present the results of our subsurface exploration program and geotechnical engineering review for the above referenced project in Wasta, South Dakota. These services were performed in general accordance with our proposal dated March 8, 2024 and the Professional Subconsultant Agreement dated January 17, 2023. We are submitting one (1) electronic copy of the report to you.

Within the limitations of scope, budget, and schedule, our services have been conducted according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, either expressed or implied, is intended. Important information regarding risk management and proper use of this report is given in the Appendix entitled "Geotechnical Report Limitations and Guidelines for Use".

Please contact me if you have any questions about the report. I can also be contacted for arranging observation and testing services during the construction phase of the project.

Sincerely,
American Engineering Testing, Inc.

Wyatt T. Leadens, EIT
Engineer II
Phone:(307) 266-2931
wleadens@teamAET.com

1745 Samco Road | Rapid City, SD 57702
Phone (605) 388-0029 | (800) 972-6364 | Fax (651) 659-1379 | teamAET.com | AA/EEO

SIGNATURE PAGE

Prepared for:

Avid4 Engineering
1805 Samco Road
Rapid City, South Dakota 57702

Attn: Mr. Dave Muck, PE/LS, CFM

Prepared by:

American Engineering Testing, Inc.
1745 Samco Road
Rapid City, South Dakota 57702
(605) 388-0029
www.teamAET.com

Authored by:

Wyatt T. Leadens, EIT
Engineer I

Reviewed by:

Kristen R. Yates, PE
Western Dakotas Area Manager

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1.0 INTRODUCTION

We understand the project will consist of sanitary sewer replacement at the Wasta rest areas near Interstate I-90 mile marker 98. To assist in planning and design, American Engineering Testing, Inc. (AET) has been authorized to conduct a geotechnical study, including standard penetration test (SPT) borings, soil laboratory testing, and a geotechnical engineering review for the project. This report presents the results of the above services and provides our engineering recommendations based on this data.

2.0 SCOPE OF SERVICES

AET's services were performed in general accordance with our proposal dated March 8, 2024. The authorized scope consists of the following:

- Perform 2 Standard Penetration Test (SPT) borings to depths of approximately 10 feet below existing grade at the requested locations near existing sanitary sewer lines.
- Soil laboratory testing.
- Geotechnical engineering report based on the gained data and analysis.

These services are intended for geotechnical purposes. The scope is not intended to explore for the presence or extent of environmental contamination and does not include a global slope stability analysis.

3.0 PROJECT INFORMATION

Based on the information provided, we understand the project will consist of the replacement of sanitary sewer lines for the eastbound and westbound rest areas near Wasta, South Dakota. These rest areas are located near mile mark 98 of Interstate I-90. It is also understood that the proposed sanitary sewer will be placed at a depth approximately 4 feet below existing grade.

The previously stated information represents our understanding of the proposed construction. This information is an integral part of our engineering review. It is important that you contact us if there are changes from that described so that we can evaluate whether modifications to our recommendations are appropriate.

4.0 SUBSURFACE EXPLORATION AND TESTING

4.1 Field Exploration Program

The subsurface exploration program conducted for the project consisted of 2 standard penetration test (SPT) soil borings, which were drilled on March 28, 2024. The boring locations were marked in the field by AET personnel base on maps provided by Avid4. The approximate locations of the borings as drilled are included on Figure 1: Boring Location Map within Appendix A. The elevations at the boring locations were taken by AET using GIS integrated GPS equipment.

The Subsurface Boring Logs and details of the methods used are also included in Appendix A. The logs contain information concerning soil layering, soil classification, geologic description, and moisture condition. Relative density (sands and gravels), or consistency (silts and clays), is also noted for the natural soils and bedrock, which is based on the standard penetration resistance (N-value).

4.2 Laboratory Testing

The laboratory test program included natural moisture content, Atterberg Limits, percent passing the No. 200 sieve, and moisture-density relationship (standard Proctor) tests. The test results appear in Appendix A on the individual Subsurface Boring Logs adjacent to the samples upon which they were performed, or on the data sheets following the boring logs.

5.0 SITE CONDITIONS

5.1 Surface Observations

The project sites are located near the eastbound and westbound rest area buildings. The westbound site is located in the relatively flat field behind the existing visitor center. The surface drainage visually appeared to drain west towards the existing ponds. This area contained planted grasses and trees. The eastbound site is located near the entrance/exit to the rest area, east of the existing dumpster location. In general, this area was relatively flat with planted grass and visually appeared to drain to the north.

5.2 Subsurface Soils/Geology

In general, our borings encountered topsoil over alluvium to the depths explored. The alluvium consisted of 2 to 3 feet of lean clay over poorly graded and silty sands to the depths explored. In Boring B-1 we also encountered sandy lean clay at a depth of 10.9 feet. The Subsurface Boring Logs included in Appendix A give a more detailed description of the soils encountered within the borings.

5.3 Groundwater

At the time of our field work, groundwater was encountered in Boring B-1 at a depth of 7.8 feet below grade. The presence or lack of groundwater noted at the boring locations should not be taken as an accurate representation of the actual groundwater levels. Groundwater levels fluctuate due to varying seasonal and annual rainfall and snow melt amounts, as well as other factors.

Typically, a long period of time is generally required for groundwater to stabilize in the soils present at the site. This period of time is generally not available during a typical subsurface exploration program. Therefore, groundwater levels during construction or at other times in the life of the project may be higher or lower than the levels indicated. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

6.0 RECOMMENDATIONS

6.1 Discussion

The following recommendations are based on the conditions observed in the soil borings at the time of our exploration. Please note the soils between the boring locations may differ significantly from those encountered at the boring locations. Further, changes in climatic conditions between the time of exploration and the time of construction may also affect soil conditions, particularly groundwater levels and the moisture content of the soils.

6.2 Site Preparation

We recommend all man-made debris, and organic matter be removed from within the construction area. Any topsoil that can be separated from the native soils can be stockpiled for later re-use across the site. The excavation for replacement of utilities can then continue to the appropriate elevations, where necessary.

Prior to the placement of new utilities, we recommend the exposed subgrade soils be scarified to a depth of at least 8-inches, and the moisture content of the cohesive soils (silts and clays) be adjusted to within -1% to +3% of optimum moisture. Any granular soils (sands and gravel) encountered in the base of the excavation can be moisture conditioned to within ±3% of optimum moisture. The scarified soils should then be recompacted to at least 95% max maximum standard Proctor dry density (ASTM: D698).

As mentioned previously, we encountered groundwater in Boring B-1 at a depth of 7.8. Accordingly, should the contractor excavate for utilities on the order of 7 to 8 feet below grade, they should anticipate groundwater in the excavation trenches for the westbound site location. We recommend that, if encountered during excavations, any groundwater be promptly removed using a de-watering technique that lowers and keeps the groundwater surface at least 2 feet below the bottom of excavations.

6.3 Trench Excavation

In our opinion, conventional construction equipment such as tracked excavators should be able to make the required trench excavations within the site soils along the proposed utility alignments.

If excavation faces are not retained, the excavations should maintain maximum allowable slopes in accordance with *OSHA Regulations (Standards 29 CFR), Part 1926, Subpart P, "Excavations"* (can be found on www.osha.gov). Even with the required OSHA sloping, water seepage or surface runoff can potentially induce side slope erosion or running which could require slope maintenance. The clay soils can be classified as Type C soils with recommended slope laybacks of 1.5H:1V. These classifications should be considered preliminary and should be verified in the field during construction by the contractor and/or geotechnical engineer.

Excavations deeper than 20 feet and/or in saturated soils or below the groundwater table should be considered on an individual basis. Water levels, due to climatic conditions should be evaluated at the time of construction. If the above trench layback recommendations are not feasible, due to space limitations or other factors, the OSHA rules should be consulted for alternative trench stabilization methods. Trench boxes or shoring in compliance with OSHA rules may be acceptable alternatives.

Depending on the time of year construction takes place, groundwater accumulation may occur within existing utility trenches and, depending on required excavation depths, may be encountered in new trenches. Earthwork contractors should anticipate dewatering the excavations and have equipment on-site that will lower and maintain the groundwater level below the base of the excavations.

Based on the range of current moisture contents determined in our laboratory, the excavated soils will likely be at or above the optimum moisture content and will require moisture conditioning (wetting), to bring the trench soils close to the optimum moisture content before reuse as trench backfill.

6.4 Trench Backfill Considerations

It is our opinion that the site soils may be used as trench backfill. As noted, processing and moisture conditioning of the soils should be anticipated to obtain moisture contents suitable to achieve the recommended compaction levels. All recommendations are based on the standard Proctor method (ASTM: D698).

1. All backfill should be free of organics, deleterious/frozen material, and manmade/construction debris and have a maximum nominal size of 2-inches.

2. Backfill material consisting of cohesive soils (clay or silt) should be moisture conditioned to within -1 to +3% of optimum moisture content prior to being placed. Granular backfill material (sands or gravels) should be moisture conditioned to within ±3% prior to use.

3. All backfill should be placed in loose lift thicknesses of 8-inches or less. If hand-operated compaction equipment is used, the loose lift thickness should be reduced to 4-inches or less.

4. Each lift should be compacted to at least 95% of maximum proctor density. Within the street alignments and under sidewalks/driveways, the top 1 foot of backfill should be compacted to at least 98% of maximum proctor density.

5. Compaction density tests should be performed on alternating lifts to ensure the minimum density is maintained.

Should additional fill be required, the proposed imported backfill should be submitted to the geotechnical engineer for approval prior to use.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 Potential Difficulties

7.1.1 Runoff Water in Excavation

Water can be expected to collect in the excavation bottom during times of inclement weather or snow melt. To allow observation of the excavation bottom, to reduce the

potential for soil disturbance, and to facilitate filling operations, we recommend water be removed from within the excavation during construction. Based on the soils encountered, we anticipate the groundwater can be handled with conventional sump pumping.

7.2 Excavation Backsloping

If excavation faces are not retained, the excavations should maintain maximum allowable slopes in accordance with *OSHA Regulations (Standards 29 CFR), Part 1926, Subpart P, "Excavations"* (can be found on www.osha.gov). Even with the required OSHA sloping, water seepage or surface runoff can potentially induce sideslope erosion or sloughing which could require slope maintenance.

7.3 Observation and Testing

The recommendations in this report are based on the subsurface conditions found at our test boring locations. Since the soil conditions can be expected to vary away from the soil boring locations, we recommend on-site observation by a geotechnical engineer/technician during construction to evaluate these potential changes. Soil density testing should also be performed on new fill placed in order to document that project specifications for compaction have been satisfied.

8.0 LIMITATIONS

Within the limitations of scope, budget, and schedule, we have endeavored to provide our services according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, expressed or implied, is intended. Important information regarding risk management and proper use of this report is given in Appendix B entitled "Geotechnical Report Limitations and Guidelines for Use."

Appendix A

AET Project No. P-0031683

Geotechnical Field Exploration and Testing
Boring Log Notes
Unified Soil Classification System
Figure 1: Boring Location Map
Subsurface Boring Logs
Moisture – Density Relationship (Proctor)

Appendix A
Geotechnical Field Exploration and Testing
AET Project No. P-0031683

A.1 FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling and sampling standard penetration test (SPT) borings. The locations of the borings appear on Figure 1, preceding the Subsurface Boring Logs in this appendix.

A.2 SAMPLING METHODS

A.2.1 Split-Spoon Samples (SS) - Calibrated to N_{60} Values

Standard penetration (split-spoon) samples were collected in general accordance with ASTM: D1586 with one primary modification. The ASTM test method consists of driving a 2-inch O.D. split-barrel sampler into the in-situ soil with a 140-pound hammer dropped from a height of 30 inches. The sampler is driven a total of 18 inches into the soil. After an initial set of 6 inches, the number of hammer blows to drive the sampler the final 12 inches is known as the standard penetration resistance or N-value. Our method uses a modified hammer weight, which is determined by measuring the system energy using a Pile Driving Analyzer (PDA) and an instrumented rod.

In the past, standard penetration N-value tests were performed using a rope and cathead for the lift and drop system. The energy transferred to the split-spoon sampler was typically limited to about 60% of its potential energy due to the friction inherent in this system. This converted energy then provides what is known as an N_{60} blow count.

The most recent drill rigs incorporate an automatic hammer lift and drop system, which has higher energy efficiency and subsequently results in lower N-values than the traditional N_{60} values. By using the PDA energy measurement equipment, we are able to determine actual energy generated by the drop hammer. With the various hammer systems available, we have found highly variable energies ranging from 55% to over 100%. Therefore, the intent of AET's hammer calibrations is to vary the hammer weight such that hammer energies lie within about 60% to 65% of the theoretical energy of a 140-pound weight falling 30 inches. The current ASTM procedure acknowledges the wide variation in N-values, stating that N-values of 100% or more have been observed. Although we have not yet determined the statistical measurement uncertainty of our calibrated method to date, we can state that the accuracy deviation of the N-values using this method is significantly better than the standard ASTM Method.

A.2.2 Disturbed Samples (DS)/Spin-up Samples (SU)

Sample types described as "DS" or "SU" on the boring logs are disturbed samples, which are taken from the flights of the auger. Because the auger disturbs the samples, possible soil layering and contact depths should be considered approximate.

A.2.3 Sampling Limitations

Unless actually observed in a sample, contacts between soil layers are estimated based on the spacing of samples and the action of drilling tools. Cobbles, boulders, and other large objects generally cannot be recovered from test borings, and they may be present in the ground even if they are not noted on the boring logs.

Determining the thickness of "topsoil" layers is usually limited, due to variations in topsoil definition, sample recovery, and other factors. Visual-manual description often relies on color for determination and transitioning changes can account for significant variation in thickness judgment. Accordingly, the topsoil thickness presented on the logs should not be the sole basis for calculating topsoil stripping depths and volumes. If more accurate information is needed relating to thickness and topsoil quality definition, alternate methods of sample retrieval and testing should be employed.

A.3 CLASSIFICATION METHODS

Soil descriptions shown on the boring logs are based on the Unified Soil Classification (USC) system. The USC system is described in ASTM: D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, accurate classifications per ASTM: D2487 are possible. Otherwise, soil descriptions shown on the boring logs are visual-manual judgments. Charts are attached which provide information on the USC system, the descriptive terminology, and the symbols used on the boring logs.

The boring logs include descriptions of apparent geology. The geologic depositional origin of each soil layer is interpreted primarily by observation of the soil samples, which can be limited. Observations of the surrounding topography, vegetation, and development can sometimes aid this judgment.

A.4 WATER LEVEL MEASUREMENTS

The ground water level measurements are shown at the bottom of the boring logs. The following information appears under "Water Level Measurements" on the logs:

- Date and Time of measurement
- Sampled Depth: lowest depth of soil sampling at the time of measurement
- Casing Depth: depth to bottom of casing or hollow-stem auger at time of measurement
- Cave-in Depth: depth at which measuring tape stops in the borehole
- Water Level: depth in the borehole where free water is encountered
- Drilling Fluid Level: same as Water Level, except that the liquid in the borehole is drilling fluid

The true location of the water table at the boring locations may be different than the water levels measured in the boreholes. This is possible because there are several factors that can affect the water level measurements in the borehole. Some of these factors include: permeability of each soil layer in profile, presence of perched water, amount of time between water level readings, presence of drilling fluid, weather conditions, and use of borehole casing.

A.5 LABORATORY TEST METHODS

A.5.1 Water Content Tests

Conducted per AET Procedure 01-LAB-010, which is performed in general accordance with ASTM: D2216 and AASHTO: T265.

A.5.2 Atterberg Limits Tests

Conducted per AET Procedure 01-LAB-030, which is performed in general accordance with ASTM: D4318 and AASHTO: T89, T90.

A.5.3 Sieve Analysis of Soils (thru #200 Sieve)

Conducted per AET Procedure 01-LAB-040, which is performed in general conformance with ASTM: D6913, Method A.

A.6 TEST STANDARD LIMITATIONS

Field and laboratory testing is done in general conformance with the described procedures. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

A.7 SAMPLE STORAGE

Unless notified to do otherwise, we routinely retain representative samples of the soils recovered from the borings for a period of 30 days.

BORING LOG NOTES

DRILLING AND SAMPLING SYMBOLS

Symbol	Definition
AR:	Sample of material obtained from cuttings blown out the top of the borehole during air rotary procedure.
B, H, N:	Size of flush-joint casing
CAS:	Pipe casing, number indicates nominal diameter in inches
COT:	Clean-out tube
DC:	Drive casing; number indicates diameter in inches
DM:	Drilling mud or bentonite slurry
DR:	Driller (initials)
DS:	Disturbed sample from auger flights
DP:	Direct push drilling; a 2.125 inch OD outer casing with an inner 1½ inch ID plastic tube is driven continuously into the ground.
FA:	Flight auger; number indicates outside diameter in inches
HA:	Hand auger; number indicates outside diameter
HSA:	Hollow stem auger; number indicates inside diameter in inches
LG:	Field logger (initials)
MC:	Column used to describe moisture condition of samples and for the ground water level symbols
N (BPF):	Standard penetration resistance (N-value) in blows per foot (see notes)
NQ:	NQ wireline core barrel
PQ:	PQ wireline core barrel
RDA:	Rotary drilling with compressed air and roller or drag bit.
RDF:	Rotary drilling with drilling fluid and roller or drag bit
REC:	In split-spoon (see notes), direct push and thin-walled tube sampling, the recovered length (in inches) of sample. In rock coring, the length of core recovered (expressed as percent of the total core run). Zero indicates no sample recovered.
SS:	Standard split-spoon sampler (steel; 1.5" is inside diameter; 2" outside diameter); unless indicated otherwise
SU	Spin-up sample from hollow stem auger
TW:	Thin-walled tube; number indicates inside diameter in inches
WASH:	Sample of material obtained by screening returning rotary drilling fluid or by which has collected inside the borehole after "falling" through drilling fluid
WH:	Sampler advanced by static weight of drill rod and hammer
WR:	Sampler advanced by static weight of drill rod
94mm:	94 millimeter wireline core barrel
▼:	Water level directly measured in boring
▽:	Estimated water level based solely on sample appearance

TEST SYMBOLS

Symbol	Definition
CONS:	One-dimensional consolidation test
DEN:	Dry density, pcf
DST:	Direct shear test
E:	Pressuremeter Modulus, tsf
HYD:	Hydrometer analysis
LL:	Liquid Limit, %
LP:	Pressuremeter Limit Pressure, tsf
OC:	Organic Content, %
PERM:	Coefficient of permeability (K) test; F - Field; L - Laboratory
PL:	Plastic Limit, %
q_p:	Pocket Penetrometer strength, tsf (approximate)
q_c:	Static cone bearing pressure, tsf
q_u:	Unconfined compressive strength, psf
R:	Electrical Resistivity, ohm-cms
RQD:	Rock Quality Designation of Rock Core, in percent (aggregate length of core pieces 4" or more in length as a percent of total core run)
SA:	Sieve analysis
TRX:	Triaxial compression test
VSR:	Vane shear strength, remolded (field), psf
VSU:	Vane shear strength, undisturbed (field), psf
WC:	Water content, as percent of dry weight
%-200:	Percent of material finer than #200 sieve

STANDARD PENETRATION TEST NOTES
(Calibrated Hammer Weight)

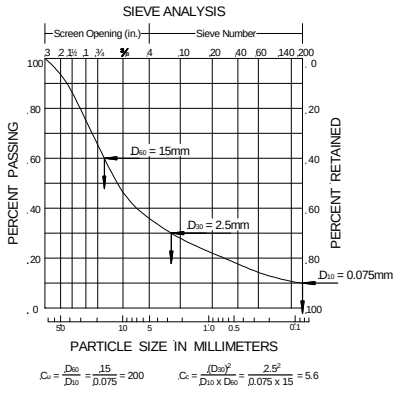
The standard penetration test consists of driving a split-spoon sampler with a drop hammer (calibrated weight varies to provide N_{60} values) and counting the number of blows applied in each of three 6" increments of penetration. If the sampler is driven less than 18" (usually in highly resistant material), permitted in ASTM: D1586, the blows for each complete 6" increment and for each partial increment is on the boring log. For partial increments, the number of blows is shown to the nearest 0.1' below the slash.

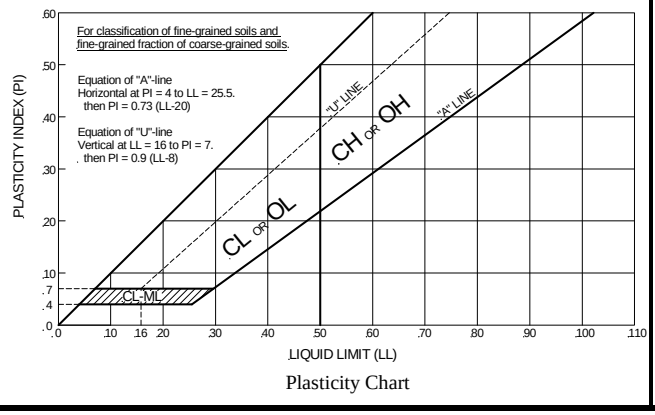
The length of sample recovered, as shown on the "REC" column, may be greater than the distance indicated in the N column. The disparity is because the N-value is recorded below the initial 6" set (unless partial penetration defined in ASTM: D1586 is encountered) whereas the length of sample recovered is for the entire sampler drive (which may even extend more than 18").

UNIFIED SOIL CLASSIFICATION SYSTEM
ASTM Designations: D 2487, D2488

AMERICAN ENGINEERING TESTING, INC.

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	Cu≥4 and 1≤Cc≤3[E]	GW	Well graded gravel[F]
			Cu<4 and/or 1>Cc>3[E]	GP	Poorly graded gravel[F]
		Gravels with Fines more than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	Cu≥6 and 1≤Cc≤3[E]	SW	Well-graded sand[I]
			Cu<6 and 1>Cc>3[E]	SP	Poorly-graded sand[I]
		Sands with Fines more than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,I]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve (see Plasticity Chart below)	Silts and Clays Liquid limit less than 50	inorganic	PI>7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI<4 or plots below "A" line[J]	ML	Silt[K,L,M]
		organic	Liquid limit–oven dried / Liquid limit – not dried <0.75	OL	Organic clay[K,L,M,N] / Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		organic	Liquid limit–oven dried / Liquid limit – not dried <0.75	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,Q]
Highly organic soil			Primarily organic matter, dark in color, and organic in odor	PT	Peat[R]





Plasticity Chart

Notes

[A]Based on the material passing the 3-in (75-mm) sieve.
[B]If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C]Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
[D]Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E]$Cu = D_{60}/D_{10}$, $Cc = (D_{30})^2/D_{10} \times D_{60}$

[F]If soil contains ≥15% sand, add "with sand" to group name.
[G]If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H]If fines are organic, add "with organic fines" to group name.
[I]If soil contains ≥15% gravel, add "with gravel" to group name.
[J]If Atterberg limits plot is hatched area, soils is a CL-ML silty clay.
[K]If soil contains 15 to 29% plus No. 200 add "with sand" or "with gravel", whichever is predominant.
[L]If soil contains ≥30% plus No. 200, predominantly sand, add "sandy" to group name.
[M]If soil contains ≥30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N]PI≥4 and plots on or above "A" line.
[O]PI<4 or plots below "A" line.
[P]PI plots on or above "A" line.
[Q]PI plots below "A" line.
[R]Fiber Content description shown below.

ADDITIONAL TERMINOLOGY NOTES USED BY AET FOR SOIL IDENTIFICATION AND DESCRIPTION

Grain Size

Term	Particle Size
Boulders	Over 12"
Cobbles	3" to 12"
Gravel	#4 sieve to 3"
Sand	#200 to #4 sieve
Fines (silt & clay)	Pass #200 sieve

Gravel Percentages

Term	Percent
A Little Gravel	3% - 14%
With Gravel	15% - 29%
Gravelly	30% - 50%

Consistency of Plastic Soils

Term	N-Value, BPF
Very Soft	less than 2
Soft	2 - 4
Firm	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	Greater than 30

Relative Density of Non-Plastic Soils

Term	N-Value, BPF
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	Greater than 50

Moisture/Frost Condition (MC Column)

D (Dry): Absence of moisture, dusty, dry to touch.
M (Moist): Damp, although free water not visible. Soil may still have a high water content (over "optimum").
W (Wet/ Waterbearing): Free water visible intended to describe non-plastic soils. Waterbearing usually relates to sands and sand with silt.
F (Frozen): Soil frozen

Layering Notes

Laminations: Layers less than ½" thick of differing material or color.
Lenses: Pockets or layers greater than ½" thick of differing material or color.

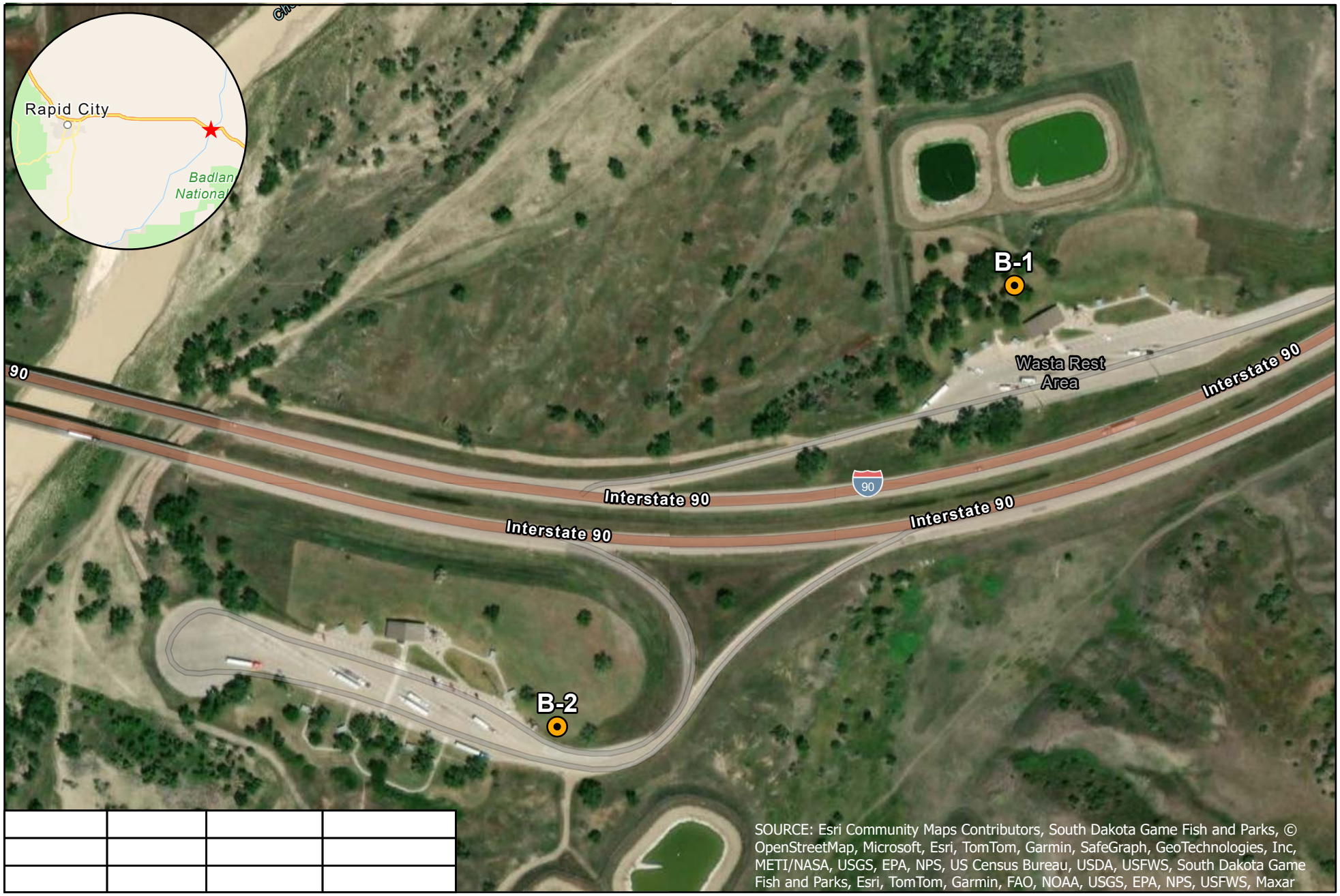
Fiber Content of Peat

Term	Fiber Content (Visual Estimate)
Fibric Peat:	Greater than 67%
Hemic Peat:	33 – 67%
Sapric Peat:	Less than 33%

Organic/Roots Description (if no lab tests)

Soils are described as *organic*, if soil is not peat and is judged to have sufficient organic fines content to influence the soil properties. *Slightly organic* used for borderline cases.

With roots: Judged to have sufficient quantity of roots to influence the soil properties.
Trace roots: Small roots present, but not judged to be in sufficient quantity to significantly affect soil properties.



AMERICAN
ENGINEERING TESTING

0 250 500
Feet

Figure 1
Boring Location Map

Sanitary Sewer Replacement - Wasta Rest Areas
Mile Marker 98, 18070 I-90, Wasta, SD 57791
Date Prepared: April 10, 2024
AET Project No. P-0031683

Approximate Boring Locations

N

SUBSURFACE BORING LOG

AET No: **P-0031683** Log of Boring No. **B-1 (p. 1 of 1)**

Project: **Sanitary Sewer Replacement- Wasta Rest Areas; Wasta, South Dakota**

Surface Elevation **2299.0**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
0	**TOPSOIL**, Lean Clay with organics, dark brown	TOPSOIL									
1	**LEAN CLAY**, dark brown, firm (CL)	ALLUVIUM	7	M	SS	18					
2											
3	**POORLY GRADED SAND**, trace gravel, grey-brown, medium dense to loose (SP)		14	M	SS	18	8				
4											
5											
6			12	M	SS	18	7		20	NP	7
7											
8			7	W	SS	18					
9											
10											
11	**SANDY LEAN CLAY**, dark grey, stiff (CL)		9	W	SS	18					
	End of Boring- 11.5'										

DEPTH:	DRILLING METHOD
10.0	**6" FA**

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
3/28/24	**12:05**	**11.5**	**10.0**	**NA**	**NA**	**8.0**
3/28/24	**12:25**	**11.5**	**10.0**	**NA**	**NA**	**7.8**

BORING COMPLETED: **3/28/24**

DR: **ES** LG: **BB** Rig: **106**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP P-0031683 BORING LOGS.GPJ AET+CPT+WELL.GDT 4/10/24

SUBSURFACE BORING LOG

AET No: **P-0031683** Log of Boring No. **B-2 (p. 1 of 1)**

Project: **Sanitary Sewer Replacement- Wasta Rest Areas; Wasta, South Dakota**

DEPTH IN FEET	Surface Elevation **2304.0** MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-#200
1	**TOPSOIL**, Lean Clay with sand and organics, dark brown	TOPSOIL									
	LEAN CLAY with sand, dark brown, stiff (CL)	ALLUVIUM	14	M	SS	18					
2											
3	**SILTY SAND** with gravel, grey, medium dense to loose (SM)		21	M	SS	18	2				
4											
5											
6			9	M	SS	18	4				
7											
8	courser below 7.5' and becomes medium dense		14	M	SS	18					
9											
10											
11			13	M	SS	18					
	End of Boring- 11.5'										

DEPTH:	DRILLING METHOD
10.0	**6" FA**

BORING COMPLETED: **3/28/24**

DR: **ES** LG: **BB** Rig: **106**

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
3/28/24	**11:10**	**11.5**	**10.0**	**NA**	**NA**	**None**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP P-0031683 BORING LOGS.GPJ AET+CPT+WELL.GDT 4/10/24

American Engineering Testing, Inc.
Rapid City
1745 Samco Road
Rapid City, SD 57702
(605) 388-0029
www.teamAET.com

Proctor Report

Report No: PTR:AET-153243-S1
Issue No: 1

Client: Avid4 Engineering, Inc. **CC:**

Project: Avid4 - Sanitary Sewer Replacement
Wasta Rest Areas

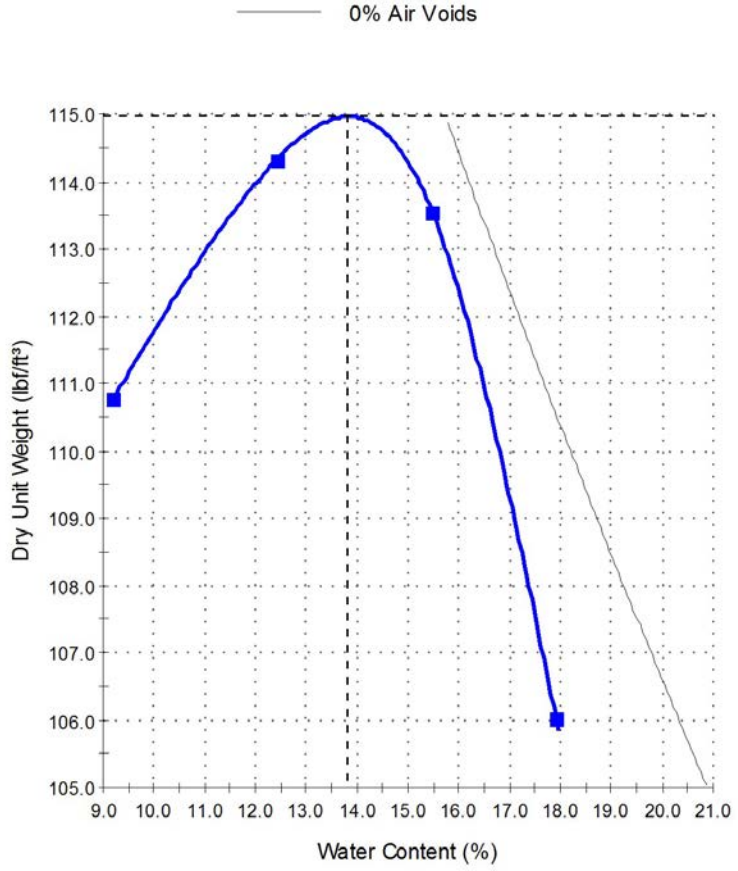
Wasta SD
Job No: P-0031683

Date of Issue: 4/10/2024
Reviewed By: Wyatt Leadens
Engineer I

Sample Details

Sample ID: AET-153243-S1
Date Sampled: 3/28/2024
Sampling Method: Soil Boring/Test Pit
Material: Clayey Sand with gravel (SC)
General Location: Geotech Boring
Location: B-2
Layer: Ft. Below Subgrade
Depth: 0-5
Sampled By: Brendan Bittner

Dry Unit Weight - Water Content Relationship



Test Results

ASTM D 698

Maximum Dry Unit Weight (lbf/ft³):	**115.0**
Optimum Water Content (%):	**13.8**
Method:	A
Preparation Method:	Moist
Specific Gravity (Fines):	2.60
Retained Sieve No 4 (4.75mm) (%):	18
Passing Sieve No 4 (4.75mm) (%):	82
Tested By:	Christine Olson
Date Tested:	4/4/2024

ASTM D 4718

Corrected Maximum Dry Unit Weight (lbf/ft³):	**120.7**
Corrected Optimum Water Content (%):	**11.3**
Specific Gravity (Oversize):	2.50
Sieve Size (Oversize):	No 4
Oversize Particles (%):	18

Comments

Appendix B

Geotechnical Report Limitations and Guidelines for Use

Appendix B
Geotechnical Report Limitations and Guidelines for Use
AET Project No. P-0031683

B.1 REFERENCE

This appendix provides information to help you manage your risks relating to subsurface problems which are caused by construction delays, cost overruns, claims, and disputes. This information was developed and provided by GBA[1], of which, we are a member firm.

B.2 RISK MANAGEMENT INFORMATION

B.2.1 Understand the Geotechnical Engineering Services Provided for this Report

Geotechnical engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical engineering services is typically a geotechnical engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

B.2.2 Geotechnical Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client.

Likewise, geotechnical engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do <u>not</u> rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. If you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

1 Geoprofessional Business Association, 1300 Piccard Drive, LL14, Rockville, MD 20850
Telephone: 301/565-2733: www.geoprofessional.org, 2019

B.2.3 Read the Full Report

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. Read and refer to the report in full.

B.2.4 You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, always inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

B.2.5 Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

B.2.6 This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations only after observing actual subsurface conditions exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.

B.2.7 This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

B.2.8 Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical engineering report, along with any attachments or appendices, with your contract documents, but be certain to note conspicuously that you've included the material for information purposes only. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, only from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to and be sure to allow enough time to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

B.2.9 Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

B.2.10 Geoenvironmental Concerns Are Not Covered

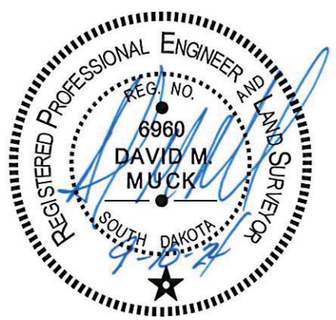
The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical engineering study. For that reason, a geotechnical engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated subsurface environmental problems have led to project failures. If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

B.2.11 Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. Geotechnical engineers are not building-envelope or mold specialists.

PROJECT ESTIMATE OF QUANTITIES

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
009E0010	Mobilization	Lump Sum	LS
100E0020	Clear and Grub Tree	2	Each
100E0100	Clearing	Lump Sum	LS
110E0460	Remove Manhole	9	Each
110E1100	Remove Concrete Pavement	104.1	SqYd
110E7800	Remove Chain Link Fence for Reset	40	Ft
230E0100	Remove and Replace Topsoil	Lump Sum	LS
250E0010	Incidental Work	Lump Sum	LS
260E2010	Gravel Cushion	53.9	Ton
260E3010	Gravel Surfacing	35.8	Ton
380E0070	9" Nonreinforced PCC Pavement	104.1	SqYd
421E2020	2" Extruded Polystyrene Insulation Board	303	SqYd
451E1004	4" PVC Sewer Pipe	14	Ft
451E1006	6" PVC Sewer Pipe	1,147	Ft
451E1504	4" Sanitary Sewer Service Cleanout	2	Each
451E1506	6" Sanitary Sewer Service Cleanout	5	Each
451E1550	Sanitary Sewer Video Inspection	1,161	Ft
451E2006	6"x4" Pipe Wye	2	Each
451E4256	6" Plug Valve with Box	4	Each
451E7015	Connect Sewer Service	2	Each
451E7016	Connect to Existing Sewer Main	5	Each
621E0520	Reset Chain Link Fence	40	Ft
633E1220	High Build Waterborne Pavement Marking Paint, 4" White	35	Ft
633E1222	High Build Waterborne Pavement Marking Paint, 4" Yellow	28	Ft
633E1260	High Build Waterborne Pavement Marking Paint, 24" White	27	Ft
634E0110	Traffic Control Signs	20.0	SqFt
634E0120	Traffic Control, Miscellaneous	Lump Sum	LS
634E0275	Type 3 Barricade	6	Each
671E1130	48" Manhole 0' to 6' Deep	3	Each
671E1131	48" Manhole 6' to 8' Deep	3	Each
671E5048	48" Manhole Cover Slab	2	Each
671E5510	Extra Depth for 48" Manhole	1.6	Ft
734E0010	Erosion Control	Lump Sum	LS
734E0151	9" Diameter Erosion Control Wattle	448	Ft
734E5010	Sweeping	20	Hour
900E1310	Concrete Washout Facility	1	Each
900E1320	Construction Entrance	2	Each
900E5410	Modify Sprinkler System	Lump Sum	LS



PROJECT NOTE

This project is the reconstruction of the sanitary sewer main for both the east and west bound rest areas near Wasta on Interstate 90. The project includes excavation, installation of sanitary sewer main and manholes.

SPECIFICATIONS TO BE USED

Standard Specifications for Roads and Bridges, 2015 Edition and Required Provisions, Supplemental Specifications, and Special Provisions as included in the Proposal.

ENVIRONMENTAL COMMITMENTS

The SDDOT is committed to protecting the environment and uses Environmental Commitments as a communication tool for the Engineer and Contractor to ensure that attention is given to avoid, minimize, and/or mitigate an environmental impact. Environmental commitments to various agencies and the public have been made to secure approval of this project. An agency with permitting authority can delay a project if identified environmental impacts have not been adequately addressed. Unless otherwise designated, the Contractor's primary contact regarding matters associated with these commitments will be the Project Engineer. During construction, the Project Engineer will verify that the Contractor has met Environmental Commitment requirements. These environmental commitments are not subject to change without prior written approval from the SDDOT Environmental Office.

Additional guidance on SDDOT's Environmental Commitments can be accessed through the Environmental Procedures Manual found at: <https://dot.sd.gov/media/documents/EnvironmentalProceduresManual.pdf >

For questions regarding change orders in the field that may have an effect on an Environmental Commitment, the Project Engineer will contact the Environmental Engineer at 605-773-3180 or 605-773-4336 to determine whether an environmental analysis and/or resource agency coordination is necessary.

Once construction is complete, the Project Engineer will review all environmental commitments for the project and document their completion.

COMMITMENT B: FEDERALLY THREATENED, ENDANGERED, AND PROTECTED SPECIES

COMMITMENT B2: WHOOPING CRANE

The Whooping Crane is a spring and fall migratory bird in South Dakota that is about 5 feet tall and typically stops on wetlands, rivers, and agricultural lands along their migration route. An adult Whooping Crane is white with a red crown and a long, dark, pointed bill. Immature Whooping Cranes are cinnamon brown. While in flight, their long necks are kept straight and their long dark legs trail behind. Adult Whooping Cranes' black wing tips are visible during flight.

Action Taken/Required:

Revised: 09-10-24 DMM

Harassment or other measures to cause the Whooping Crane to leave the site is a violation of the Endangered Species Act. If a Whooping Crane is sighted roosting in the vicinity of the project, borrow pits, or staging areas associated with the project, cease construction activities in the affected area until the Whooping Crane departs and immediately contact the Project Engineer. The Project Engineer will contact the Environmental Office so that the sighting can be reported to USFWS.

COMMITMENT B4: BALD EAGLE

Bald eagles are known to occur in this area.

Action Taken/Required:

If a nest is observed within one mile of the project site, notify the Project Engineer immediately so that he/she can consult with the Environmental Office for an appropriate course of action.

COMMITMENT C: WATER SOURCE

The Contractor will not withdraw water with equipment previously used outside the State of South Dakota or previously used in aquatic invasive species (AIS) positive waters within South Dakota without prior approval from the SDDOT Environmental Office. To prevent and control the introduction and spread of invasive species into the project vicinity, all equipment will be power washed with hot water (≥140 °F) and completely dried for a minimum of 7 days prior to subsequent use. South Dakota administrative rule 41:10:04:02 forbids the possession and transport of AIS; therefore, all attached dirt, mud, debris and vegetation must be removed and all compartments and tanks capable of holding standing water must be drained. This includes, but is not limited to, all equipment, pumps, lines, hoses and holding tanks.

Action Taken/Required:

The Contractor will obtain the necessary permits from the regulatory agencies such as the South Dakota Department of Agriculture and Natural Resources (DANR) and the United States Army Corps of Engineers (USACE) prior to water extraction activities.

Additional information and mapping of water sources impacted by Aquatic Invasive Species in South Dakota can be accessed at:
< https://sdleastwanted.sd.gov/maps/default.aspx>

< South Dakota Administrative Rule 41:10:04 Aquatic Invasive Species: https://sdlegislature.gov/rules/DisplayRule.aspx?Rule=41:10:04 >

COMMITMENT E: STORM WATER

Construction activities constitute less than 1 acre of disturbance.

Action Taken/Required:

At a minimum and regardless of project size, appropriate erosion and sediment control measures must be installed to control the discharge of pollutants from the construction site.

HIGH BUILD WATERBORNE PAVEMENT MARKING PAINT

The Contractor is responsible to replace all disturbed striping associated with the pavement removal in this project.

The replaced striping will match the existing width, color, and location in relation to the joints in the PCC Pavement. The minimum lane width will be 12'.

All materials will be applied as per the manufacturer's recommendations. High build waterborne pavement marking paint will conform to the supplemental specifications for Section 980.1 B.

INCIDENTAL WORK

This work includes all miscellaneous items not included under the regular items covered by unit prices listed in the proposal, but which must be performed in order to complete the Contract. Incidental work includes but is not limited to:

1. Bypass pumping.
2. Backfill manhole locations.
3. Repair disturbed utilities not called for removal.
4. Dewatering.
5. Watering for seeding.

CONSTRUCTION STAKING

All staking will be provided by the Design Engineer on behalf of the SDDOT in accordance with the Standard Specification and Special Provisions.

GENERAL TRAFFIC CONTROL

Existing guide, route, informational logo, regulatory, and warning signs will be temporarily reset and maintained during construction. Removing, relocating, covering, salvaging, and resetting of existing traffic control devices, including delineation, will be the responsibility of the Contractor. Cost for this work will be incidental to the contract unit prices for the various items unless otherwise specified in the plans. Any delineators and signs damaged or lost will be replaced by the Contractor at no cost to the State.

All temporary traffic control sign locations will be set in the field by the Contractor and verified by the Engineer prior to installation.

If there is a discrepancy between the traffic control plans, standard plates, and the MUTCD, whichever is more stringent will be used, as determined by the Engineer.

Type 3 Barricades will be installed at the opening of the exit ramp as shown in the plans.

TRENCH EXCAVATION BEDDING AND BACKFILL

Trench excavation and backfill will conform to the requirements of specification section of 31 23 00.00 20. Trenches will be excavated to a minimum width of 24 inches and a maximum width of 32 inches. Trenches will be excavated to a depth of 3 inches below the pipe invert. Pipe bedding will be per the special details shown in these plans. Bedding will extend from 3 inches below the pipe invert to 3 inches above the pipe crown over the full width of the trench.

The utility trench from both sites will have approximately 115 cu. yd. of over burden. This material will cover the embankment quantities necessary to backfill removed manholes throughout the project and complete the grading at the west bound rest area.

Type 1, Type 2, Type 3, and Type 4 material will be a crushed rock having a minimum of two fractured faces and meet the following gradation requirements by dry weight:

Type 1 – Bedding Material:

Passing 1-inch sieve	100%
Passing 3/4-inch sieve	90-100%
Passing 3/8-inch sieve	20-55%
Passing #4 sieve	0-10%
Passing #8 sieve	0-8%

Type 2 – Foundation Material

Passing a 3 inch sieve	100%
Passing a 3/4 inch sieve	50-70%
Passing a #4 sieve	20-40%
Passing a #200 sieve	0-8%

Type 3 – Foundation Material

Passing a 3-inch sieve	100%
Passing a 1-inch sieve	0-15%
Passing a #4 sieve	0-8%

Type 4 – Foundation Material

Passing the 8 inch sieve	100%
Passing the 6 inch sieve	65-85%
Passing the 3 inch sieve	0-20%
Passing the #200 sieve	0-5%

Measurement and payment for trench excavation, pipe bedding and backfill will be incidental to the respective bid item.

SEWER MAIN ABANDONMENT & REMOVAL

Sanitary sewer main called to be abandoned in the plans will be plugged with 12" of concrete at each open end of sewer main.

All sanitary sewer manholes removed will be backfilled per Section 110 per the standard specifications.

All labor, material, and equipment necessary to properly abandon the sewer main will be incidental to the contract bid item "Remove Manhole".

GRADING AROUND MANHOLES

Revised: 09-10-24 DMM

Minor grading may be needed around proposed manholes. The Contractor is responsible to grade around manholes so that the concrete barrel section and cover are not exposed. The rim must remain exposed and may extrude from the surface by no more than two inches. All grading associated with the manholes will be incidental to the installation of that specific manhole.

SANITARY SEWER MAIN

Installation of the sanitary sewer will be in accordance with Section 33 30 00 of the project specifications and the details shown in these plans.

All sewer main trench must be installed with check dams to prevent groundwater movement through the bedding material in the trench. Trench check dams must be constructed per the details provided with a minimum one dam between each manhole, at all laterals (tees), in service line trenches (outside of main trench), and also at locations as indicated on the plans and detailed specifications.

Payment will be at the unit price bid for the appropriate size and material of sewer pipe, furnished and installed, including, trenching, excavation, Type 1 bedding material, trench check dams, compacting, backfilling, dewatering, sheeting or shoring, and testing.

SANITARY SEWER INSULATION

Sanitary sewer main insulation must be installed per the special details provided.

Insulation will be paid at the unit bid price for insulation furnished and installed, including cushion material per the bid item "2" Extruded Polystyrene Insulation Board".

SANITARY SEWER FITTINGS

Installation of the sanitary sewer fittings including in-line wyes, cleanouts, and bends will be in accordance with Section 33 30 00 of the project specifications and the details shown in these plans.

Payment will be at the unit price bid for the appropriate size and material of fitting, furnished and installed, including, trenching, excavation, Type 1 bedding material, compacting, backfilling, dewatering, sheeting or shoring, and testing. Fittings used to connect to existing pipe will be incidental to the "Connect to Existing Sanitary Sewer" bid item.

TV INSPECTION OF SEWER LINES

All sanitary sewer installed with this project must be televised in accordance with Section 33 01 30.16 of the project specifications.

Payment for the televising of sewer mains will be made for the work done on the basis of the unit bid price per linear foot for "Sanitary Sewer Video Inspection" for total length of utility regardless of diameter.

No additional payment will be made for any cleaning required for televising of the mains.

No additional payment will be made for re-televising or re-cleaning of the mains.