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US Army Corps
of Engineers
Pittsburgh District

Conemaugh Lake
Permanent Embankment and Culvert Repair

Conemaugh Lake
Blairsville, Pennsylvania

Certified Final Documents
Technical Specifications
July 2017

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SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 18 00

UTILITY COORDINATIONS

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SECTION 01 18 00

UTILITY COORDINATIONS

PART 1 GENERAL

1.1 SUMMARY

This section addresses the requirements regarding the Contractor's responsibility for coordination of the work under this contract with existing utilities.

1.2 PROTECTION OF UTILITIES

The Contractor shall locate and clearly identify all underground and above ground utility lines, wires, cables, pipes, poles, support lines, and culverts, within the Contractor's work areas. The Contractor shall contact the Pennsylvania One Call System at telephone (800) 242-1776 at least three business days prior to beginning any Construction activity. The Contractor shall be responsible for any costs for the Pennsylvania One Call System. The Contractor shall conduct his operations such that the utilities are not damaged or disturbed. Any damage to utilities caused by the Contractor's actions shall be repaired by him at no additional expense to the Government. The Contractor shall store materials and equipment in a manner that does not interfere with utility company services or utility company access to the facilities. The Contractor shall relocate any equipment or stockpiles, at no additional cost to the Government, that interfere with utility company operations, emergency repairs, or standard maintenance services.

1.3 LOCATION OF EXISTING UTILITIES

There are a number of utilities within the construction work limits including water, gas, and sewer lines. Many have been relocated due to the slope failure. The location of these utlities is shown on the drawings as they were located at the time of the solicitation; however, the Contractor shall coordinate with the Borough of Blairsville and all relevant utility services to verify the location and extent of all utilities.

1.4 CONNECTIONS TO MUNICIPAL UTILITY SYSTEMS

All work in connection with connection to existing utility systems shall be coordinated with the appropriate authority. Such connections shall be made in accordance with the requirements of the authority. Costs for all connections shall be the responsibility of the Contractor.

1.5 UTILITY SERVICES

The following is a listing of points of contact for some utilities:

EXISTING UTILITIES

Utility Service	Point of Contact
General Utility	Pennsylvania One Call System

Locations	Telephone Requests Only Ph. 1-800-242-1776
Government Utility Locations	Mr. Paul Toman, Resource Manager Loyalhanna Lake Ph. (724) 639-9013 Fax (724) 639-9818

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

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MEASUREMENT AND PAYMENT

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SECTION 01 22 00.00 10

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

This section covers measurement and payment of items applicable to the performance of the work under this contract.

1.2 JOB PAYMENT ITEMS

Payment items for the work of this contract for which contract job payments will be made are listed in the BIDDING SCHEDULE and described below. All costs for items of work, which are not specifically mentioned to be included in a particular job or unit price payment item, shall be included in the listed job item most closely associated with the work involved. The job price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.2.1 Reimbursement For Actual Performance And Payment Bond Premiums

1.2.1.1 Payment

Payment for reimbursement for actual performance and payment bond premiums will be made as specified in 00100; FAR Clauses 52.228-13 ALTERNTIVE PAYMENT PROTECTIONS and 52.228-15 PERFORMANCE AND PAYMENT BONDS--CONSTRUCTION.

1.2.1.2 Unit of Measure

Unit of measure: Job.

1.2.1.3 Payment Item

Item No. 0001 Reimbursement for Actual Performance and Payment Bond Premiums
Item No. 1001 Reimbursement for Actual Performance and Payment Bond Premiums
Item No. 2001 Reimbursement for Actual Performance and Payment Bond Premiums
Item No. 3001 Reimbursement for Actual Performance and Payment Bond Premiums

1.2.2 Erosion and Sediment Controls

1.2.2.1 Payment

This work is specified in Section 01 57 23.00 08 ENVIRONMENTAL PROTECTION, Section 01 57 23.00 08 STORM WATER POLLUTION CONTROL, Section 31 32 11 SOIL

SURFACE EROSION CONTROL, and Section 32 92 19 SEEDING. Payment will be made for costs associated with furnishing, installing, maintaining, and removing sediment and erosion controls measures; including but not limited to compost filter socks, inlet protection, seeding, fertilizer, lime, mulch, erosion control blanket, pumped sediment removal system, dewatering, dust control, temporary stream crossing, etc., as shown on the drawings or as defined in the Erosion and Sediment Control Plan. Price shall include all materials, labor, equipment, and supplies associated with this work.

1.2.2.2 Unit of Measure

Unit of measure: Job.

1.2.2.3 Payment Item

Item No. 0003 Erosion and Sediment Controls

1.2.3 Diversion Structure

1.2.3.1 Payment

This work is specified in Section 01 57 23.00 08 STORM WATER POLLUTION CONTROL and Section 33 01 30.72 08 RELINING CULVERTS. Payment will be made for costs associated with diversion of culvert flows, including, but not limited to, rock filter, temporary sandbag dam, and pipe flume. Price shall include all materials, labor, equipment, and supplies associated with this work.

1.2.3.2 Unit of Measure

Unit of measure: Job.

1.2.3.3 Payment Item

Item No. 0004 Diversion Structure

1.2.4 Site Demolition

1.2.4.1 Payment

Payment shall be made for costs associated with removal and disposal of materials from the failed portion of the arch culvert and the concrete headwall, security fence, and concrete blocks and steel plates from the temporary stabilization contract. Payment shall also be made for removal of section of security fence and any pipes or abandoned utilities that are exposed during excavation and any concrete or asphalt from the roadway or driveways. Price shall include all materials, labor, equipment, and supplies associated with this work.

1.2.4.2 Unit of Measure

Unit of measure: Job

1.2.4.3 Payment Items

Item No. 0014~~3~~ Site Demolition

1.2.5 Stormwater Collection System

1.2.5.1 Payment

Payment will be made for costs associated with the furnishing and installation and removal of 15 and 18 inch temporary slope stormpipes, temporary storm inlets, and sandbags for redirecting stormwater collection system for North Spring Street, not limited to, excavation, bedding, HDPE pipes, concrete, rebar, backfill, etc. Sandbags are to remain in place once construction is complete. Price shall include all materials, labor, equipment, and supplies associated with this work.

1.2.5.2 Unit of Measure

Unit of measure: Job.

1.2.5.3 Payment Item

Item No. 00154 Stormwater Collection System

1.3 UNIT PRICE PAYMENT ITEMS

Payment items for the work of this contract on which the contract unit price payments will be made are listed in the BIDDING SCHEDULE and described below. The unit price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for each of the unit price items.

1.3.1 Digital Progress Images

1.3.1.1 Payment

This work is specified in Section 01 32 33 DIGITAL PROGRESS IMAGES. Payment will be made for costs associated with furnishing digital progress images, as specified. Each set shall consist of all specified hard copies and electronic copies of each photographic session as specified. Price shall include all materials, labor, equipment, and supplies associated with this work.

1.3.1.2 Measurement

Measurement will be made of the number of sets of photographs taken and delivered to the Contracting Officer as approved or directed by the Contracting Officer or authorized representative. Each set shall consist of all specified hard copies and electronic copies of each photographic session as specified.

1.3.1.3 Unit of Measure

Unit of measure: Sets.

1.3.1.4 Payment Item

Item No. 0002 Digital Progress Images

1.3.2 Earthwork

1.3.2.1 Payment

This work is specified in Section 31 00 00 EARTHWORK. Payment will be made for costs associated with required excavation as specified and as shown in the contract drawings. Price shall include an additional diversion structure for excavation in the stream required for R-5 streambank armoring. Price shall include all materials, labor, equipment, and supplies associated with this work.

1.3.2.2 Measurement

Measurement of quantities will be made for the actual volume of common excavation, excavation of existing R-4 material, and excavation required for installation of R-5 streambank armoring completed within the limits, lines and grades shown on the contract drawings. No allowance will be made for overdepth excavation of for the removal of any material outside the required lines unless authorized by the Contracting Officer. The volume of material removed and placed shall be determined by the average-end-area method, based on cross sections taken by field survey prior to and after completion of common excavation, or other method approved by the Contracting Officer. The cross section surveys shall be obtained by the Contracting Officer at a maximum 50-foot interval over the length of disturbance prior to and after excavation to determine the actual amount of material removed. Volume computations shall be performed by the Contractor, and copies of all cross section data and computations shall be submitted to the Contracting Officer within 48 hours following completion of the field cross sections.

1.3.2.3 Unit of Measure

Unit of measure: Cubic Yard.

1.3.2.4 Payment Item

Item No. 0005 Unclassified Excavation

Item No. 0006 Excavation of Existing R-4 Material

Item No. 1002 Excavation for R-5 Streambank Armoring

1.3.3 Stone Protection

1.3.3.1 Payment

This work is specified in Section 31 00 00 EARTHWORK. Payment will be made for costs associated with furnishing and placing R-4 stone for the bank stabilization and bed stabilization, AASHTO #57 stone, AASHTO #1 stone, crest fill 2RC, and R-5 streambank armoring as shown in the construction drawings. Price shall include all materials, labor, equipment, and supplies associated with this work.

1.3.3.2 Measurement

Measurement for payment will be made for the actual volume of stone placed within the limits, lines and grades shown on the contract drawings. The volume of material shall be determined by the average-end-area method based on cross sections taken by field survey prior to and after completion of

stone installation or other method approved by the Contracting Officer. The cross section surveys shall be obtained by the Contracting Officer at a maximum 50-foot interval over the length of the area prior to and after stone installation to determine the actual amount of material placed. Volume computations shall be performed by the Contractor, and copies of all cross section data and computations shall be submitted to the Contracting Officer within 48 hours following completion of the field cross sections.

1.3.3.3 Unit of Measure

Unit of measure: Cubic Yard

1.3.3.4 Payment Items

Item No. 0007 Temporary Stockpile and Reuse of Existing R-4 Material

Item No. 0008 Furnish and Install New R-4 Material

Item No. 0016~~7~~ Furnish and Install AASHTO #57 Stone

Item No. 0017~~7~~8 Furnish and Install AASHTO #1 Stone

Item No. 0018~~8~~9 Furnish and Install Crest Fill 2RC

Item No. 00~~19~~20 Furnish and Install R-5 Streambank Armoring

Item No. 1003 Furnish and Install R-5 Streambank Armoring

1.3.4 Centrifugally Cast Concrete Pipe (CCCP) Liner

1.3.4.1 Payment

This work is specified in Sections 33 40 00 STORM DRAIN UTILITIES and 31 00 00 EARTHWORK. Payment will be made for costs associated with installing the CCCP liner including, but not limited to, CCCP liner, flowable mortar, structural fill, cleaning, surface preparation, and temporary stabilization/bracing as required etc. Price shall include all engineering, design, materials, labor, equipment, and supplies associated with this work.

1.3.4.2 Measurement

Measurement for payment shall be based upon the length of CCCP liner installed within the limits as shown on the contract drawings and as accepted by the Contracting Officer.

1.3.4.3 Unit of Measure

Unit of measure: Linear Foot

1.3.4.4 Payment Item

0009 CCCP Liner

2002 Upstream Culvert Lining

3002 Downstream Culvert Extension Lining

1.3.5 Invert Repair Mortar

1.3.5.1 Payment

This work is specified in Sections 33 40 00 STORM DRAIN UTILITIES and 31 00 00 EARTHWORK. Payment will be made for costs associated with installing the invert repair mortar. Price shall include all engineering, design, materials, labor, equipment, and supplies associated with this work.

1.3.5.2 Measurement

Measurement for payment shall be based upon the length of invert repair mortar installed within the limits as shown on the contract drawings and as accepted by the Contracting Officer.

1.3.5.3 Unit of Measure

Unit of measure: Linear Foot

1.4.5.4 Payment Item

0010 Invert Repair Mortar

1.3.6 Structural Plate Arch

1.3.6.1 Payment

Payment will be made for costs associated with the structural plate including, but not limited to, structural plate, keyway grouting, and micropiles, and concrete pile cap, as specified and as shown on the contract drawings. Price shall also include cost associated with temporary stabilization/bracing as required. Price shall include all engineering, design, materials, labor, equipment, and supplies associated with this work.

1.3.6.2 Measurement

Measurement for payment shall be made by the actual length of structural plates installed, including the volume of grout placed. Measurement also includes any concrete required at the transition from the culvert lines to the existing brick lined culvert. The Contracting Officer shall approve all methods and procedures.

1.3.6.3 Unit of Measure

Unit of measure: Linear Foot

1.3.6.4 Payment Items

Item No. 001~~0~~1 Structural Plate Arch

1.3.7 Headwall

1.3.7.1 Payment

Payment will be made for costs associated with the furnishing and installation in place of concrete materials for headwall at the end of Sulphur Run culvert, not limited to, formwork, ready mix concrete, concrete grouting, etc. Price shall include all materials, labor, equipment, and supplies associated with this work.

1.3.7.2 Measurement

Measurement for payment for installation of headwall shall be based upon the number of headwalls installed as shown on the contract drawings and as accepted by the Contracting Officer.

1.3.7.3 Unit of Measure

Unit of measure: Each

1.3.7.4 Payment Item

001~~1~~2 Headwall

1.3.8 Geotextile

1.3.8.1 Payment

This work is specified in Section 31 05 19 GEOTEXTILE. Payment will be made for costs associated with placement of geotextile fabric as indicated on the contract drawings. Price shall include all materials, labor, equipment, and supplies associated with this work.

1.3.8.2 Measurement

Measurement for payment shall be by the actual area of geotextile acceptably installed, not including overlaps, based on the surface area of slope covered. All measurements for payment shall be made by or in presence of the Contracting Officer.

1.3.8.3 Unit of Measure

Unit of measure: Square Yard.

1.3.8.4 Payment Item

Item No. 001~~2~~3 Geotextile

Item No. 1004 Streambank Geotextile

1.3.9 Security Fence

1.3.9.1 Payment

This work is specified in Section 32 31 13 CHAIN LINK FENCES AND GATES. Payment will be made for costs associated with acceptable installation of security fence and signage, including all appurtenances and hardware for the execution of this work, as specified and as shown on the contract drawings. Borough of Blairsville will provide the missing gate section. Contractor shall reinstall gate section to working conditions. Price shall include all materials, labor, equipment, and supplies associated with this work.

1.3.9.2 Measurement

Measurement for payment shall be by the actual linear foot of security fence and posts installed as shown on the contract drawings and as accepted by the Contracting Officer.

1.3.9.3 Unit of Measure

Unit of measure: Linear Foot.

1.3.9.4 Payment Item

Item No. 00156 Security Fence

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PROJECT SCHEDULE

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SECTION 01 32 01.00 10

PROJECT SCHEDULE

PART 1 GENERAL

1.1 SUBMITTALS

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

SD-01 Preconstruction Submittals

Project Schedule - Bar Chart; G, RE

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Pursuant to the Contract Clause 52.236-15, SCHEDULE FOR CONSTRUCTION CONTRACTS, a Project Schedule as described below shall be prepared. The scheduling of construction shall be the responsibility of the Contractor. Contractor management personnel shall actively participate in its development. Subcontractors and suppliers working on the project shall also contribute in developing and maintaining an accurate Project Schedule. A bar chart shall be prepared in accordance with paragraph PROGRESS SCHEDULE - BAR CHART.

3.2 MONITORING CONSTRUCTION PROGRESS

The schedule shall be the basis for measuring Contractor progress. Lack of an approved schedule or scheduling personnel will result in an inability of the Contracting Officer to evaluate Contractor's progress. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire Project Schedule submission and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. In the case where Project Schedule revisions have been directed by the Contracting Officer and those revisions have not been included in the Project Schedule, the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until revisions to the Project Schedule have been made.

3.3 PROGRESS SCHEDULE - BAR CHART

The progress chart to be prepared by the Contractor pursuant to Section 00700 CONTRACT CLAUSE 52.236-15, "SCHEDULE FOR CONSTRUCTION CONTRACTS" shall consist of a Project Schedule - Bar Chart as described herein. In preparing this schedule, the scheduling of construction is the responsibility of the Contractor and contractor management personnel shall

actively participate in its development. The chart may be prepared in a format proposed by the Contractor and approved by the Contracting Officer. Each activity shall include the applicable Price Schedule item number and show the estimated cost. The chart shall be prepared in sufficient detail to clearly show the Contractor's planned progress and the relationship of the various items of work. Larger activities shall be broken down into smaller activities with clearly defined limits (i.e. Excavation between STA xx and STA yy). In general, the estimated cost of any individual activity should not exceed $50,000. The selection and number of activities shall be subject to the Contracting Officer's approval. The chart shall be updated monthly to show actual progress and percentage of work completed for each activity. The Contractor shall submit, as part of his monthly request for payment, updated copies of his progress schedule identifying the work completed during the reporting period. If the Government issues changes to the existing work or adds additional work items to the contract, the Contractor shall revise his progress schedule accordingly. All costs associated with revising the schedule shall be included as part of the modification of the contract. If the Contractor's progress falls behind his planned work effort, a revised schedule shall be furnished with a brief explanation demonstrating how the Contractor proposes to complete the remaining work within the contract time. If the Contractor fails to submit updates as required, the Contracting Officer may withhold approval of partial payment estimates, until such submittals are made.

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SURVEY AND ALIGNMENT CONTROL

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SECTION 01 32 23.00 08

SURVEY AND ALIGNMENT CONTROL

PART 1 GENERAL

1.1 SUMMARY

This section addresses the overall project survey control and procedure requirements to meet all survey/positional accuracy requirements for this contract.

1.2 REFERENCES

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

GERMAN INSTITUTE FOR STANDARDIZATION (DIN)

DIN 18723	(1990-07) Specification for Theodolite Accuracy

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 17123-4	(2012) Optics And Optical Instruments - Field Procedures For Testing Geodetic And Surveying Instruments - Part 4: Electro-Optical Distance Meters (EDM Measurements To Reflectors)

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 1110-1-1005	(2007) Control and Topographic Surveying
EM 1110-2-1003	(2013) Hydrographic Surveying

1.3 SUBMITTALS

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

NOTE: Any submittals classified as "SD-01 Preconstruction Submittals" require approval prior to mobilization to the contract work site. All other submittals, classified as "SD-02" through "SD-11," require approval prior to commencing the particular task to which the submittal is associated.

SD-01 Preconstruction Submittals

Qualifications; G, DO, RE

Submit qualifications of the independent licensed surveyor(s) for topographic and hydrographic surveying to the Government

Survey Point of Contact prior to commencing any survey work.

Survey Procedures and Equipment; G, DO, RE

Submit all surveying procedures, methods, and equipment for topographic surveys to the Government Survey Point of Contact, prior to the start of any surveying work. A manufacturer's certificate showing serial number and accuracy ratings must be submitted for each total station and/or digital automatic level as a part of the equipment list, along with an active (dated within past 12 months) NIST-traceable Certificate of Calibration. All survey equipment shall be owned or leased by an independent survey company, unless otherwise approved by the Contracting Officer.

SD-07 Certificates

Survey Logs; G, DO, RE

Post excavation and Post Construction Surveys; G, DO, RE

Submit after excavation and after construction surveys as required herein, including raw data collector files and all data and plotted drawings as specified herein, within 72 hours after collection of a survey data.

Metadata; G, DO

Submit metadata within 14 business days after completion of survey operations.

1.4 DIFFERENTIAL GLOBAL POSITIONING SYSTEM (DGPS) EQUIPMENT

The Contractor must have at least one Differential/Real-Time/RTK/RTN GPS/GNSS receiver, and shall conduct all GPS/GNSS surveys in accordance with EM 1110-2-1003. All real-time positioning data submitted must include GPS/GNSS base files (RINEX or Trimble format), GPS/GNSS rover files, base-rover vectors, northing, easting, ellipsoid height, elevation, date and time each record (point) was collected. All GPS/GNSS Receivers shall be set to log satellite data to be included with data submittals. Any RTN/VRS rovers used shall be set to log vector data.

1.5 TOPOGRAPHIC SURVEYS

The Contractor shall perform all topographic surveys in accordance with EM 1110-1-1005, and shall conduct all topographic surveys utilizing RTK/RTN-GPS/GNSS or an "auto-lock" or robotic total station. A data collector that writes digital files shall be used in conjunction with the GPS/GNSS receivers or total station to record any and all field survey data. Record a three-dimensional raw electronic vector, and corresponding position for each data point. RTN/VRS field surveys are acceptable if and only if localization/checks on USACE-provided survey control is performed on each day RTN/VRS is used in the field. All raw digital data shall be included with submittals and shall be submitted in a format compatible with Trimble Business Center or Bentley InRoads.

1.5.1 SURVEY LOGS

Submit survey logs to the District Survey Point of Contact and Contracting Officer.

1.6 SURVEY PROCEDURES AND EQUIPMENT

All total stations used in conjunction with this Contract shall have a valid calibration certificate ("valid" is defined as dated within that past 12 months) from an independent instrument service facility, shall be capable of at least an "auto-lock" function that will automatically turn angles to a stationary tripod-mounted prism (higher performance capabilities such as robotic prism tracking are acceptable and recommended), be rated at an angular accuracy (DIN 18723) of 3" (three seconds of arc) or less, and be rated at a distance measurement accuracy (ISO 17123-4) of 2mm + 2ppm or less. All GPS/GNSS receivers used in conjunction with this contract shall be capable of creating data files that can be converted to a RINEX (Receiver INdependent EXchange) format. All automatic/spirit levels used for control, geodetic, or Quality Control purposes in conjunction with this Contract shall be a digital level, meaning that they read the level rod automatically and be capable of writing a digital file of observations that contains BS/FS observations and date & time of observations. All level rods used for control, geodetic, or Quality Control purposes in conjunction with this contract shall be equipped with a bar code that matches the digital level it is to be used with.

1.7 QUALIFICATIONS

Any and all field surveys shall be performed under the direct physical on-site supervision of a surveyor with a minimum of five years of current and relevant experience, and in accordance with the laws and regulations of the State(s) that the work is performed in.

1.8 QUALITY ASSURANCE

Quality assurance will be conducted by the District Survey Office on a minimum of 10 percent of the Contractor's survey work. To accomplish this, the District survey office will either re-survey areas or observe the Contractor in conducting their surveys or inspect submitted raw and processed data.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL SURVEY REQUIREMENTS

Conduct all surveys required to demonstrate that the construction is in compliance with the specified placement tolerances and the lines, grades, and elevations shown on the drawings.

3.1.1 Vertical and Horizontal Datums

Utilize North American Vertical Datum (NAVD) 1988 as the vertical/elevation reference datum. Utilize the State Plane Coordinate System (NAD 1983) of the State the project site is in as the horizontal reference datum.

3.1.2 Tolerances

Conduct topographic surveys utilizing procedures and methodology that meet

or exceed accuracy tolerances of +/- 0.10 feet in the vertical and +/- 0.10 feet in the horizontal. Take complete notes in areas where obstructions are present, explaining the offset.

3.2 SURVEY CONTROL

a. Existing horizontal and vertical control to be used for all construction layout is shown on the contract drawings and is on the internet via the USACE Survey Monument Archival & Retrieval Tool (U-SMART) website at http://usmart.usace.army.mil.

b. b. All new work to be constructed under this Contract shall be constructed based on the survey control established by the Government (Pittsburgh District Geospatial Section) and provided to the Contractor. The Contractor shall verify that control points check within themselves prior to commencing work and utilize U-SMART to report any destroyed/disturbed control. If control points do not check within themselves or have been destroyed/disturbed, submit a request through the Contracting Officer for the USACE Pittsburgh District Geospatial Section to re-establish control. The request shall be made at least 14 calendar days prior to the intended use of the control. The Contractor shall establish any other temporary survey control as may be necessary to carry out the requirements of this Contract. Any and all temporary control set by the Contractor shall be based off the existing control as provided by the Government. Any questions or problems concerning the survey control shall be directed to the Pittsburgh District Geospatial Section through the Contracting Officer.

3.3 POST EXCAVATION AND POST CONSTRUCTION SURVEYS

3.3.1 General

Take sufficient topography within the site to discern 1 foot contour intervals. Surveys shall also be taken after construction.

3.4 DATA SUBMISSION

Transfer all raw field survey data digitally onto compact disc (CD) or via AMRDEC SAFE FTP (https://safe.amrdec.army.mil) in a format compatible with Trimble Business Center, Bentley InRoads, or Autodesk Civil 3D.

Submit all survey data in the following formats:

a. Trimble JobXML (.jxl), Trimble Job (.job), or Bentley InRoads- or Autodesk Civil 3D- compatible format that shall contain all raw base/rover or backsight/standpoint/foresight vectors along with calculated coordinates/points/features.

b. Trimble-compatible (.T02, etc) or RINEX format GPS/GNSS data logs for every base or rover used in any Differential/Real-Time/RTK/RTN GPS/GNSS data collection.

c. Raw/unadjusted leveling data in .DAT format from any digital leveling.

d. Plotted and electronic plan view drawings in DXF format with accompanying LandXML that contains the DTM/TIN data. Drawings should show contour lines at a 1 foot interval and all other onsite features/structures. Submit a copy of the plan view drawings in PDF

format. Please note that any and all necessary reference files shall be included as DXF or LandXML.

3.5 DISCREPANCIES

In the event of any discrepancies that cannot be resolved by the District Office Geospatial Section Quality Assurance review of the Contractor's data, the Contracting Officer may request an additional survey be performed by the Pittsburgh District Survey Section. The results of the Government survey will be considered in the final determination made by the Contracting Officer to resolve any conflicts.

3.6 METADATA SUBMISSION

Provide metadata file(s) for all geospatial data produced under this Contract that are compatible with ESRI ArcGIS applications. (Information on ESRI ArcGIS is available at the following link: http://www.esri.com.) The metadata file(s) must comply with Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata Version 2.0 or higher. If another metadata generation tool is used, the ".txt" or ".doc" file types will be sufficient, however the ".xml" alternative file type would be preferred.

Geospatial data is defined as information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth. Geospatial data affected by these requirements are those generated for use in a:

Geographic Information System (GIS);
Land Information System (LIS);
Remote Sensing or Image processing system;
Computer-Aided Design and Drafting (CADD) system;
Automated Mapping/Facilities Management (AM/FM) system and
Other computer systems that employ or reference data using either absolute, relative or assumed coordinates.

Provide digital FGDC compliant metadata file(s) for each deliverable product and data set outlined in these specifications.

Metadata standards can be found at http://www.fgdc.gov/metadata.

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DIGITAL PROGRESS IMAGES

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SECTION 01 32 33

DIGITAL PROGRESS IMAGES

PART 1 GENERAL

1.1 SUMMARY

The work under this section includes furnishing progress photographs consisting of digital photographs showing the progress of the construction operations throughout the contract period.

1.2 GENERAL REQUIREMENTS

1.2.1 Description

The Contractor shall, during the progress of the project (including progress of fabrication), furnish the Contracting Officer progress photographs to depict progress of construction throughout the life of the contract. The photographs shall be taken using digital photography equipment furnished by the Contractor. Electronic copies of approved photographs shall be furnished on compact disk or other storage media as approved by the Contracting Officer.

1.2.2 Digital Photographs

Digital photographs shall have a CCD resolution no less than 7.0 million pixels per image (3072 by 2304) which will provide enough detail to print an 8-inch by 10-inch photo-realistic photograph. The Contractor shall furnish, using Microsoft Word 2013 version, a file with each set of photographs which lists the following identifying information for each photographic image:

a. Name and location of project.
b. Contract number.
c. Date taken.
d. Contractor (and subcontractor if applicable).
e. Orientation of view and brief description of work depicted.

Each photograph shall be sequentially numbered. The identifying data shall be placed in the document accompanying the photographs. No identifying data, except the date stamp, shall appear on the photographs.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having an "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:+

Submittals

SD-03 Product Data

Digital Camera; G, RE

Product specification sheets for each item of equipment.

SD-11 Closeout Submittals

Thumbnail Hard Copy Prints of Progress Images; G, RE
Glossy Prints of Selected Official Progress Images; G, RE
Electronic Copy of Selected Official Progress Images; G, RE
Electronic Copy of All Other Progress Images; G, RE

Copies of digital progress images in electronic form and hard copy form shall be submitted monthly for approval in accordance with paragraph "Photography". Progress images shall be submitted in a timely manner as coordinated with the Contracting Officer.

1.4 PHOTOGRAPHER QUALIFICATIONS

Progress photographs shall be made by a person experienced in photography and familiar with the photographic equipment to be used for making such photographs.

PART 2 PRODUCTS

2.1 CONTRACTOR-FURNISHED EQUIPMENT

The Contractor shall be responsible for furnishing all photographic equipment to perform the work specified by this section. If the camera becomes unusable for three days or more due to defects in materials or workmanship, the Contractor shall be responsible for furnishing a temporary replacement for the period it is out of service. The Contractor shall furnish the camera equipment within 14 days after receipt of Notice-to-Proceed. The Contractor shall use a color printer for producing the final,photo-quality, color hard copies of progress images.

2.1.1 Digital Camera

The Contractor shall have a minimum of one digital camera for his use to take the official progress photos for this contract. Progress photos,shall include progress during all phases of construction. The digital camera shall conform to the following minimum requirements. The camera shall have a CCD resolution no less than 7.0 million pixels per image (3072 by 2304) which will provide enough detail to print an 8-inch by 10-inch photo-realistic photograph. The camera shall have the capability to set the exposure settings manually or automatically. The camera shall also have picture overlay capability, which shall allow the user to overlay the time, date, and/or text over the digital image. The camera shall come with software that allows the user to download the images onto an IBM-compatible personal computer running Windows XP, Vista, or 7 and allow the images to be saved in one of the following graphic formats: JPG (Joint Photographic Experts Group), TIFF (Tagged Image File Format) or BMP (Windows Bitmap).

2.1.2 Color Printer

The Contractor shall furnish and utilize a photo-quality color laser printer or inkjet printer capable of producing high quality color photographs. The color printer shall be used for developing all official progress photographs taken during the contract.

PART 3 EXECUTION

3.1 PHOTOGRAPHY

The Contractor shall, during the progress of the work, furnish the Contracting Officer digitally produced progress photographs to depict the progress of the work both onsite and offsite at fabrication facilities. All progress images shall be taken at the camera's highest resolution. In coordination with the Contracting Officer, two (2) sets of progress photographs per month shall be taken over the full duration of this contract, except photographs will not be required for periods when no work is in progress. Thumbnail Hard Copy Prints of Progress Images shall be submitted to the Contracting Officer for approval between the first and fifth day of each month. The Contracting Officer will select from the thumbnail views, unless directed otherwise, at least ten (10) views to become official progress images. The selected official progress images shall be printed in color using the printer, ink, and paper combinations required to produce the quality of photograph specified above in 8-inch by 10-inch format and submitted for approval. Glossy Prints of Selected Official Progress Images and Electronic Copy of Selected Official Progress Images shall be furnished within ten days of approval of the thumbnail images. Electronic copies shall be furnished on compact disk with file of required photographic information. Electronic Copy of All Other Progress Images (including those not selected) shall be furnished on separate compact disk with file of required photographic information with the selected official progress images. Digital photographs shall be taken continuously throughout each month in which work is in progress. Unless otherwise directed by the Contracting Officer, photographs will not be required for periods of time in which work is not being performed. Additional sets of photographs shall be taken as directed by the Contracting Officer. Enough digital photographs shall be taken to adequately depict each phase of the work and shall show progress made during those phases and at the completion of the project. Digital photographs shall show work accomplished since the previous photographs. Progress photographs shall be submitted as specified herein and in paragraph "Submittals".

-- End of Section --

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SECTION 01 33 00

SUBMITTAL PROCEDURES

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SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections.

Units of weights and measures used on all submittals are to be the same as those used in the contract drawings.

Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

Contractor's Quality Control (CQC) System Manager to check and approve all items prior to submittal and stamp, sign, and date indicating action taken. Proposed deviations from the contract requirements are to be clearly identified. Include within submittals items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals.

Submittals requiring Government approval are to be scheduled and made prior to the acquisition of the material or equipment covered thereby. Pick up and dispose of samples not incorporated into the work in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

1.1 DEFINITIONS

1.1.1 Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by Submittal Description (SD) numbers and titles as follows:

SD-01 Preconstruction Submittals

Submittals which are required prior to start of construction (work) or the start of the next major phase of the construction on a multi-phase contract, includes schedules, tabular list of data, or tabular list including location, features, or 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

Construction Progress Schedule

Submittal register

Schedule of prices

Health and safety plan

Work plan

Quality Control(QC) plan

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. (Testing must have been within three years of date of contract award for the project.)

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

Report which 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 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 purpose of which is to further quality of 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-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (MSDS)concerning impedances, hazards and safety precautions.

SD-11 Closeout Submittals

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

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.

Interim "DD Form 1354" with cost breakout for all assets 30 days prior to facility turnover.

1.1.2 Approving Authority

Office or designated person authorized to approve submittal.

1.1.3 Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, except those SD-01 Pre-Construction Submittals noted above, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in

accordance with this section.

SD-01 Preconstruction Submittals

Submittal Register; G, RE

The Submittal Register shall be submitted within 20 calendar days after receipt of Notice to Proceed. The attached Submittal Register contains submittal requirements for the work under this Contract. A minimum of 30 days, exclusive of mailing time, shall be allowed and shown on the register for review and approval of submittals.

1.3 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.3.1 Government Approved G

Government approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled, "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.3.2 Information Only

Submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.4 PREPARATION

1.4.1 Transmittal Form

Use the form (ENG Form 4025) for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms are included in the QCS software that the Contractor is required to use for this contract. Properly complete this form by filling out all the heading blank spaces and identifying each item submitted. Exercise special care to ensure proper listing of the specification paragraph and sheet number of the contract drawings pertinent to the data submitted for each item.

1.4.2 Procedures

Five copies of submittals shall be submitted to:

Ms. Denise Polizzano, Resident Engineer
Upper Ohio Area Office
3510 Grand Ave.
Pittsburgh, PA 15225
(412)395-7680

1.4.3 Electronic File Format

Provide submittals other than material samples in both hard copy (paper) and electronic formats. The electronic submittal file must be compiled as a single, complete document, to include the Transmittal Form described in

Paragraph 1.6.1. The electronic submittal file must be named specifically according to its contents (e.g. 01 45 00.00-1.2_Quality Control Plan.pdf).

Electronic files must be of sufficient quality that all information is legible. Electronic format shall be in Adobe.PDF format, unless otherwise specified or directed by the Contracting Officer's Representative (COR). Whenever possible, PDF files shall be generated from original documents so that the text included in the PDF file is both searchable and can be copied. If documents are scanned, Optical Character Resolution (OCR) routines are required. Files exceeding 30 pages shall be indexed and bookmarked to allow efficient navigation of the file. When required, the electronic file must include a valid electronic signature, or scan of a signature.

Email electronic submittal documents fewer than 10MB to an email address as directed by the COR. Electronic documents over 10MB shall be provided on a CD/DVD, or through an electronic file sharing system such as the AMRDEC SAFE Web Application located at the following website:

https://safe.amrdec.army.mil/safe/

Provide hard copies of submittals as specified in this or other specification sections. Up to 5 additional hard copies of any submittal may be requested from the Contractor at the discretion of the COR, at no additional cost to the Government.

1.5 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to 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 Contracting Officer 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 Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

1.6 VARIATIONS

Variations from contract requirements require both Designer of Record (DOR) and Government approval pursuant to contract Clause FAR 52.236-21 and will be considered where advantageous to Government.

1.6.1 Considering Variations

Discussion with Contracting Officer prior to submission, after consulting with the DOR, will help ensure functional and quality requirements are met and minimize rejections and re-submittals. When contemplating a variation which results in lower cost, consider submission of the variation as a Value Engineering Change Proposal (VECP).

Specifically point out variations from contract requirements in transmittal letters. Failure to point out deviations may result in the Government requiring rejection and removal of such work at no additional cost to the Government.

1.6.2 Proposing Variations

When proposing variation, deliver written request to the Contracting Officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to Government, including the DOR's written analysis and approval. 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.

Check the column "variation" of ENG Form 4025 for submittals which include proposed deviations requested by the Contractor. Set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

1.6.3 Warranting That Variations Are Compatible

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

1.6.4 Review Schedule Is Modified

In addition to normal submittal review period, a period of 10 working days will be allowed for consideration by the Government of submittals with variations.

1.7 SUBMITTAL REGISTER

Prepare and maintain submittal register, as the work progresses. Do not change data which is output in columns (c), (d), (e), and (f) as delivered by Government; retain data which is output in columns (a), (g), (h), and (i) as approved. A submittal register showing items of equipment and materials for which submittals are required by the specifications is provided as an attachment. This list may not be all inclusive and additional submittals may be required. Maintain a submittal register for the project in accordance with Section 01 45 00.10 10 QUALITY CONTROL SYSTEM (QCS). The Government will provide the initial submittal register in electronic format with the following fields completed, to the extent that will be required by the Government during subsequent usage.

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

Column (d): Lists each submittal description (SD No. and type, e.g. SD-02 Shop Drawings) required in each specification section.

Column (e): Lists one principal paragraph in 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 project requirements.

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

1.7.1 Use of Submittal Register

Submit submittal register. Submit with QC plan and project schedule. Verify that all submittals required for 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 approving authority to receive submittals.

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

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

1.7.2 Contractor Use of Submittal Register

Update the following fields in the Government-furnished submittal register program or equivalent fields in program utilized by Contractor with each submittal throughout contract.

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

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

Column (l) List date of submittal transmission.

Column (q) List date approval received.

1.7.3 Approving Authority Use of Submittal Register

Update the following fields in the Government-furnished submittal register program or equivalent fields in program utilized by Contractor.

Column (b) Transmittal Number: Contractor assigned list of consecutive numbers.

Column (l) List date of submittal receipt.

Column (m) through (p) List Date related to review actions.

Column (q) List date returned to Contractor.

1.7.4 Copies Delivered to the Government

Deliver one copy of submittal register updated by Contractor to Government with each invoice request.

1.8 SCHEDULING

Schedule and submit concurrently submittals covering component items forming a system or items that are interrelated. Include certifications to be submitted with the pertinent drawings 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. Allow for potential resubmittal of requirements.

b. Submittals called for by the contract documents will be listed on the register. If a submittal is called for 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 Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but which have been omitted from the register or marked "N/A."

c. Re-submit register and annotate monthly by the Contractor with actual submission and approval dates. When all items on the register have been fully approved, no further re-submittal is required.

d. Carefully control procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

1.9 GOVERNMENT APPROVING AUTHORITY

When approving authority is Contracting Officer, the Government will:

a. Note date on which submittal was received.

b. Review submittals for approval within 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 entitled, "Review Notations," of this section and with markings appropriate for action indicated.

Upon completion of review of submittals requiring Government approval, stamp and date approved submittals. Four (4) copies of the approved submittal will be retained by the Contracting Officer and one (1) copy of the submittal will be returned to the Contractor. If the Government performs a conformance review of other Designer of Record approved submittals, the submittals will be so identified and returned, as described above.

1.10 DISAPPROVED OR REJECTED SUBMITTALS

Contractor shall make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications; notice as required under the clause entitled, "Changes," is to be given to the Contracting Officer. Contractor is responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the Government requiring rejection and removal of such work at the Contractor's expense.

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

1.11 APPROVED/ACCEPTED SUBMITTALS

The Contracting Officer's approval or acceptance 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 will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work.

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

1.12 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, the Contractor to assure 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 which may be damaged in testing, will be returned to the Contractor, at his expense, upon completion of the contract. Samples not approved 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 of that material. Government reserves the right to disapprove any material or equipment which previously has proved unsatisfactory in service.

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

Approval of the Contractor's samples by the Contracting Officer does not relieve the Contractor of his responsibilities under the contract.

1.13 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

1.14 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements is to be similar to the following:

CONTRACTOR
(Firm Name)
_____ Approved
_____ Approved with corrections as noted on submittal data and/or attached sheets(s)
SIGNATURE: _____
TITLE: _____
DATE: _____

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

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SPECIAL PROCEDURES

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SECTION 01 35 00.00 08

SPECIAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

This section addresses the general requirements applicable to the performance of the work under this contract. These requirements are in addition to those specified in other sections of the contract.

1.2 REFERENCES

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

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.146	Permit-required Confined Spaces

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having an "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Access Plan; G, RE
Emergency Plan; G, RE

The Contractor shall develope and submit a Government Access Plan.

Traffic Control Plan;G, RE

The Contractor shall develop and submit a plan for traffic control at the work site.

ROV Survey Work Plan; G, DO, RE

Utility Plan; G, RE

The Contractor shall develop and submit a plan to detail any work which the Contractor disturbs or impacts utilities. The plan shall provide a description of methods for preventing damage and ensuring utilities services are not disrupted.

~~Confined Space Work Plan; G, RE~~

The Contractor shall develop and submit a plan to detail their work sequence for all work within the culvert. The plan shall specifically address the confined space requirements established in EM 385-1-4 and OSHA 29 CFR 1910.146. The plan shall address the Contractor's methods for monitoring precipitation and stream levels along Sulphur Run. The plan shall address means of evaluating stream levels to ensure safety of workers. The plan shall address the Contractor's methods for protecting workers from high flows along Sulphur Run.

~~SD-07 Certificates~~

~~Confined Entry Permit~~

~~The Contractor shall not perform any work in the culvert without a vaild Confined Entry Permit.~~

SD-11 Closeout Submittals

ROV Survey Reports; G, DO, RE

1.4 CONTRACTOR RESPONSIBILITIES

1.4.1 General

Responsibilities of the Contractor include, but shall not be limited to, all planning, programming, administration, coordination, and management to ensure that all work is performed in accordance with all laws, regulations, codes or directives. The Contractor shall be responsible for ensuring that the work performed meets or exceeds the requirements of the contract. The Contractor shall perform all related Contractor administrative services necessary to perform the work, such as quality control, contractor financial control, and maintenance of accurate and complete records and files. The Contractor shall also be responsible for establishing and executing programs required to ensure that all work is performed in strict accordance with all health, safety and environmental laws, regulations, codes and directives, to protect the general public, as well as Contractor and Government employees.

1.4.2 Licenses and Permits

The Contractor shall be responsible for complying with all state or local contractor licensing or registration laws and permit requirements. The Contractor shall be responsible for furnishing qualified personnel for work which requires specialized registration or training.

1.5 DRAWINGS

1.5.1 Contract Drawings

The contract drawings provided reflect the work to be performed under this contract. In accordance with
48 CFR 252.236-7001, CONTRACT DRAWINGS AND SPECIFICATIONS, the Contractor shall check all drawings immediately upon receipt, and verify the figures, dimensions, and representation of the work. The Contractor shall compare all drawings and verify the figures before laying out the work. Dimensions marked on drawings shall, in general, be followed. Use of scaled

measurements shall not be allowed. The Contractor shall promptly notify the Contracting Officer of any discrepancies, and shall be responsible for any errors which might have been avoided by complying with this paragraph. Any omissions from the contract drawings, specifications or incorrect description of details of the work which are manifestly necessary to carry out the intent of the contract drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or incorrectly described details of work, but shall be performed as if fully and correctly set forth and described in the contract drawings and specifications. Unless otherwise noted, dimensions and elevations, and other features shown on contract drawings are generally based on site surveys and measurements, and As-Built drawings. The Government cannot guarantee the accuracy of the dimensions, elevations, and features shown on the contract drawings which are based on the reference drawings, and it shall be the responsibility of the Contractor to verify all elevations and the dimensions shown by measurements in the field, at no additional cost to the Government.

1.5.2 Reference Drawings

The reference drawings included with the folio of contract drawings show existing conditions to the best knowledge of the Government. Unless otherwise noted, dimensions, elevations, and other features shown on contract drawings, are generally based on the reference drawings supplemented by field surveys. The Government cannot guarantee the accuracy of the dimensions, elevations, and features shown on the reference drawings or on the contract drawings which are based on the reference drawings, and it shall be the responsibility of the Contractor, whenever necessary, to verify all elevations and the dimensions shown by measurements in the field. The Contractor shall verify elevations and dimensions before laying out the work. The Contracting Officer shall be notified of any discrepancies prior to commencing work.

1.6 WORK AREAS AND RESTRICTIONS

1.6.1 Work Areas

As required by Section 00700 CONTRACT CLAUSES 52.236-10, OPERATIONS AND STORAGE AREAS, all operations of the Contractor shall be confined to areas identified in the contract documents, or if not identified, as required to accomplish the work under this contract and as authorized and approved by the Contracting Officer.

1.6.2 Hauling Materials and Equipment

1.6.2.1 General

The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for all damage to existing roads and property occasioned by any of his operations. When intending to transport any heavy loads on roadways, the Contractor shall investigate all weight limits for the roads he intends to use and shall secure any required bond(s) from the respective owner(s). The Contractor shall document the existing condition of the roadways that he will be using, with the owners thereof. In the past, video recordings of the original roadway conditions have provided satisfactory documentation. Prior to beginning any construction, the Contractor shall

videorecord on DVD format all existing structures including, but not limited to, local roads, public and private property, and any other areas as directed by the Contracting Officer. The owners of such roadways and other property should be present at the time of the documentation. An unedited copy of all video recordings shall be given to the owners and the Contracting officer within 5 days after documentation. All damage to transportation facilities, public or private property, or utilities caused by the Contractor's operations shall be repaired to the satisfaction of the Contracting Officer at no additional cost to the Government. Any damage to the roadways, caused by the Contractor's operations, shall be repaired in kind by the Contractor and at his own expense. Roads shall be kept clear of all debris generated by the Contractor's operations. Roads shall be cleaned of any spillage. Upon completion of all work requiring use of the local roads, the roadways shall be restored to their preconstruction condition by cleaning and or reconstruction of damaged drainage facilities, base courses, and pavements as necessary. Repairs shall be made in the same manner as the original construction. No separate payment will be made for maintaining and restoring the condition of the roads, and all costs in connection therewith shall be considered as incidental to performance of the work.

1.6.2.2 Hauling Permits

The Contractor shall be responsible for acquiring all necessary oversized hauling permits and general hauling permits for any equipment or debris transported via roadways, as required. No heavy hauling on public roads will be permitted until all permits and bonds have been obtained as required. All costs associated with securing these permits shall be borne by the Contractor.

1.6.3 Laydown, Storage and Parking Areas

Storage areas at the site will be limited to areas identified in the contract and as required for performance of the work under this contract. No other areas will be made available at the project for storage of equipment and materials.

1.6.4 Utilities

Unless otherwise specified, the Government will not make any utilities or services available to the Contractor; and the Contractor shall be responsible for furnishing all utilities and services required for performance of the work under this contract.

1.7 EMERGENCY PLAN

The Contractor shall submit an Emergency Plan for approval prior to beginning any earthwork or construction activities in the existing stone arch culvert, culvert replacement, or existing structural plate section. The Emergency Plan shall detail the contractor's planned methods for response to a breach of the existing sewer line during construction. The Plan shall include the proposed equipment as well as the response time between breach and containment/mitigation. The plan shall also detail special procedures being used throughout all phases of construction to mitigate potential breaches of the sewer line. The plan shall show the locations, setbacks, and weights of any equipment to be used in the vicinity of the sewer.

1.8 EXISTING FACILITIES

The Contractor shall perform a video survey of the existing facilities including, but not limited to, Pump Station Driveway and Apron, pump station facilities, nearby residences, etc., prior to construction. The Contractor shall be responsible for ensuring that the existing facilities are not damaged. Should any of the existing facilities be damaged during construction the Contractor shall perform repairs to return them to the existing conditions at no additional cost to the government.

1.9 EXISTING SURVEY CONTROLS

1.9.1 Project Alignment

All new work to be constructed under this contract shall be constructed level, plumb, and accurately from survey control points established by the Contractor as necessary to construct all work within the proper alignment. The Contractor shall verify the elevations and positions of the Corps of Engineers survey controls before using them to layout the work under this contract, and shall notify the Contracting Officer of any discrepancies prior to commencing work.

1.10 PROTECTION AND MAINTENANCE OF ROAD TRAFFIC

During construction the Contractor shall maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. The traveling public shall be protected from damage to person and property. The Contractor shall submit his proposed traffic control plan for approval.

1.11 STREAM WATER LEVEL FLUCTUATION

The nature and location of the work covered under this contract presents risks associated with flooding. The water level along Sulphur Run can rise quickly. The Contractor shall be responsible for deciding when to remove equipment and personnel and to secure work in progress prior to the stream level or lake levels impacting work area. It shall remain the Contractor's responsibility to monitor weather forecast; stream water conditions; anticipate and react to possible rising water levels; develop self-warning procedures; and withdraw equipment and material from the culvert; as required until the water levels recede. It shall be the Contractor's responsibility to determine the time necessary to make a complete and safe withdrawal of equipment and material safely and efficiently. Information on flash flood guidance is available from the National Weather Service Website at http://www.weather.gov/pbz/. The Government reserves the right to direct the Contractor to begin preparing for the flooding at any time that such action, in the opinion of the Contracting Officer, is warranted.

In the event that work remains to be done, is actually in progress, and is impacted by flooding, an allowance will be made to the Contractor upon full resumption of work provided the Contractor had taken reasonable precautions to prevent damage to work. If scour has occured to ongoing or completed work, an equitable adjustment in the contract price will be made for furnishing and placing of stone or other fill material into scoured areas. However, compensation as provided for herein will not be included in any allowance or adjustment made under the provisions of Paragraph DAMAGE TO WORK.

1.12 DAMAGE TO WORK

The responsibility for damage to any part of the permanent work shall be as set forth in Section 00700 CONTRACT CLAUSES, 52.236-7 "PERMITS AND RESPONSIBILITIES". However, if, in the judgment of the Contracting Officer, any part of the permanent work performed by the Contractor is damaged by flood or earthquake, which damage is not due to the failure of the Contractor to take reasonable precautions or to exercise sound engineering and construction practices in the conduct of the work, the Contractor shall make the repairs as ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. If, in the opinion of the Contracting Officer, there are no contract unit or lump sum prices applicable to any part of such work, an equitable adjustment pursuant to the Section 00700 CONTRACT CLAUSES, 52.243-4 "CHANGES", will be made as full compensation for the repairs of that part of the permanent work for which there are no applicable contract unit or lump sum prices. Except as herein provided, damage to all work (including temporary construction), utilities, materials, and equipment shall be repaired to the satisfaction of the Contracting Officer at the Contractor's expense, regardless of the cause of such damage.

1.13 PROTECTION OF UTILITIES

Notwithstanding the Section 00700 CONTRACT CLAUSES, 52.236-9 "PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS", the Contractor shall locate and clearly identify all underground and above ground utility lines, wires, cables, pipes, poles, support lines, and culverts, within the Contractor's work area. The Contractor shall contact the Pennsylvania One Call System at telephone (800) 242-1776 at least three business days prior to beginning any Construction activity and comply with all applicable provisions of the PA Underground Utility Line Protection Act, PA Act 287. The Contractor shall be responsible for any costs for the Pennsylvania One Call System. The Contractor shall conduct his operations such that the utilities are not damaged or disturbed. The Contractor shall take special precautions when working within 10 feet of all utilities to prevent damage to existing utilities. A utility plan shall be submitted and approved prior to any work that disturbs or impacts existing utitilies. Any damage to utilities caused by the Contractor's actions shall be repaired by him at no additional expense to the Government. The Contractor shall store materials and equipment in a manner that does not interfere with utility company services or utility company access to the facilities. The Contractor shall relocate any equipment or stockpiles, at no additional cost to the Government, that interfere with utility company operations, emergency repairs, or standard maintenance services.

1.14 INSPECTIONS AND ACCEPTANCE OF WORK

Not withstanding other provisions of this contract, all materials and work to be performed under this contract shall be inspected and accepted by the Contracting Officer or his authorized representative(s). Inspections and acceptance will be performed on phases of the work, before the next definable sequential phase of work commences, OR may be performed at the completion of all of the work, as determined appropriate by the Contracting Officer. The Contracting Officer or his authorized representative shall be the individual(s) solely authorized to reject materials, disapprove or approve any work in progress, or order or direct any revision or change to the plans and specifications as presently shown and stated. The Contractor shall submit an Access Plan for Government personnel and inspectors to the

Contracting Officer.

1.15 OPERATION OF MUNICIPAL FACILITIES

The Municipal Sewer Authority facility shall remain in operation at all times. The Contractor shall perform his work in a manner which will not interfere with the operation of the facilities. Particular care shall be taken during all operations under this contract to prevent damage to any operating equipment or facilities on the site. The Contractor shall take all necessary precautions to ensure the safety of the workers in accordance with the applicable provisions of EM 385-1-1. Contractor operations shall be performed in such a manner to ensure that facility personnel, and the public are protected at all times.

1.15.1 Contractor's Work Hours

Contractor's work hours shall be restricted to 7:30 AM to 6:00 PM, Monday through Friday, or as otherwise approved by the Contracting Officer. The contractor shall coordinate with the Contracting Officer to make sure government personnel are present during major features of work. Federal Holidays are excepted from work. Contractor is to plan for all Federal holidays within the work schedule.

1.15.2 Coordination with Municipal Sewer Authority

The Contractor shall perform all work in a manner that will not interfere with the duties of the Municipal Sewer Authority personnel. Particular care shall be taken during all operations under this contract to prevent damage to any operating equipment, utilities, or facilities. The Contractor shall continuously maintain safe access for personnel, during every phase of the work, unless otherwise directed by the Contracting Officer.

1.16 POOL LEVELS

See the contract drawings for hydrographs throughout the project operational history. The target pool for this facility is maintained between elevation 900.0 and 905.0 feet NAVD88.Pool levels are monitored and available to the public online at: http://www.lrp.usace.army.mil/Portals/72/docs/WaterManagement/ResSum.pdf

1.17 PRECIPITATION

Sulphur Run transmits drainage from Blairsville to the Conemaugh River. Measured precipitation levels at Conemaugh Lake are included in the attachments to the specifications; however precipitation in the Sulphur Run watershed is not reflected in this data. The Contractor shall be responsible for installation of any instruments to monitor precipitation along Sulphur Run. The Contractor shall use this information for planning and sequencing of their operations.

~~## 1.18 WORK WITHIN THE CULVERT~~

~~Work within the existing stone arch culvert shall be considered to be within a confined space. The appropriate amount of personnel, type of sensors and safety equipment, and up to date confined space certificates are required prior to starting and shall be present during all work within the culvert. All equipment and activities shall comply with EM 385-1-1 and OSHA requirements. A Confined Space Competent Person (CSCP) shall be~~

~~present during the inspection. The definition of a CSCP is stated in section 34, subsection A.03.d within EM 385 1 1 and is defined as, "a person with thorough knowledge of OSHA's Confined Space Standard, 29 CFR 1910.146, experience with Permit Required Confined Space (PRCS) space entry procedures and the authority to supervise and influence how work is performed on job sites and in facilities. No work shall be permitted until the Confined Space Work Plan and Confined Entry Permit is submitted and approved by the Contracting Officer. The government is concerned with the safety of workers within the existing culvert. The contractor shall provide a confined space work plan for approval prior to any work within the culvert.~~

1.18 USE OF EXPLOSIVES

Use of explosives is prohibited for this project.

PART 2 PRODUCTS

2.1 PRODUCTS AND PARTS OF STANDARD MANUFACTURE

All materials, supplies and articles furnished so as to be incorporated into the work under this contract shall, whenever so specified and otherwise practicable, be standard products of recognized reputable manufacturers. Standard products of manufacturers other than those specified will be accepted when it is proven to the satisfaction of the Contracting Officer, in accordance with the Section 00700 CONTRACT CLAUSES, 52.236-5 "MATERIAL AND WORKMANSHIP", that they are equal in performance, strength, durability, usefulness and convenience for the purpose intended. Any changes required in the details and dimensions shown on the drawings as a result of the substitution of standard products, other than those provided for, shall be properly made as approved by the Contracting Officer, and at the expense of the Contractor. All products specified by "similar or equal to" a particular brand name are for descriptive purposes only and are not to imply that the product is available from only that source. Each major piece of equipment furnished under the contract shall be provided with a substantial nameplate securely fastened or cast in place and clearly inscribed with the manufacturer's name, year of manufacture, principal rating data and other pertinent data.

PART 3 EXECUTION

3.1 SEQUENCE OF WORK

The work shall be prosecuted in such order of precedence as best suits the Contractor's construction schedule and the following restrictions. The Contractor shall perform the work in a diligent, effective manner, and shall schedule his operations in such a manner that the work is completed on time. In accordance with contained in Section 00800 SPECIAL CONTRACT REQUIREMENTS, 52.211-12 "LIQUIDATED DAMAGES --CONSTRUCTION", the Contractor will be assessed the daily monetary damages for failure to complete the work in the allotted contract period.

3.2 SEQUENCE OF OPERATIONS

The work shall be prosecuted in such order of precedence as best suits the Contractor's Construction Schedule. A recommended construction sequence has been provided in the plans and should be review for planning purposes.

3.3 PROJECT SPECIFIC SECURITY REQUIREMENTS

This paragraph contains information for security requirements for work on Government Property. The purpose of these security requirements it to ensure that all Contractor or subcontractor employees working on this contract have received proper clearance for access to the Government property. Identification of Critical Infrastructure and submission of required employee information will be discussed at the Preconstruction Meeting. Required employee information shall be submitted to the Pittsburgh Office of Security and Law Enforcement, as applicable, **at least 15 calendar days prior to required employee access to the project**.

3.3.1 Pre-screen candidates using E-Verify Program

The Contractor must pre-screen candidates using the E-verify Program (http://www.dhs.gov/E-Verify) website to meet the established employment eligibility requirements. The Vendor must ensure that the Candidate has two valid forms of Government issued identification prior to ensure the correct information is entered into the E-verify system. An initial list of verified/eligible Candidates must be provided to the Contracting Officer no later than 3 business days after the initial contract award

3.3.2 Contract for Work on Federal Contracts

The contractor and all associated subcontractors' employees shall comply with applicable installation, facility, and area commander installation and facility access and local security policies and procedures (provided by the Government Representative). The contractor shall also provide all information required for background checks to meet installation access requirements to be accomplished by the installation and the USACE Security Office. The contractor workforce must comply with all personal identity verification requirements as directed by DoD, HQDA, and/or local policy. In addition to the changes otherwise authorized by the changes clause of this contract, should the Force Protection Condition (FPCON) at any individual facility or installation change, the Government may require changes in contractor security matters or processes. The contractor must submit the full name, Social Security Number, Date of Birth, and place of Birth for all associated contractor or subcontractor employees to the USACE Security Specialist Paul M. Surace, 412-395-7162, paul.m.surace@usace.army.mil or Stephen Davidson, 412-395-7504, stephen.davidson@usace.army.mil. The District retains the right to deny any contractor and subcontractor employee from working on one of its contracts based on final background investigation results

3.3.3 Identification Of Employees

The Contractor shall be responsible for furnishing an identification badge/card to each employee prior to the employee working on-site and for requiring each employee engaged on the work to display identification. Identification shall consist of name tags with the name of the Contractor and the employee's name. As a minimum, a valid state driver's license or other government-issued photo identification card is required for positive identification.

3.3.4 E-Quip Information Needed for Contractors

Information Needed for Contractors

Full Name

Date of Birth

City of Birth

Social Security Number

Country of Birth

Are they a US Citizen

E-mail Address

Phone Number (Primary and Secondary

Supervisor Full Name

Supervisor E-mail Address

Supervisor Phone Number

Government POC Full Name

Government POC E-mail Address

Government POC Phone Number

-- End of Section --

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SECTION 01 35 26

GOVERNMENTAL SAFETY REQUIREMENTS

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 SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.34	(2001; R 2012) Protection of the Public on or Adjacent to Construction Sites

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code
NFPA 70E	(2015) Standard for Electrical Safety in the Workplace

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926	Safety and Health Regulations for Construction

1.2 DEFINITIONS

a. High Visibility Accident. Any mishap which may generate publicity or high visibility.

b. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even through provided by a physician or registered personnel.

c. Recordable Injuries or Illnesses. Any work-related injury or illness that results in:

(1) Death, regardless of the time between the injury and death, or the length of the illness;

(2) Days away from work (any time lost after day of injury/illness onset);

(3) Restricted work;

(4) Transfer to another job;

(5) Medical treatment beyond first aid;

(6) Loss of consciousness; or

(7) A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

d. "USACE" property and equipment specified in USACE EM 385-1-1 should be interpreted as Government property and equipment.

1.3 SUBMITTALS

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

SD-01 Preconstruction Submittals

Accident Prevention Plan (APP); G, RE

Confined Space Entry Plan; G, RE

Activity Hazard Analysis (AHA); G, RE

SD-06 Test Reports

Submit reports as their incidence occurs, in accordance with the requirements of the paragraph entitled, "Reports."

Accident Reports

Monthly Exposure Reports

1.4 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this contract, comply with the most recent edition of USACE EM 385-1-1, and the following federal, state, and local laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern.

1.5 SITE QUALIFICATIONS, DUTIES AND MEETINGS

1.5.1 Personnel Qualifications

1.5.1.1 Site Safety and Health Officer (SSHO)

Provide a Site Safety and Health Officer (SSHO) at the the work site at all times to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The Contractor Quality Control (QC) person can be the SSHO on this project. The SSHO shall meet the following requirements:

A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects.

30-hour OSHA construction safety class or equivalent within the last 5 years.

An average of at least 24 hours of formal safety training each year for the past 5 years with training for competent person status for at least the following areas of competency: Excavation; Scaffolding; Fall Protection; and Personal Protective Equipment and Clothing to include selection, use and maintenance.

1.5.2 Personnel Duties

1.5.2.1 Site Safety and Health Officer (SSHO)

The SSHO shall:

a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Attach safety inspection logs to the Contractors' daily production quality control report.

b. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and sub-contractors.

c. Maintain applicable safety reference material on the job site.

d. Attend the pre-construction conference, pre-work meetings including preparatory inspection meeting, and periodic in-progress meetings.

e. Implement and enforce accepted APPS and AHAs.

f. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. Post a list of unresolved safety and health deficiencies on the safety bulletin board.

g. Ensure sub-contractor compliance with safety and health requirements.

h. Maintain a list of hazardous chemicals on site and their material safety data sheets.

Failure to perform the above duties will result in dismissal of the superintendent, QC Manager, and/or SSHO, and a project work stoppage.

The project work stoppage will remain in effect pending approval of a suitable replacement

1.5.3 Meetings

1.5.3.1 Preconstruction Conference

a. Contractor representatives who have a responsibility or significant role in accident prevention on the project shall attend the preconstruction conference. This includes the project superintendent, site safety and health officer, quality control supervisor, or any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).

b. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.

c. Deficiencies in the submitted APP will be brought to the attention of the Contractor at the preconstruction conference, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.

1.6 ACCIDENT PREVENTION PLAN (APP)

Use a qualified person to prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of USACE EM 385-1-1 and as supplemented herein. Cover all paragraph and subparagraph elements in USACE EM 385-1-1, Appendix A, "Minimum Basic Outline for Accident Prevention Plan". Specific requirements for some of the APP elements are described below. The APP shall be job-specific and address any unusual or unique aspects of the project or activity for which it is written. The APP shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer, the Contractor Quality Control Manager, and any designated CSP or CIH.

Submit the APP to the Contracting Officer 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP.

Once accepted by the Contracting Officer, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this

contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.

Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and quality control manager. Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSE/SAFE A10.34,) and the environment.

Copies of the accepted plan will be maintained at the Contracting Officer's office and at the job site. Continuously review and amend the APP, as necessary, throughout the life of the contract. Incorporate unusual or high-hazard activities not identified in the original APP as they are discovered.

1.6.1 EM 385-1-1 Contents

In addition to the requirements outlined in Appendix A of USACE EM 385-1-1, the following is required:

a. Site Demolition Plan. The safety and health aspects prepared in accordance with Section 02 41 00 DEMOLITION and referenced sources. Include engineering survey as applicable.

b. Excavation Plan. The safety and health aspects prepared in accordance with Section 31 00 00 EARTHWORK.

c. Confined Space Entry Plan. The safety and health aspects prepared in accordance with Section 01 35 00.00 08 SPECIAL PROCEDURES. No work within the existing stone arch culvert shall be permitted until the Confined Space Entry Plan and Permit is submitted and approved by the Contracting Officer.The appropriate amount of personnel, type of sensors and safety equipment, and up-to-date confined space certificates are required prior to starting and shall be present during all work within the culvert. All equipment and activities shall comply with EM 385-1-1 and OSHA requirements. A Confined Space Competent Person (CSCP) shall be present during the inspection. The definition of a CSCP is stated in section 34, subsection A.03.d within EM 385-1-1 and is defined as, "a person with thorough knowledge of OSHA's Confined Space Standard, 29 CFR 1910.146, experience with Permit Required Confined Space (PRCS) space entry procedures and the authority to supervise and influence how work is performed on job sites and in facilities.The government is concerned with the safety of workers within the existing culvert.

1.7 ACTIVITY HAZARD ANALYSIS (AHA)

The Activity Hazard Analysis (AHA) format shall be in accordance with USACE EM 385-1-1, Section 1. Submit the AHA for review at least 15 calendar days prior to the start of each phase. Format subsequent AHAs as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.

The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.

Develop the activity hazard analyses using the project schedule as the basis for the activities performed. Any activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier or subcontractor and provided to the prime contractor for submittal to the Contracting Officer.

1.8 DISPLAY OF SAFETY INFORMATION

Within 1 calendar day(s) after commencement of work, erect a safety bulletin board at the job site. Where size, duration, or logistics of project do not facilitate a bulletin board, an alternative method, acceptable to the Contracting Officer, that is accessible and includes all mandatory information for employee and visitor review, shall be deemed as meeting the requirement for a bulletin board. Include and maintain information on safety bulletin board as required by EM 385-1-1, section 01.A.06. Additional items required to be posted include:

1.9 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturer's manuals.

1.10 EMERGENCY MEDICAL TREATMENT

Contractors will arrange for their own emergency medical treatment. Government has no responsibility to provide emergency medical treatment.

1.11 NOTIFICATIONS AND REPORTS

1.11.1 Accident Notification

Notify the Contracting Officer as soon as practical, but no more than four hours after any accident meeting the definition of Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than $2,000, or any weight handling equipment accident. Within notification include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on-site and Government investigation is conducted.

1.11.2 Accident Reports

a. Conduct an accident investigation for recordable injuries and illnesses, for Medical Treatment defined in paragraph DEFINITIONS, property damage accidents resulting in at least $2,000 in damages, and near misses as defined in EM 385-1-1, to establish the root cause(s) of the accident. Complete the applicable USACE Accident Report Form 3394, and provide the report to the Contracting Officer within 5calendar day(s) of the accident. The Contracting Officer will provide copies of any required or special forms.

b. Conduct an accident investigation for any weight handling equipment accident (including rigging gear accidents) to establish the root cause(s) of the accident, complete the WHE Accident Report (Crane and Rigging Gear) form and provide the report to the Contracting Officer within 30 calendar days of the accident. Do not proceed with crane operations until cause is determined and corrective actions have been implemented to the satisfaction of the contracting officer. The Contracting Officer will provide a blank copy of the accident report form.

1.11.3 Monthly Exposure Reports

Monthly exposure reporting to the Contracting Officer is required to be submitted by the 5th day of the month. This report is a compilation of employee hours worked each month for all site workers, both prime and subcontractor. The Contracting Officer will provide copies of any special forms.

1.12 FACILITY OCCUPANCY CLOSURE

Streets, walks, and other facilities occupied and used by the Government shall not be closed or obstructed without written permission from the Contracting Officer.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 CONSTRUCTION AND/OR OTHER WORK

3.1.1 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with USACE EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocynates, lead-based paint are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials. The Radiation Safety Officer (RSO) must be notified prior to excepted items of radioactive material and devices being brought on base.

3.1.2 Unforeseen Hazardous Material

The design should have identified materials such as PCB, lead paint, and friable and non-friable asbestos and other OSHA regulated chemicals (i.e. 29 CFR Part 1910.1000). If material, not indicated, that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to

"FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."

3.2 PRE-OUTAGE COORDINATION MEETING

Contractors are required to apply for utility outages at least 15 days in advance. As a minimum, the request should include the location of the outage, utilities being affected, duration of outage and any necessary sketches. Special requirements for electrical outage requests are contained elsewhere in this specification section. Once approved, and prior to beginning work on the utility system requiring shut down, attend a pre-outage coordination meeting with the Contracting Officer and the Installation representative to review the scope of work and the lock-out/tag-out procedures for worker protection. No work will be performed on energized electrical circuits unless proof is provided that no other means exist.

3.3 EQUIPMENT

3.3.1 Material Handling Equipment

a. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions.

b. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions.

c. Operators of forklifts or power industrial trucks shall be licensed in accordance with OSHA.

3.4 EXCAVATIONS

Perform soil classification by a competent person in accordance with 29 CFR 1926.

3.4.1 Utility Locations

Prior to digging, the appropriate digging permit must be obtained. All underground utilities in the work area must be positively identified by a private utility locating service in addition to any station locating service and coordinated with the station utility department. Any markings made during the utility investigation must be maintained throughout the contract.

3.4.2 Utility Location Verification

The Contractor must physically verify underground utility locations by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system. Digging within 2 feet of a known utility must not be performed by means of mechanical equipment; hand digging shall be used. If construction is parallel to an existing utility expose the utility by hand digging every 100 feet if parallel within 5 feet of the excavation.

3.4.3 Shoring Systems

Trench and shoring systems must be identified in the accepted safety plan and AHA. Manufacture tabulated data and specifications or registered

engineer tabulated data for shoring or benching systems shall be readily available on-site for review. Job-made shoring or shielding must have the registered professional engineer stamp, specifications, and tabulated data. Extreme care must be used when excavating near direct burial electric underground cables.

3.4.4 4 Trenching Machinery

Operate trenching machines with digging chain drives only when the spotters/laborers are in plain view of the operator. Provide operator and spotters/laborers training on the hazards of the digging chain drives with emphasis on the distance that needs to be maintained when the digging chain is operating. Keep documentation of the training on file at the project site.

3.5 UTILITIES WITHIN CONCRETE SLABS

Utilities located within concrete slabs or pier structures, bridges, and the like, are extremely difficult to identify due to the reinforcing steel used in the construction of these structures. Whenever contract work involves concrete chipping, saw cutting, or core drilling, the existing utility location must be coordinated with station utility departments in addition to a private locating service. Outages to isolate utility systems must be used in circumstances where utilities are unable to be positively identified. The use of historical drawings does not alleviate the contractor from meeting this requirement.

3.6 ELECTRICAL

3.6.1 Conduct of Electrical Work

Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to performing each cut. Positive cable identification must be made prior to submitting any outage request for electrical systems. Arrangements are to be coordinated with the Contracting Officer and Station Utilities for identification. The Contracting Officer will not accept an outage request until the Contractor satisfactorily documents that the circuits have been clearly identified. Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers will be permitted to enter. When work requires Contractor to work near energized circuits as defined by the NFPA 70, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses. In addition, provide electrical arc flash protection for personnel as required by NFPA 70E. Insulating blankets, hearing protection, and switching suits may also be required, depending on the specific job and as delineated in the Contractor's AHA.

3.6.2 Portable Extension Cords

Size portable extension cords in accordance with manufacturer ratings for

the tool to be powered and protected from damage. Immediately removed from service all damaged extension cords. Portable extension cords shall meet the requirements of NFPA 70E and OSHA electrical standards.

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SOURCES FOR REFERENCE PUBLICATIONS

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SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization, (e.g. ASTM B564 Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers which were not assigned by the standards producing organization should be ordered from the source by title rather than by number.

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)
38800 Country Club Drive
Farmington Hills, MI 48331
Ph: 248-848-3700
Fax: 248-848-3701
E-mail: bkstore@concrete.org
Internet: http://www.concrete.org

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
444 North Capital Street, NW, Suite 249
Washington, DC 20001
Ph: 202-624-5800
Fax: 202-624-5806
E-Mail: info@aashto.org
Internet: http://www.aashto.org

AMERICAN HARDBOARD ASSOCIATION (AHA)
1210 West Northwest Highway
Palatine, IL 60067
Ph: 847-934-8800
Fax: 847-934-8803
E-mail: aha@hardboard.org
Internet: http://www.hardboard.org

AMERICAN PETROLEUM INSTITUTE (API)
1220 L Street, NW
Washington, DC 20005-4070
Ph: 303-397-7993

Fax: 303-397-2740
E-mail: greg.kallio@ihs.com
Internet: http://www.api.org

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
1801 Alexander Bell Drive
Reston, VA 20191-4400
Ph: 703-295-6300 - 800-548-2723
Fax: 703-295-6333
E-mail: member@asce.org
Internet: http://www.asce.org

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)
1800 East Oakton Street
Des Plaines, IL 60018-2187
Ph: 847-699-2929
Fax: 847-768-3434
E-mail: customerservice@asse.org
Internet: http://www.asse.org

AMERICAN WELDING SOCIETY (AWS)
550 N.W. LeJeune Road
Miami, FL 33126
Ph: 800-443-9353 - 305-443-9353
Fax: 305-443-7559
E-mail: info@aws.org or customerservice@awspubs.com
Internet: http://www.aws.org

ASME INTERNATIONAL (ASME)
Three Park Avenue, M/S 10E
New York, NY 10016-5990
Ph: 800-854-7179 or 800-843-2763
Fax: 212-591-7674
E-mail: infocentral@asme.org
Internet: http://www.asme.org

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 610-832-9585
Fax: 610-832-9555
E-mail: service@astm.org
Internet: http://www.astm.org

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)
933 North Plum Grove Road
Schaumburg, IL 60173-4758
Ph: 847-517-1200 or 800-328-6306
Fax: 847-517-1206
Internet: http://www.crsi.org/

INTERNATIONAL CODE COUNCIL (ICC)
5360 Workman Mill Road
Whittier, CA 90601
Ph: 1-888-422-7233
Fax: 562-908-5524
E-mail: webmaster@iccsafe.org
Internet: www.iccsafe.org

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
1, ch. de la Voie-Creuse
Case Postale 56
CH-1211 Geneve 20 Switzerland
Ph: 41-22-749-01-11
Fax: 41-22-733-34-30
E-mail: central@iso.ch
Internet: http://www.iso.org

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
1 Batterymarch Park
Quincy, MA 02169-7471
Ph: 617-770-3000 or 800-344-3555
Fax: 617-770-0700
E-mail: webmaster@nfpa.org
Internet: http://www.nfpa.org

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)
100 Bureau Drive
Stop 1070
Gaithersburg, MD 20899-1070
Ph: 301-975-NIST (6478
E-mail: inquiries@nist.gov
Internet: http://www.nist.gov

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (PADEP)
Rachel Carson State Office Building
400 Market Street
Harrisburg, PA 17101
Ph: 717-783-2300
Internet: http://www.depweb.state.pa.us

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PDT)
PennDOT Sales Store
P.O. Box 2028
Harrisburg, PA 17105-2028
Ph: 717-787-6746
Fax: 717-787-8779
Internet: http://www.dot.state.pa.us

POST-TENSIONING INSTITUTE (PTI)
38800 Country Club Drive
Farmington Hills, MI 48331
Ph: 248-848-3180
Fax: 248-848-3181
E-mail: info@post-tensioning.org
Internet: http://www.post-tensioning.org/

U.S. ARMY CORPS OF ENGINEERS (USACE)
CRD-C DOCUMENTS available on Internet:
http://www.wbdg.org/ccb/browse_cat.php?c=68
Order Other Documents from:
USACE Publications Depot
Attn: CEHEC-IM-PD
2803 52nd Avenue
Hyattsville, MD 20781-1102
Ph: 301-394-0081

Fax: 301-394-0084
E-mail: pubs-army@usace.army.mil
Internet: http://www.publications.usace.army.mil/
or
http://www.hnc.usace.army.mil/Missions/Engineering/TECHINFO.aspx

U.S. DEPARTMENT OF AGRICULTURE (USDA)
Order AMS Publications from:
AGRICULTURAL MARKETING SERVICE (AMS)
Seed Regulatory and Testing Branch
801 Summit Crossing Place, Suite C
Gastonia, NC 28054-2193
Ph: 704-810-8871
Fax: 704-852-4189
E-mail: seed.ams@usda.gov
Internet: http://www.ams.usda.gov/lsg/seed.htm
Order Other Publications from:
U.S. Department of Agriculture, Rural Utilities Service
14th and Independence Avenue, SW, Room 4028-S
Washington, DC 20250
Ph: 202-720-2791
Fax: 202-720-2166
Internet: http://www.usda.gov/rus

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20004
Ph: 202-272-0167
for Fax and E-mail see below
Internet: http://www.epa.gov
--- Some EPA documents are available only from:
National Technical Information Service (NTIS)
5301 Shawnee Road
Alexandria, VA 22312
Ph: 703-605-6050 or 1-688-584-8332
Fax: 703-605-6900
E-mail: info@ntis.gov
Internet: http://www.ntis.gov

U.S. GENERAL SERVICES ADMINISTRATION (GSA)
General Services Administration
1275 First St. NE
Washington, DC 20417
Ph: 202-501-1231
Internet: http://www.gsaelibrary.gsa.gov/ElibMain/home.do
Obtain documents from:
Acquisition Streamlining and Standardization Information System (ASSIST)
Internet: https://assist.dla.mil/online/start/; account registration required

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
8601 Adelphi Road
College Park, MD 20740-6001
Ph: 866-272-6272
Fax: 301-837-0483
E-mail: contactcenter@gpo.gov
Internet: http://www.archives.gov

Order documents from:
Superintendent of Documents
U.S.Government Printing Office (GPO)
732 North Capitol Street, NW
Washington, DC 20401
Ph: 202-512-1800
Fax: 202-512-2104
E-mail: contactcenter@gpo.gov
Internet: http://www.gpoaccess.gov

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

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QUALITY CONTROL

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QUALITY CONTROL

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.

ASTM INTERNATIONAL (ASTM)

ASTM D3740	(2012a) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E329	(2014a) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2012) International Building Code

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all associated costs will be included in the applicable Bid Schedule unit or lump-sum prices.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor Quality Control (CQC) Plan; G, RE

SD-07 Certificates

CQC Training

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Establish and maintain an effective quality control (QC) system in compliance with the Contract Clause titled "Inspection of Construction." QC consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. Cover all construction operations, both onsite and offsite, and be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of work and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. In this context the highest level manager responsible for the overall construction activities at the site, including quality and production is the project superintendent. The project superintendent must maintain a physical presence at the site at all times and is responsible for all construction and related activities at the site, except as otherwise acceptable to the Contracting Officer.

3.2 QUALITY CONTROL PLAN

Submit no later than 30 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The Government will consider an interim plan for the first 90days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional work.

3.2.1 Content of the CQC Plan

Include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff will implement the three phase control system for all aspects of the work specified. Include a CQC System Manager who reports to the project superintendent.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. Letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities will be issued by the CQC System Manager. Copies of these letters must be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures must be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities approved by the Contracting Officer must be used.)

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

j. Any special inspection requirements as required in accordance with ICC IBC

3.2.2 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.3 Notification of Changes

After acceptance of the CQC Plan, notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. Submit the CQC Plan a minimum of 21 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the Government, signed by both the Contractor and the Contracting Officer and will become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual

understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 Personnel Requirements

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure safety and contract compliance. The Safety and Health Manager shall conform to the requirements in Section01 35 26 GOVERNMENT SAFETY REQUIREMENTS and shall recieve direction and authority from the CQC System Manager and serve as a member of the CQC staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff must maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff will be subject to acceptance by the Contracting Officer. Provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly complete and furnish all letters, material submittals, shop drawing submittals, schedules and all other project documentation to the CQC organization. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2 CQC System Manager

Identify as CQC System Manager an individual within the onsite work organization who is responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager must be a construction person with a minimum of 10 years in related work. This CQC System Manager must be on the site at all times during construction and be employed by the prime Contractor. The CQC System Manager and the SSHO can be the same individual on this project. The Project Superintendent is to be a separate individual from the CQC Manager and SSHO. Identify in the plan an alternate to serve in the event of the CQC System Manager's absence. The requirements for the alternate are the same as the CQC System Manager.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: concrete, concrete and soils materials technician. These individuals must be directly employed by the prime Contractor and may not be employed by a supplier or subcontractor on this project; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals must have no other duties other than quality control.

Experience Matrix	
Area	Qualifications
Concrete, Pavements and Soils	Materials Technician with 2 yrs experience for the appropriate area

3.4.4 Additional Requirement

In addition to the above experience and/or education requirements the CQC System Manager must have completed the course entitled "Construction Quality Management For Contractors" CQC Training;. Completion of the course offered by any Corps of Engineers District will be accepted upon presentation of a valid certificate.

3.4.5 Organizational Changes

Maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, must comply with the requirements in Section 01 33 00 SUBMITTAL PROCEDURES. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the contract requirements.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control must be conducted by the CQC System Manager for each definable feature of the construction work as follows:

3.6.1 Preparatory Phase

This phase is performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase includes:

a. A review of each paragraph of applicable specifications, reference codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.

b. Review of the contract drawings.

c. Check to assure that all materials and/or equipment have been tested, submitted, and approved.

d. Review of provisions that have been made to provide required control inspection and testing.

e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

f. Examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

g. Review of the appropriate activity hazard analysis to assure safety requirements are met.

h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

i. Check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

j. Discussion of the initial control phase.

k. The Government must be notified at least48 hours in advance of beginning the preparatory control phase. Include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the preparatory phase actions by separate minutes prepared by the CQC System Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase is accomplished at the beginning of a definable feature of work. Accomplish the following:

a. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Government must be notified at least 24 hours in advance of beginning the initial phase. Prepare separate minutes of this phase by the CQC System Manager and attach to the daily CQC report. Indicate the exact location of initial phase for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. Record the checks in the CQC documentation. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. Procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. Perform the following activities and record and provide the following data:

a. Verify that testing procedures comply with contract requirements.

b. Verify that facilities and testing equipment are available and comply with testing standards.

c. Check test instrument calibration data against certified standards.

d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

e. Record results of all tests taken, both passing and failing on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

The listing of validated testing laboratories is available at:

http://www.erdc.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/476661/materials-testing-center/.

3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel must meet criteria detailed in ASTM D3740 and ASTM E329.

3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge of $1,200.00 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Conduct an inspection of the work by the CQC Manager near the end of the work, or any increment of the work established by a time stated in the SPECIAL CONTRACT REQUIREMENTS Clause 52.211-10, "Commencement, Prosecution, and Completion of Work", or by the specifications. Prepare and include in the CQC documentation a punch list of items which do not conform to the approved drawings and specifications, as required by paragraph DOCUMENTATION. Include within the list of deficiencies the estimated date by which the deficiencies will be corrected. Make a second inspection the CQC System Manager or staff to ascertain that all deficiencies have been corrected. Once this is accomplished, notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. Ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Correct any items noted on the Pre-Final inspection in a timely manner. These inspections and any deficiency corrections required by this paragraph must be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting

Officer's Representative must be in attendance at the final acceptance inspection. Additional Government personnel may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notify the Contracting Officer at least 14 days prior to the final acceptance inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9 DOCUMENTATION

Maintain current records providing factual evidence that required quality control activities and/or tests have been performed. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, as a minimum, the following information:

a. Contractor/subcontractor and their area of responsibility.

b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

d. Test and/or control activities performed with results and references to specifications/drawings requirements. Identify the control phase (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.

e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

f. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.

g. Offsite surveillance activities, including actions taken.

h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

i. Instructions given/received and conflicts in plans and/or specifications.

k. Contractor's verification statement.

Indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. Furnish the original and one copy of these records in report form to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, prepare and submit

one report for every 7 days of no work and on the last day of a no work period. All calendar days must be accounted for throughout the life of the contract. The first report following a day of no work will be for that day only. Reports must be signed and dated by the CQC System Manager. Include copies of test reports and copies of reports prepared by all subordinate quality control personnel within the CQC System Manager Report.

3.10 NOTIFICATION OF NONCOMPLIANCE

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

-- End of Section --

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RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE(RMS CM)

-- End of Section Table of Contents --

SECTION 01 45 00.15 10

RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE(RMS CM)

PART 1 GENERAL

1.1 REFERENCES

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

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

1.2 CONTRACT ADMINISTRATION

The Government will use the Resident Management System (RMS) to assist in its monitoring and administration of this contract. The Contractor uses the Government-furnished Construction Contractor Mode of RMS, referred to as RMS CS, to record, maintain, and submit various information throughout the contract period. The Contractor mode user manuals, updates, and training information can be downloaded from the RMS web site (http://rms.usace.army.mil). The joint Government-Contractor use of RMS facilitates electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

Administration
Finances
Quality Control
Submittal Monitoring
Scheduling
Import/Export of Data

1.2.1 Correspondence and Electronic Communications

For ease and speed of communications, exchange correspondence and other documents in electronic format to the maximum extent feasible between the Government and Contractor. Correspondence, pay requests and other documents comprising the official contract record are also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

1.2.2 Other Factors

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01 32 01.00 10 PROJECT SCHEDULE, Section 01 33 00 SUBMITTAL PROCEDURES, and Section 01 45 00.00 10 QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through RMS. Also, there is no separate payment for establishing and maintaining the RMS database; costs

associated will be included in the contract pricing for the work.

1.3 RMS SOFTWARE

RMS is a Windows-based program that can be run on a Windows based PC meeting the requirements as specified in Section 1.3. The Government will make available the RMS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor will be responsible to download, install and use the latest version of the RMS software from the Government's RMS Internet Website. Any program updates of RMS will be made available to the Contractor via the Government RMS Website as the updates become available.

1.3.1 RMS CONTRACTOR'S MODE (CM)

RMS Contractor's Mode or RMS CM is the replacement for Quality Control System or QCS. The database remains the same. References to RMS in this specification includes RMS CM.

1.4 SYSTEM REQUIREMENTS

The following is the minimum system configuration required to run RMS and Contractor Mode:

Minimum RMS System Requirements	
Hardware	
Windows-based PC	1.5 GHz 2 core or higher processor
RAM	8 GB
Hard drive disk	200 GB space for sole use by the QCS system
Monitor	Screen resolution 1366 x 768
Mouse or other pointing device	
Windows compatible printer	Laser printer must have 4 MB+ of RAM
Connection to the Internet	minimum 4 Mbs per user
Software	
MS Windows	Windows 7 x 64 bit (RMS requires 64 bit O/S) or newer
Word Processing software	Viewer for MS Word 2013, MS Excel 2013, or newer

Minimum RMS System Requirements	
Microsoft.NET Framework	Coordinate with Government QA Representative for free version required
Email	MAPI compatible
Virus protection software	Regularly upgraded with all issued manufacturer's updates and is able to detect most zero day viruses.

1.5 RELATED INFORMATION

1.5.1 RMS User Guide

After contract award, download instructions for the installation and use of RMS from the Government RMS Internet Website.

1.6 CONTRACT DATABASE

Prior to the pre-construction conference, the Government will provide the Contractor with basic contract award data to use for RMS. The Government will provide data updates to the Contractor as needed. These updates will generally consist of submittal reviews, correspondence status, Quality Assurance(QA) comments, and other administrative and QA data.

1.7 DATABASE MAINTENANCE

Establish, maintain, and update data in the RMS database throughout the duration of the contract at the Contractor's site office. Submit data updates to the Government (e.g., daily reports, submittals, RFI's, schedule updates, payment requests) using RMS. The RMS database typically includes current data on the following items:

1.7.1 Administration

1.7.1.1 Contractor Information

Contain within the database the Contractor's name, address, telephone numbers, management staff, and other required items. Within 7 calendar days of receipt of RMS software from the Government, deliver Contractor administrative data in electronic format in RMS.

1.7.1.2 Subcontractor Information

Contain within the database the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor is listed separately for each trade to be performed. Assign each subcontractor/trade a unique Responsibility Code, provided in RMS. Within 7 calendar days of receipt of RMS software from the Government, deliver subcontractor administrative data in electronic format.

1.7.1.3 Correspondence

Identify all Contractor correspondence to the Government with a serial number. Prefix correspondence initiated by the Contractor's site office with "S". Prefix letters initiated by the Contractor's home (main) office with "H". Letters are numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

1.7.1.4 Equipment

Contain within the Contractor's RMS database a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

1.7.1.5 Management Reporting

RMS includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of RMS. Among these reports are: Progress Payment Request worksheet, Quality Assurance/Quality Control (QA/QC) comments, Submittal Register Status, Three-Phase Control checklists.

1.7.1.6 Request For Information (RFI)

Exchange all Requests For Information (RFI) using the Built-in RFI generator and tracker in RMS.

1.7.2 Finances

1.7.2.1 Pay Activity Data

Include within the RMS database a list of pay activities that the Contractor develops in conjunction with the construction schedule. The sum of pay activities equals the total contract amount, including modifications. Each pay activity must be assigned to a Contract Line Item Number (CLIN). The sum of the activities equals the amount of each CLIN. The sum of all CLINs equals the contract amount.

1.7.2.2 Payment Requests

Prepare all progress payment requests using RMS. Complete the payment request worksheet, prompt payment certification, and payment invoice in RMS. Update the work completed under the contract, measured as percent or as specific quantities, at least monthly. After the update, generate a payment request report using RMS. Submit the payment request, prompt payment certification, and payment invoice with supporting data using RMS CM. If permitted by the Contracting Officer, email or a optical disc may be used. A signed paper copy of the approved payment request is also required and will govern in the event of discrepancy with the electronic version.

1.7.3 Quality Control (QC)

RMS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other Contractor QC requirements. Maintain this data on a daily basis. Entered data will automatically output to the

RMS generated daily report. Provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section 01 45 00.00 10 QUALITY CONTROL. Within seven calendar days of Government acceptance, submit a RMS update reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.7.3.1 Daily Contractor Quality Control (CQC) Reports.

RMS includes the means to produce the Daily CQC Report. The Contractor can use other formats to record basic Quality Control(QC) data. However, the Daily CQC Report generated by RMS must be the Contractor's official report. Summarize data from any supplemental reports by the Contractor and consolidate onto the RMS-generated Daily CQC Report. Submit daily CQC Reports as required by Section 01 45 00.00 10 QUALITY CONTROL. Electronically submit reports to the Government within 24 hours after the date covered by the report. Also provide the Government a signed, printed copy of the daily CQC report.

1.7.3.2 Deficiency Tracking.

Use RMS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using its Quality Control (QC) punch list items. Maintain a current log of its QC punch list items in the RMS database. The Government will log the deficiencies it has identified using its Quality Assurance (QA) punch list items. The Government's QA punch list items will be included in its export file to the Contractor. Regularly update the correction status of both QC and QA punch list items.

1.7.3.3 QC Requirements

Develop and maintain a complete list of QC testing and required structural and life safety special inspections required by the International Code Council (ICC), transferred and installed property, and user training requirements in RMS. Update data on these QC requirements as work progresses, and promptly provide the information to the Government via RMS.

1.7.3.4 Three-Phase Control Meetings

Maintain scheduled and actual dates and times of preparatory and initial control meetings in RMS.

1.7.3.5 Labor and Equipment Hours

Log labor and equipment exposure hours on a daily basis. The labor and equipment exposure data will be rolled up into a monthly exposure report.

1.7.3.6 Accident/Safety Reporting

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be provided via RMS CM. Regularly update the correction status of the safety comments. In addition, utilize RMS to advise the Government of any accidents occurring on the jobsite. A brief supplemental entry of an accident is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 300.

1.7.3.7 Features of Work

Include a complete list of the features of work in the RMS database. A feature of work is associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

1.7.3.8 Hazard Analysis

Use RMS CM to develop a hazard analysis for each feature of work included in the CQC Plan. The Activity Hazard Analysis will include information required by EM 385-1-1, paragraph 01.A.13.

1.7.4 Submittal Management

The Government will provide the initial submittal register in electronic format. Thereafter, maintain a complete list of submittals, including completion of data columns. Dates when submittals are received and returned by the Government will be included. Use RMS CM to track and transmit submittals. ENG Form 4025, submittal transmittal form, and the submittal register update is produced using RMS. RMS will be used to update, store and exchange submittal registers and transmittals. In addition to requirements stated in specification 01 33 00, actual submittals are to be stored in RMS CM, with hard copies also provided. Exception will be where the Contracting Officer specifies only hard copies required, where size of document cannot be saved in RMS CM, and where samples, spare parts, color boards, and full size drawings are to be provided.

1.7.5 Schedule

Develop a construction schedule consisting of pay activities, in accordance with Section 01 32 01.00 10 PROJECT SCHEDULE. Input and maintain in the RMS database the schedule either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01 32 01.00 10 PROJECT SCHEDULE). Include with each pay request the updated schedule. Provide electronic copies of transmittals.

1.7.6 Import/Export of Data

RMS includes the ability to import schedule data using SDEF.

1.8 IMPLEMENTATION

Use of RMS CM as described in the preceding paragraphs is mandatory. Ensure that sufficient resources are available to maintain contract data within the RMS CM system. RMS CM is an integral part of the Contractor's management of quality control.

1.9 MONTHLY COORDINATION MEETING

Update the RMS CM database each workday. At least monthly, generate and submit a schedule update. At least one week prior to submittal, meet with the Government representative to review the planned progress payment data submission for errors and omissions.

Make required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will not be accepted. The Government will not

process progress payments until all required corrections are processed.

1.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, will be deemed sufficient for the purpose of notification.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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PROJECT SIGN

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SECTION 01 50 10

PROJECT SIGN

PART 1 GENERAL

1.1 SUMMARY

The work covered by this Section consists of fabricating, erecting and maintaining the Project Identification sign. The the signs shall be installed within 15 calendar days prior to the start of work and shall be maintained in good condition throughout the construction period. All items will remain the property of the Contractor and shall be removed at the end of the contract.

1.2 APPLICABLE PUBLICATIONS

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

U.S. ARMY CORPS OF ENGINEERS (USACE)

EP 310-1-6a (2006) Sign Standards Manual, Volume 1

1.3 PAYMENT

No separate or direct payment will be made for the items listed in this Section, and such work will be considered as a subsidiary obligation of the Contractor.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having an "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Project Sign; G, RE

Drawing depicting the sign as it will be constructed.

1.5 CONSTRUCTION PROJECT SIGNS

Construction project signs shall be coordinated with the Contracting Officer. Include one Project Identification Sign. The layout of all signs shall be in accordance with the standards specified in EP 310-1-6a.

1.6 PROJECT IDENTIFICATION SIGN

Provide one project identification sign constructed in accordance with EP 310-1-6a, Section 16. The following information shall be used for the Project Identification Sign:

Corps relationship to project:

Design and Construction Supervised by:

Division/District

Pittsburgh District

One to three line title to describe work

Conemaugh Lake
Blairsville Slide - Permanent Embankment and Culvert Repairs

One to two line identification of project or name of sponsoring department:

(Leave Blank)

One to five line identification of prime contractor - this information is optional.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Wood

Wood material for the posts shall be preservative treated, structural grade Douglas Fir or No. 1 Southern Pine, or better. All other wood members shall be of well seasoned, kiln dried, clear redwood, bald cypress, red cedar, Douglas fir, spruce, tulip poplar, or white pine. The lumber materials shall be free of splits, wane, and loose knots or pitch pockets. All members of the sign shall be fastened with screws or bolts of type, size, number, and spacing to provide rigid construction and neat appearance. If the vertical supports system does not rigidly support the sign due to local soil conditions and/or wind loading additional bracing of the sign supports shall be provided. This additional bracing shall be composed of 2" x 4" bracing bolted to the inside face of each 4" x 4" support post and firmly anchored to the ground behind the sign. This additional bracing is not required to be treated lumber. Two-inch x four-inch struts shall be installed between the 4" x 4" support posts to reinforce the top and bottom edges of the sign panels.

2.1.2 Sign Face

The sign faces shall be electronically printed on white non-reflective vinyl decals four mils thick. The sign face decals shall be mounted on panels of 3/4" thick high density overlay exterior plywood with single-sided vinyl facing. The entire circumference of the sign panels will be sealed and protected with white vinyl trim cap. A protective overlaminate film shall be applied over the sign face decals capable of minimizing the deteriorating effects of ultraviolet radiation and providing additional protection against weathering and application of graffiti.

2.1.3 Fasteners

All bolts shall be 0.375" diameter and 4" long Allen head bolts, threaded to match T-nuts.

PART 3 EXECUTION

3.1 SIGN PLAN

Provide a dimensioned drawing of the Project Sign to the Contracting Officer for approval.

3.2 INSTALLATION

The Contractor shall affix the panels to the posts with the Allen head bolts prior to erection of the signs, including drilling counter-sunk 0.375 inch diameter holes in the posts to match the T-nut locations. The Contractor shall take all precautions necessary to protect the faces of the signs from damage during assembly and construction. The signs shall be installed upon commencement of the work under this contract. The location in which each sign is to be installed shall be cleared and leveled to facilitate the installation of, and provide easy visual contact with, the signs. Installation and positioning of the sign plate and posts shall be as indicated on the attached Project Sign Standards. Excavation and backfilling of the holes for posts and installation of the posts, braces, and stakes shall be such that signs are installed plumb and level.

3.3 MAINTENANCE

The Contractor shall maintain the signs in good condition and the sign site in a neat condition throughout the construction period. The safety performance record shall be updated daily.

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ENVIRONMENTAL PROTECTION

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SECTION 01 57 20.00 10

ENVIRONMENTAL PROTECTION

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.

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

33 CFR 328	Definitions of Waters of the United States
40 CFR 279	Standards for the Management of Used Oil
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 355	Emergency Planning and Notification
40 CFR 68	Chemical Accident Prevention Provisions
49 CFR 171 - 178	Hazardous Materials Regulations

1.2 DEFINITIONS

1.2.1 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally and/or historically.

1.2.2 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2.3 Contractor Generated Hazardous Waste

Contractor generated hazardous waste means materials that, if abandoned or

disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene etc.), waste thinners, excess paints, excess solvents, waste solvents, and excess pesticides, and contaminated pesticide equipment rinse water.

1.2.4 Land Application for Discharge Water

The term "Land Application" for discharge water implies that the Contractor must discharge water at a rate which allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" must occur. Land Application must be in compliance with all applicable Federal, State, and local laws and regulations.

1.2.5 Surface Discharge

The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers,creeks, and/or "waters of the United States" and would require a permit to discharge water from the governing agency.

1.2.6 Waters of the United States

All waters which are under the jurisdiction of the Clean Water Act, as defined in 33 CFR 328.

1.3 GENERAL REQUIREMENTS

Minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work must be protected during the entire duration of this contract. Comply with all applicable environmental Federal, State, and local laws and regulations. Any delays resulting from failure to comply with environmental laws and regulations will be the Contractor's responsibility.

1.4 SUBCONTRACTORS

Ensure compliance with this section by subcontractors.

1.5 PAYMENT

No separate payment will be made for work covered under this section. Payment of fees associated with environmental permits, application, and/or notices obtained by the Contractor, and payment of all fines/fees for violation or non-compliance with Federal, State, Regional and local laws and regulations are the Contractor's responsibility. All costs associated with this section must be included in the contract price.

1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in

accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Protection Plan; G, RE

The environmental protection plan.

1.7 ENVIRONMENTAL PROTECTION PLAN

Prior to commencing construction activities or delivery of materials to the site, submit an Environmental Protection Plan for review and approval by the Contracting Officer. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Issues of concern must be defined within the Environmental Protection Plan as outlined in this section. Address each topic at a level of detail commensurate with the environmental issue and required construction task(s). Topics or issues which are not identified in this section, but are considered necessary, must be identified and discussed after those items formally identified in this section. Prior to submittal of the Environmental Protection Plan, meet with the Contracting Officer for the purpose of discussing the implementation of the initial Environmental Protection Plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. The Environmental Protection Plan must be current and maintained onsite by the Contractor.

1.7.1 Compliance

No requirement in this Section will relieve the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor will be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

1.7.2 Contents

Include in the environmental protection plan, but not limit it to, the following:

a. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.

b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable.

c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.

d. Description of the Contractor's environmental protection personnel training program.

e. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.

f. Include in the Spill Control plan the procedures, instructions, and

reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The Spill Control Plan supplements the requirements of EM 385-1-1. Include in this plan, as a minimum:

(1) The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual will immediately notify the Contracting Officer and the local Fire Department in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. Include in the plan a list of the required reporting channels and telephone numbers.

(2) The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup.

(3) Training requirements for Contractor's personnel and methods of accomplishing the training.

(4) A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.

(5) The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.

(6) The methods and procedures to be used for expeditious contaminant cleanup.

g. A non-hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris and schedules for disposal.

(1) Identify any subcontractors responsible for the transportation and disposal of solid waste. Submit licenses or permits for solid waste disposal sites that are not a commercial operating facility.

(2) Evidence of the disposal facility's acceptance of the solid waste must be attached to this plan during the construction. Attach a copy of each of the Non-hazardous Solid Waste Diversion Reports to the disposal plan. Submit the report for the previous quarter on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted (e.g. the first working day of January, April, July, and October).

(3) Indicate in the report the total amount of waste generated and total amount of waste diverted in cubic yards or tons along with the percent that was diverted.

(4) A recycling and solid waste minimization plan with a list of measures to reduce consumption of energy and natural resources. Detail in the plan the Contractor's actions to comply with and to participate in Federal, State, Regional, and local government

sponsored recycling programs to reduce the volume of solid waste at the source.

h. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.

i. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In accordance with EM 385-1-1, a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be onsite at any given time must be included in the contaminant prevention plan. Update the plan as new hazardous materials are brought onsite or removed from the site.

j. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, the plan must include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the waste water, the plan must include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented. If surface discharge will be the method of disposal, include a copy of the permit and associated documents as an attachment prior to discharging the waste water. If disposal is to a sanitary sewer, the plan must include documentation that the Waste Water Treatment Plant Operator has approved the flow rate, volume, and type of discharge.

k. A historical, archaeological, cultural resources, and biological resources plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, and biological resources known to be on the project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, and biological resources not previously known to be onsite or in the area are discovered during construction. Include in the plan methods to assure the protection of known or discovered resources, identifying lines of communication between Contractor personnel and the Contracting Officer.

1.7.3 Appendix

Attach to the Environmental Protection Plan, as an appendix, copies of all environmental permits, permit application packages, approvals to construct, notifications, certifications, reports, and termination documents.

1.8 PROTECTION FEATURES

This paragraph supplements the Contract Clause FAR 52.236-9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Contracting Officer will make a joint condition survey. Immediately following the survey, the Contractor will prepare a brief report including

a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. This survey report will be signed by both the Contractor and the Contracting Officer upon mutual agreement as to its accuracy and completeness. The Contractor must protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference which their preservation may cause to the work under the contract.

1.9 SPECIAL ENVIRONMENTAL REQUIREMENTS

1.9.1 Fuels and Lubricants

Fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spills and evaporation. Lubricants and waste oil to be discarded shall be stored in marked corrosion-resistant containers and recycled or disposed in accordance with Federal, State, and local laws and regulations.

1.9.2 Other Requirements

The Contractor shall review the governing documents, and attachments (notably the PPC Plan), and other project requirements.

1.10 ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations from the drawings, plans and specifications, requested by the Contractor and which may have an environmental impact, will be subject to approval by the Contracting Officer and may require an extended review, processing, and approval time. The Contracting Officer reserves the right to disapprove alternate methods, even if they are more cost effective, if the Contracting Officer determines that the proposed alternate method will have an adverse environmental impact.

1.11 NOTIFICATION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. After receipt of such notice, the Contractor will inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions will be granted or equitable adjustments allowed for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 ENVIRONMENTAL PERMITS AND COMMITMENTS

Contractor shall comply with all environmental requirements by Federal, State, Regional, and local environmental laws and regulations.

3.2 LAND RESOURCES

Confine all activities to areas defined by the drawings and specifications. Identify any land resources to be preserved within the work area prior to the beginning of any construction. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval, except in areas indicated on the drawings or specified to be cleared. Ropes, cables, or guys will not be fastened to or attached to any trees for anchorage unless specifically authorized. Provide effective protection for land and vegetation resources at all times, as defined in the following subparagraphs. Remove stone, soil, or other materials displaced into uncleared areas.

3.2.1 Work Area Limits

Mark the areas that need not be disturbed under this contract prior to commencing construction activities. Mark or fence isolated areas within the general work area which are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, any markers must be visible in the dark. The Contractor's personnel must be knowledgeable of the purpose for marking and/or protecting particular objects.

3.2.2 Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved must be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques. Restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

3.2.3 Erosion and Sediment Controls

Providing erosion and sediment control measures in accordance with Federal, State, and local laws and regulations is the Contractor's responsibility. Select and maintain the erosion and sediment controls such that water quality standards are not violated as a result of construction activities. The area of bare soil exposed at any one time by construction operations should be kept to a minimum. Construct or install temporary and permanent erosion and sediment control best management practices (BMPs) as indicated on the drawings. BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope stabilization, compost filter socks, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. Remove any temporary measures after the area has been stabilized.

3.2.4 Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor

facilities will be made only when approved. Erosion and sediment controls must be provided for onsite borrow and spoil areas to prevent sediment from entering nearby waters. Temporary excavation and embankments for plant and/or work areas must be controlled to protect adjacent areas.

3.3 WATER RESOURCES

Monitor all water areas affected by construction activities to prevent pollution of surface and ground waters. Do not apply toxic or hazardous chemicals to soil or vegetation unless otherwise indicated. For construction activities immediately adjacent to impaired surface waters, the Contractor must be capable of quantifying sediment or pollutant loading to that surface water when required by State or Federally issued Clean Water Act permits.

3.3.1 Wastewater

Wastewater directly derived from construction activities shall not be discharged into Sulphur Run before being treated to remove sediment and pollutants. Wastewater discharge shall be in accordance with the approved wastewater management plan.

3.4 AIR RESOURCES

Equipment operation, activities, or processes will be in accordance with all Federal and State air emission and performance laws and standards.

3.4.1 Particulates

Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials; must be controlled at all times, including weekends, holidays and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with all State and local visibility regulations.

3.4.1.1 Hydrocarbons and Carbon Monoxide

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

3.4.1.2 Concrete Debris Processing

Sprinkling or other methods approved by the Contracting Officer shall be employed at the concrete processing area in order to prevent emission of particulates outside the work area.

3.4.2 Odors

Odors from construction activities must be controlled at all times. The

odors must be in compliance with State regulations and/or local ordinances and may not constitute a health hazard.

3.4.3 Sound Intrusions

Keep construction activities under surveillance and control to minimize environment damage by noise. Comply with the provisions of the State of Pennsylvania rules.

3.4.4 Burning

Burning is prohibited on the Government premises.

3.4.5 Monitoring of Air Quality

Monitoring of air quality shall be the responsibility of the Contractor. All air areas affected by the construction activities shall be kept under surveillance by the Contractor to prevent violation of the Commonwealth of Pennsylvania Air Pollution Control Law and local regulations.

3.5 CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes will be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

3.5.1 Solid Wastes

Place solid wastes (excluding clearing debris) in containers which are emptied on a regular schedule. Handling, storage, and disposal must be conducted to prevent contamination. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with solid waste. Transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill will be the minimum acceptable offsite solid waste disposal option. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. All disposal sites must be properly permitted and commercially available.

3.5.2 Chemicals and Chemical Wastes

Dispense chemicals ensuring no spillage to the ground or water. Perform and document periodic inspections of dispensing areas to identify leakage and initiate corrective action. This documentation will be periodically reviewed by the Government. Collect chemical waste in corrosion resistant, compatible containers. Collection drums must be monitored and removed to a staging or storage area when contents are within 6 inches of the top. Wastes will be classified, managed, stored, and disposed of in accordance with Federal, State, and local laws and regulations.

3.5.3 Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable State and local regulations. Hazardous materials are defined in 49 CFR 171 - 178. At a minimum, manage and store hazardous waste in compliance with 40 CFR 262. Take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. Segregate hazardous waste from other materials and wastes, protect it from the weather by placing it in a safe covered location, and take precautionary measures such

as berming or other appropriate measures against accidental spillage. Storage, describing, packaging, labeling, marking, and placarding of hazardous waste and hazardous material in accordance with 49 CFR 171 - 178, State, and local laws and regulations is the Contractor's responsibility. Transport Contractor generated hazardous waste off Government property within 60 days in accordance with the Environmental Protection Agency and the Department of Transportation laws and regulations. Dispose of hazardous waste in compliance with Federal, State and local laws and regulations. Spills of hazardous or toxic materials must be immediately reported to the Contracting Officer. Cleanup and cleanup costs due to spills are the Contractor's responsibility. All disposed material should be disposed of at a properly permitted, commercially available site.

3.5.4 Fuel and Lubricants

Storage, fueling and lubrication of equipment and motor vehicles must be conducted in a manner that affords the maximum protection against spill and evaporation. Manage and store fuel, lubricants and oil in accordance with all Federal, State, Regional, and local laws and regulations. Used lubricants and used oil to be discarded must be stored in marked corrosion-resistant containers and recycled or disposed in accordance with 40 CFR 279, State, and local laws and regulations. Storage of fuel on the project site will be in accordance with all Federal, State, and local laws and regulations.

3.5.5 Waste Water

Wastewater from construction activities, such as concrete curing, concrete clean-up, water used in concrete trucks, forms, etc., shall not be allowed to enter waterways or to be discharged prior to being treated to remove pollutants. The Contractor shall dispose of the construction related wastewater off Government property in accordance with all Federal, State, Regional, and Local laws and regulations.

3.6 RECYCLING AND WASTE MINIMIZATION

Participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project.

3.7 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, all activities that may damage or alter such resources will be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. Cease all activities that may result in impact to or the destruction of these resources. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

3.8 BIOLOGICAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants including their habitat. The protection of threatened and endangered animal and plant species, including their habitat, is the Contractor's responsibility in accordance with Federal, State, Regional, and local laws and regulations.

3.9 PREVIOUSLY USED EQUIPMENT

Clean all previously used construction equipment prior to bringing it onto the project site. Ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the USDA jurisdictional office for additional cleaning requirements.

3.10 MAINTENANCE OF POLLUTION FACILITIES

Maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

3.11 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel must be trained in all phases of environmental protection and pollution control. Conduct environmental protection/pollution control meetings for all personnel prior to commencing construction activities. Additional meetings must be conducted for new personnel and when site conditions change. Include in the training and meeting agenda: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, and endangered species and their habitat that are known to be in the area.

3.12 POST CONSTRUCTION CLEANUP

The Contractor will clean up all areas used for construction in accordance with Contract Clause: FAR 52.236-12 "Cleaning Up". Unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed area must be graded, filled and the entire area seeded unless otherwise indicated.

-- End of Section --

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STORM WATER POLLUTION CONTROL

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SECTION 01 57 23.00 08

STORM WATER POLLUTION CONTROL

PART 1 GENERAL

1.1 SCOPE

This section addresses temporary water pollution control measures during construction and permanent storm water pollution control measures to be constructed upon completion of construction.

1.2 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.

ASTM INTERNATIONAL (ASTM)

ASTM D3212	(2007; R 2013) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D4873	(2002; R 2009) Identification, Storage, and Handling of Geosynthetic Rolls and Samples
ASTM F2306	Standard Specification for 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile- Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications
ASTM F477	(2014) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION (PADEP)

ESPCP Manual	(March 2012) Erosion and Sediment Pollution Control Manual

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PDT)

PDT 408	(2011) Specifications

1.3 GENERAL REQUIREMENTS

Contractor shall implement the storm water pollution prevention measures to prevent sediment from entering streams or water bodies as specified in this Section in conformance with the requirements of Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION and the Erosion and Sediment Control Plan.

1.4 SYSTEM DESCRIPTION

The work consists of implementing the storm water pollution prevention measures to prevent sediment from entering streams or water bodies as shown on the drawings and as specified in this Section in conformance with the requirements of Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION, and the requirements of the Erosion and Sediment Control Plan.

1.5 EROSION AND SEDIMENT CONTROLS

The controls and measures required of the Contractor are described below.

1.5.1 Stabilization Practices

The stabilization practices to be implemented include temporary seeding, mulching, geotextiles, compost filter socks, stone protection, protection of trees, preservation of mature vegetation, etc. On the daily CQC Report, record the dates when the major grading activities occur, (e.g., clearing and grubbing, excavation, fill or stone placement, and grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in paragraphs Unsuitable Conditions and NO Activity For Less Than 21 Days, initiate stabilization practices as soon as practicable, but no more than 14 days, in any portion of the site where construction activities have temporarily or permanently ceased.

1.5.1.1 Unsuitable Conditions

Where the initiation of stabilization measures by the fourteenth day after construction activity temporarily or permanently ceases or is precluded by unsuitable conditions caused by the weather, initiate stabilization practices as soon as practicable after conditions become suitable.

1.5.1.2 No Activity for Less Than 21 Days

When the total time period in which construction activity is temporarily ceased on a portion of the site is 7 days minimum, stabilization practices do not have to be initiated on that portion of the site until 14 days have elapsed after construction activity temporarily ceased.

1.5.1.3 Protection of Erodible Soils

Immediately finish the earthwork brought to a final grade, as indicated or specified, and protect the side slopes and back slopes upon completion of rough grading. Plan and conduct earthwork to minimize the duration of exposure of unprotected soils.

1.5.2 Structural Practices

Implement structural practices to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Implement structural practices in a timely manner, during the construction process, to minimize erosion and sediment runoff. Location and details of installation and construction are shown on the drawings.

1.5.3 Vegetation and Mulch

a. Provide temporary protection on sides and back slopes as soon as rough

grading is completed or sufficient soil is exposed to require erosion protection. Protect slopes by accelerated growth of permanent vegetation, temporary vegetation, mulching, or netting. Stabilize slopes by seeding, anchoring mulch in place, covering with anchored netting, sodding, or such combination of these and other methods necessary for effective erosion control.

b. Seeding: Provide new seeding where ground is disturbed. Include topsoil or nutriment during the seeding operation necessary to establish a suitable stand of grass. The seeding operation will be as specified in Section 32 92 19 SEEDING.

c. Erosion Control Blankets: Provide erosion control blankets where areas have undergone the clearing and grubbing process. The erosion control blankets are to be installed in accordance with Section 31 32 11 SOIL SURFACE EROSION.

1.6 SUBMITTALS

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

SD-01 Preconstruction Submittals

Erosion And Sediment Controls

SD-03 Product Data

Aggregates; G, RE
Geotextile; G, RE
Pumped Water Filter Bag; G, RE
Compost Filter Sock; G, RE
Pipe Flume and Stream Crossing Corrugated Dual Wall Drainage Pipe; G, RE
Annular Corrugated Single Wall Heavy Duty (HDPE); G, RE
Precast Concrete Inlet; G, RE
Non-Shrink Grout; G, RE
Inlet Grate; G, RE
Filter Bag Inlet Protection; G, RE

SD-07 Certificates

Aggregates; G, RE
Geotextile; G, RE
Pumped Water Filter Bag; G, RE
Compost Filter Sock; G, RE
Pipe Flume and Stream Crossing Corrugated Dual Wall Drainage Pipe; G, RE
Annular Corrugated Single Wall Heavy Duty (HDPE); G, RE
Precast Concrete Inlet; G, RE
Non-Shrink Grout; G, RE
Inlet Grate; G, RE
Filter Bag Inlet Protection; G, RE

1.7 DELIVERY, STORAGE, AND HANDLING

Identify, store and handle filter fabric in accordance with ASTM D4873.

1.7.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Before, during, and after installation, plastic pipe and fittings shall be protected 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 Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.7.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aggregates

Aggregates shall conform to the requirements identified in Section 31 00 00 EARTHWORK.

2.1.2 Geotextile

PDT 408, Section 735. Unless otherwise specified, filter fabric (geotextile) shall be non-woven fabric and shall meet Class 2, Type A Physical Requirements.

2.1.3 Pumped Water Filter Bag

ESPCP Manual, Chapter 3, Pumped Water Filter Bag.

2.1.4 Compost Filter Sock

ESPCP Manual, Chapter 4, Compost Filter Sock. Compost sock fabric shall be 5 mil HDPE material and conform to Table 4.1 and be sized according to Figure 4.2.

2.1.5 Pipe for Culverts and Storm Drains

Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified.

2.1.5.1 Pipe Flume and Stream Crossing Corrugated Dual Wall Drainage Pipe

Corrugated High Density Polyethylene (HDPE) pipe for storm water shall

conform to ASTM F2306, ASTM F2648, and AASHTO M294, or the latest revisions thereof, and shall be smooth interior wall with solid corrugated exterior. All HDPE pipe joints shall consist of integral bell and spigot with rubber gasket that meets specification requirements of ASTM F477. Bell shall span over three (3) spigot corrugations. All joints shall be soil tight, per ASTM F2306, paragraph 6.6.3.1, AASHTO M294, and ASTM D3212.

2.1.5.2 Temporary Slope Pipe

Annular Corrugated Single Wall Heavy Duty (HDPE) pipe for storm water shall conform to ASTM F667, or the latest revisions thereof, and shall be corrugated interior with solid corrugated exterior. Pipes shall connect by external snap.

2.1.6 Filter Bag Inlet Protection

At a minimum, the fabric shall have a minimum grab tensile strength of 120 lbs, a minimum burst strength of 200 psi, and a minimum trapezoidal tear strength of 50 lbs. Filter bags shall be capable of trapping all particles not passing a No. 40 Sieve.

PART 3 EXECUTION

3.1 GENERAL

Construction and installation of erosion and sediment control best management practices (BMP's) shall be in accordance with the applicable requirements of ESPCP Manual and a shown on the contract drawings.

3.1.1 Staging of Construction and Installation of Best Management Practices

Staging of construction and installation of the various erosion and sediment control features shall be in accordance with contract sequence drawings. Any deviations from the approved specified sequence must be approved by the Contracting Officer. If the Contractor proposes deviations from the Erosion and Sediment Control Plan, the Contractor shall submit the revised plan for review and approval at least 30 calendar days prior to installation.

No step in the staging of construction and installation of BMP's which deviates from the specified sequence may be started until the required written approval is received.

3.1.2 Removal of Best Management Practices

Upon completion of construction and stabilization of the landscape features, all temporary erosion and sediment control features shall be removed and the site shall be restored as specified.

3.2 FIELD QUALITY CONTROL

Maintain the temporary, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures.

All temporary storm water pollution control measures and best management practices shall be inspected and maintained in accordance with the Erosion

and Sediment Control Plan and ESPCP Manual. Sediment and other materials removed shall be disposed as specified in Section 02 42 00.00 08 DISPOSAL OF MATERIALS.

3.3 INSPECTIONS

3.3.1 General

The Contractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation and have not been permanently stabilized, stabilization practices, structural practices, other controls, and areas where vehicles exit the site. Such inspections shall be made at least once every seven calendar days and within 24 hours of the end of any storm event

3.4 INSPECTION DETAILS

Inspect disturbed areas and areas used for material storage that are exposed to precipitation for evidence of, or the potential for, pollutants entering the drainage system. Observe erosion and sediment control measures identified in the Erosion and Sediment Control Plan to ensure that they are operating correctly. Inspect discharge locations or points to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Inspect locations where vehicles exit the site for evidence of offsite sediment tracking.

3.5 INSPECTION REPORTS

For each inspection conducted, prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Erosion and Sediment Control Plan, maintenance performed, and actions taken. Furnish the report to the Contracting Officer within 24 hours of the inspection as a part of the Contractor's daily CQC REPORT. A copy of the inspection report shall be maintained on the job site for review by the Indiana County Conservation District and Pennsylvania Department of Environmental Protection (PADEP) upon request.

3.6 EXCAVATION TEMPORARY SLOPE PIPES AND DRAINAGE STRUCTURES

Excavation of trenches, and for appurtenances and backfilling for culverts and storm drains, shall be in accordance with the applicable portions of Section 31 00 00 EARTHWORK and the requirements specified below.

3.6.1 Trenching

The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter as shown on the detail to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing, where required, shall be placed within the trench width as specified, without any over-excavation. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures will be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.

3.6.2 Removal of Rock

Rock in either ledge or boulder formation shall be replaced with suitable

materials to provide a compacted earth cushion having a thickness between unremoved rock and the pipe of at least 8 inches or 1/2 inch for each foot of fill over the top of the pipe, whichever is greater, but not more than three-fourths the nominal diameter of the pipe. Rock excavation shall be as specified and defined in Section 31 00 00 EARTHWORK.

3.6.3 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor while performing shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the Government.

3.7 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe and meet the requirements of ASTM D2321. Use AASHTO No. 57 material for bedding, haunching, and initial backfill.

3.8 PLACING PIPE

Each pipe shall be thoroughly examined before being laid with spigot ends of bell-and-spigot pipe point in the direction of the flow. Defective or damaged pipe shall not be used. Pipes shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. Deflection of installed flexible pipe shall not exceed the PIPE MAXIMUM ALLOWABLE DEFLECTION of 5 percent.

3.9 DRAINAGE STRUCTURES

3.9.1 Precast Concrete Inlet

Contractor shall provide materials and perform work in accordance with the current version of PDT 408.

3.9.2 Inlet Pipe Connections

Connect pipe to inlet using non-shrink grout in accordance with PDT 408, section 1001.2(d).

3.10 METAL ITEMS

3.10.1 Inlet Grate

Grates shall be in accordance with PDT 408 and per RC-45M for structural steel, bicycle safe.

3.11 BACKFILLING

3.11.1 Backfilling Pipe in Trenches

After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation equal to the midpoint (spring line) of HDPE or has reached an elevation of at least 12 inches above the top of the pipe for flexible pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 8 inches.

Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the Contracting Officer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

3.11.2 Backfilling Pipe in Fill Section

For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified below. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 8 inches. Use select granular material for this entire region of backfill for flexible pipe installations.

3.11.3 Movement of Construction Machinery

When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.

3.11.4 Compaction

3.11.4.1 General Requirements

Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

3.11.4.2 Minimum Density

Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.

a. Under paved roads, streets, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.

b. Under unpaved or turfed traffic areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.

c. Under non-traffic areas, density shall be not less than that of the surrounding material.

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CLOSEOUT SUBMITTALS (AS-BUILT DRAWINGS)

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SECTION 01 78 02.00 15

CLOSEOUT SUBMITTALS (AS-BUILT DRAWINGS)

PART 1 GENERAL

1.1 SUBMITTALS

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

SD-11 Closeout Submittals

Working As-Built Drawings; G, RE

Drawings showing final "As-Built" conditions of the project.

1.2 PROJECT RECORD DOCUMENTS

1.2.1 As-Built Drawings

An as-built drawing is a contract construction drawing revised to reflect the final as-built conditions of the project because of modifications, changes, corrections to the project design required during construction, submittals and extensions of design. The terms "drawings," "contract drawings," "drawing files," "working as-built drawings" and "final as-built drawings" refer to contract drawings that are revised to be used for the "RECORD DRAWING AS-BUILTS".

1.2.2 Government Furnished Electronic Technical Contract Documents

The Contractor will be provided files at the beginning of construction, normally at the preconstruction meeting, for use during the construction phase which are to be maintained during construction and for the preparation of as-builts. The files provided will include a complete set of drawing files and specification files with all amendments incorporated. The drawing files provided that are in CAL, PDF, TIF, or other image formats are being provided for use by the Contractor in printing hard copies. The Contractor shall enter changes and corrections on blue line drawings on a weekly basis in accordance with Paragraph "Maintenance of Working As-Built Drawings". Documents shall be available at all times and shall be provided promptly to the Contracting Officer when requested.

1.2.3 Maintenance of Working As-Built Drawings

The Contractor shall revise and maintain during the execution of the project two (2) sets of full-scale paper prints by red-line process to show the as-built conditions during the progression of the project. These working as-built drawings shall be kept current on a weekly basis and available for review on the jobsite at all times. Changes from the contract drawings that are made in the work or additional information that

might be uncovered in the course of construction shall be accurately, legibly and neatly recorded and dated as they occur by means of details and notes. All design variations from the contract drawings, for whatever reason, including those occasioned by modifications, optional material and the required coordination between trades, shall be indicated. These variations shall be shown in the same general detail that is utilized in the contract drawings. Changes must be reflected on all sheets affected by the change.

The working as-built drawings will be jointly reviewed for accuracy and completeness by the COR and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working as built drawings as specified herein, the COR shall deduct from the monthly progress payment an amount representing the estimated cost of maintaining the working as-built drawings. The working as-built drawings shall show the following information, but not be limited thereto:

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, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Valves, splice boxes and similar appurtenances shall be located by dimensioning along the utility run from a reference point. The average depth below the surface of each run shall also be recorded.

b. The location and dimensions of any changes within any structure.

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

d. Additional as-built information that exceeds the detail shown on the Contract Drawings. These as-built conditions include those that reflect structural details, fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations and layouts, equipment, sizes, mechanical and electrical room layouts and other extensions of design, that were not shown in the original contract documents because the exact details were not known until after the time of approved Shop Drawings. It is recognized that these Shop Drawing submittals (revised showing as-built conditions) will serve as the as-built record without actual incorporation into the contract as-built drawings. In turn, the shop drawing shall reference the applicable construction as-built drawing. All such Shop Drawings to be used as final as-built contract drawings must include, along with the hard copy of the drawings, CADD files of the Shop Drawings in a commercially available digital format.

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

f. Changes or modifications which result from the final inspection.

g. Where contract drawings or specifications present options, only the option selected for construction shall be shown on the final as-built prints.

h. If borrow material for this project is from sources on Government

property, or if Government property is used as a spoil area, the Contractor shall furnish a contour map of the final borrow pit/spoil area elevations.

i. Finalized modifications (each applicable change order price proposal shall include the Contractor's cost to change working and final as-built drawings to reflect modifications) and compliance with the following procedures.

a. Directions in the modification for posting descriptive changes shall be followed.

b. A Modification Equilateral Triangle (3/8" per side) shall be placed at the location of each deletion.

c. For new details or sections which are added to a drawing, a Modification Equilateral Triangle shall be placed by the detail or section title.

d. For minor changes, a Modification Equilateral Triangle shall be placed by the area changed on the drawing (each location).

e. For major changes to a drawing, a Modification Equilateral Triangle shall be placed by the title of the affected plan, section, or detail at each location.

f. For changes to schedules or drawings, a Modification Equilateral Triangle shall be placed either by the schedule heading or by the change in the schedule.

1.2.4 Mark-up Guidelines

The following information is provided to improve the quality of the marked-up prints and thereby facilitate preparation of final as-built drawings. The most important guideline is that the marked-up changes on the prints shall be complete and understandable.

a. Where possible use three base colors in marking up the hard copy of the working as-builts. If the base colors are deviated from, provide a legend indicating any special purpose of the colors used. Traditional base colors:

a. Deletions (Red) - Deleted graphic items (lines) shall be colored red with red lettering in notes and leaders.

b. Additions (Green) - Added items shall be drawn in green with green lettering in notes and leaders.

c. Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes shall be in blue.

2. Frequently use written explanations on as-built drawings to describe changes - DO NOT rely totally on graphic means to convey the revision.

3. Legibility of lettering and digit values shall be precise and clear when marking prints, and clarify ambiguities concerning the nature and application of change involved.

4. Wherever a revision is made, make changes to affect 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.

5. When changes are made, cross out all features, data and captions that relate to that revision. DO NOT ERASE

6. When changes are required on small-scale drawings and in restricted areas, suggest large-scale inserts be drawn or sketched, with leaders to the location where applicable.

7. Be sure to add and denote in legend, any additional equipment or material facilities, service lines, etc., incorporated under as-built Revision if not already shown in legend.

8. When attached prints (or sketches) are provided with marked-up print, indicate whether:

a. Entire drawing shall be added to contract drawings in accordance Paragraphs "Maintenance of Working As-Built Drawings" and "Computer Aided Design and Drafting (CADD) Drawings" or

b. Whether the contract drawings shall be changed to agree, or

c. For reference only to further details not required for initial design.

9. Make the comments on the drawing complete without reference to letters, memo's, RFI, or materials that are not also a part of the as-built. Annotating the drawing, “Per Change Order #42,” means nothing when the actual change order states, “added an additional 12 duplex” outlets or similar statements. The same is true when the drawing is marked, “changed per COE instructions.” This office and ultimately the using organizations must know what was changed, how it was changed, where the items(s) were relocated to and how the affected connections were altered. Change Orders usually do not provide information as to how the facility was changed, only what was changed.

10. The markups shall be accomplished on black line prints of the most current sheet.

11. Changes shall be annotated with a triangle and sequential number at the following locations:

a. bottom of the revised detail

b. right hand and bottom border aligned with the revised detail

c. the revision block of the title block

Separate markings shall be made for each modification negotiated into the contract.

12. The sheet index shall be updated if any sheets are added or the sheet name has been modified.

1.2.5 Retainage

The Contractor shall include in his/her bid price, the cost of as-built document preparation. This value shall include all requirements of this clause:

1. Maintenance of working as-built drawings

2. Submittal of as-built documents in the required forms and numbers of copies

If the Contractor fails to maintain the working as-built drawings as specified herein, the Contracting Officer will deduct from the monthly progress payment an amount that, in the Contracting Officer's judgment, represents the estimated cost of bringing the as-built documents up to date. This monthly deduction will continue until an agreement can be reached between the Contracting Officer and the Contractor regarding the accuracy and completeness of working as-built documents.

Retainage for the final as-built drawings in the amount of $50,000 or 1% of the present construction value, whichever is the greater, shall be withheld until the Final As-Built Drawings (including full-scale prints) are accepted by the Government.

No separate payment will be made for providing approved as-built drawings required under this contract. All costs in connection therewith shall be considered a subsidiary obligation of the Contractor.

1.2.6 Preliminary (Working) As-Built Drawings Submittal

Three (3) weeks before occupancy of this facility by the Government, the Contractor shall submit one (1) set of the original working as-built drawings to the Contracting Officer for review and approval. These working as-built marked drawings shall be neat, legible and accurate. The review by Government personnel will be expedited to the maximum extent possible. If upon review, the working as-built drawings are found to contain errors and/or omissions, they will be returned to the Contractor for corrections. The Contractor shall complete the corrections and return the working as-built marked drawings to the Contracting Officer within 15 calendar days. Upon approval, the working as-built drawings will be returned to the Contractor for use in preparation of final as-built drawings.

Partial Occupancy. For projects where portions of construction are to be occupied or activated before overall project completion, including portions of utility systems, as-built drawings for those portions of the facility being occupied or activated shall be supplied at the time the facility is occupied or activated. This same as-built information previously furnished must also be shown on the final set of as-built drawings at project completion.

1.2.7 Final As-Built Drawing Submittal

Within 30 calendar days after Government approval of the approved working as-built drawings or a phase of work, the Contractor shall prepare and make the final as-built drawings. This submittal shall consist of one the following:

1. One set of the approved working as-built drawings

These contract drawings shall be modified as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract drawings into agreement with approved working as-built drawings, adding such additional drawings as may be necessary.

In the event the Contractor accomplishes additional work which changes the as-built conditions of the facility, after submission and approval of the working as-built drawings, he shall be responsible for the addition of these changes to the working as-built drawings and also to the final as-built documents.

Any transactions or adjustments necessary to accomplish this is the responsibility of the Contractor. The Government reserves the right to reject any drawing files it deems incompatible with the customer's CADD system. Paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final as-built drawing files and marked prints as specified shall be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final as-built drawings shall be accomplished before final payment is made to the Contractor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

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DIVISION 02 - EXISTING CONDITIONS

SECTION 02 41 00

DEMOLITION

-- End of Section Table of Contents --

SECTION 02 41 00

DEMOLITION

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 SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.6	(2006) Safety Requirements for Demolition Operations

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

1.2 PROJECT DESCRIPTION

1.2.1 Demolition

Prepare a Demolition Plan and submit proposed removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Coordinate with Waste Management Plan. Provide procedures for safe conduct of the work in accordance with EM 385-1-1. Plan shall be approved by Contracting Officer prior to work beginning.

1.2.2 General Requirements

Do not begin demolition until authorization is received from the Contracting Officer. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

1.3 ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated.

1.3.1 Existing Construction Limits and Protection

Do not execute work or disturb existing site conditions beyond the extent

indicated or necessary for removal of items required to be removed. Remove debris from work areas daily.

1.3.2 Utility Service

Maintain and protect against damage all existing utilities indicated to stay in service and protect against damage during demolition operations. Prior to start of work, utilities serving each area of removal will be shut off by the Government and disconnected and sealed by the Contractor.

1.3.3 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and/or pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities.

1.4 BURNING

Burning at the project site for the disposal of refuse and debris will not be permitted.

1.5 SUBMITTALS

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

SD-01 Preconstruction Submittals

Existing Condition Survey; G, RE

Demolition Plan; G, RE

1.6 QUALITY ASSURANCE

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," conform to the safety requirements contained in ASSE/SAFE A10.6. Comply with the Environmental Protection Agency requirements specified. Use of explosives will not be permitted.

1.6.1 Dust and Debris Control

Prevent the spread of dust and debris and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if, determined by the Contracting Officer, it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

1.7 TEMPORARY RELOCATIONS

The Contractor, with the approval of the Contracting Officer, may remove any fences, gates, signs, posts, equipment, fixtures, piping, or other miscellaneous items on Government property which would interfere with his operations, and reinstall these items after all interfering construction is complete. The Contractor shall disassemble such items and store them for reinstallation at a later time. The items shall be stored in a safe

location, and in a manner to prevent damage. Any damaged items, as a result of the Contractor's neglect during disassembly, storage, and/or reinstallation shall be repaired or replaced to the satisfaction of the Contracting Officer.

1.8 EXISTING CONDITION SURVEY

Before beginning any demolition work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs will be acceptable as a record of existing conditions. Include in the record possible conflicting utilities, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to starting work. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document. Submit survey results.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED AND/OR REINSTALLED

3.1.1 Concrete Structures

Concrete structures to be removed include existing catch basins and headwalls, concrete pavement, and pre-cast concrete blocks supporting temporary construction, as indicated on the contract drawings.

All edges of concrete to be removed, except where the edge of a repair area occurs at a joint, shall be saw cut to the full depth of the removal, unless otherwise shown on the contract drawings, or specified elsewhere. All edges of concrete removal shall be made square. Feathered edges will be permitted. Concrete shall be removed by an approved method(s) that will not injure adjacent concrete to remain in place or remove excessive amounts of concrete beyond that which is permitted.

Blasting for removal of concrete will not be permitted

Hand-held air or hydraulic-driven chipping hammers shall be considered acceptable types of power tools. Other removal methods will be permitted, with the approval of the Contracting Officer. Demolition of concrete with explosives will not be permitted. Adequate safety measures shall be provided to protect workers, equipment, and structures in the vicinity of the work. All equipment shall be subject to the review and approval of the Contracting Officer.

Concrete and or debris shall be collected and retained near to its point of removal. The Contractor's method of debris control and removal shall be described in his demolition plan and must meet the approval of the Contracting Officer.

3.1.2 Steel Plates

Remove steel plates from the temporary embankment stabilization as

indicated in the contract documents. Ensure that adequate safety measures are provided to protect workers, equipment, and the adjacent hillside.

3.2 STONE ARCH CULVERT

Remove the failed portion of the stone arch culvert to the extents shown on the drawings, or as directed by the Contracting Officer. Blasting for removal of culvert materials will not be permitted. All debris shall be contained and collected in a manner that does not impact the stream.

3.3 SECURITY FENCE

Remove the section of chain-link fence to the extent shown on the contract drawings, or as directed by the Contracting Officer.

3.4 CONCURRENT EARTH-MOVING OPERATIONS

Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition work until all demolition in the area has been completed and debris disposed. Fill holes and other hazardous openings.

3.5 CLEANUP

3.5.1 Debris and Rubbish

Debris and rubbish as a result of the Contractor's demolition operations shall be removed from the limits of the work.

3.5.2 Regulations

Local site and municipal regulations regarding hauling and disposal apply.

3.6 DISPOSAL OF REMOVED MATERIALS

3.6.1 General

Materials generated under this contract shall be managed and disposed of in accordance with the following paragraphs. The Contractor shall submit, as part of the Disposal Plan, the method(s) and safety provision(s) by which he intends to collect, handle, transport, and dispose of concrete debris and solid wastes.

3.6.2 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from demolition in accordance with all applicable federal, state and local regulations as contractually specified in the Disposal Plan.

3.6.3 Removal from Government Property

Transport waste materials removed from demolished and deconstructed structures, except waste soil, from Government property in accordance with Section 02 42 00 DISPOSAL OF MATERIALS. Dispose of waste soil as directed by the Contracting Officer.

-- End of Section --

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DIVISION 02 - EXISTING CONDITIONS

SECTION 02 42 00

DISPOSAL OF MATERIALS

-- End of Section Table of Contents --

SECTION 02 42 00

DISPOSAL OF MATERIALS

PART 1 GENERAL

1.1 SUMMARY

This section covers disposal of all materials resulting from excavation, demolition and construction operations under this contract.

1.2 REFERENCES

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

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 262.22	Number of Copies
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
49 CFR 171	Hazardous Materials Regulations

1.3 DEFINITIONS

1.3.1 Demolition Debris

Demolition debris is concrete, stone, wood, pipe, bituminous pavement, and miscellaneous items resulting from the demolition of structures or other facilities.

1.3.2 Excavated Material

Soil, rock and incidental debris like materials removed during excavation for construction.

1.3.3 Hazardous Waste

Hazardous substances as defined in 40 CFR 261, or as defined by applicable State and local regulations.

1.3.4 Permitted Solid Waste Disposal Facility

A permitted solid waste disposal facility is a commercially available, properly permitted facility which is properly permitted by the state in which the work is located for the disposal of municipal, residual, or construction/demolition waste. The facility shall be permitted to accept

the particular material being disposed.

1.3.5 Solid Waste

Solid waste is rubbish, debris, waste materials, garbage, and other discarded solid materials (excluding clearing debris).

1.4 SUBMITTALS

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

SD-01 Preconstruction Submittals

Disposal Plan; G, RE

Waste Classification, Handling, and Disposal Plan; G, RE

Disposal Sites; G, RE

Salvaged Materials; G, RE

List of specific waste materials that will be salvaged for resale, salvaged and reused on the current project, salvaged and stored for reuse on a future project, or recycled. Recycling facilities that will be used shall be identified by name, location, and phone number, including a copy of the permit or license for each facility.

1.5 ENVIRONMENTAL PROTECTION REQUIREMENTS

The Contractor shall comply with all applicable Federal, State, and local statues, laws and regulations. The Contractor shall provide environmental protective measures and procedures to prevent and control pollution, limit habitat disruption, and correct environmental damage that occurs during construction as specified in Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION.

1.6 FEDERAL ENVIRONMENTAL COMPLIANCE REQUIREMENTS FOR CONTRACTOR-PROPOSED DISPOSAL SITE

These requirements apply only to that material which is identified as acceptable for disposal at an area other than a permitted solid waste disposal facility.

1.6.1 Background

As an agency of the Federal government, the Pittsburgh District, US Army Corps of Engineers (District), is responsible for insuring compliance of its activities, including those undertaken by its contractors, with all applicable Federal environmental and cultural protection statutes and regulations.

Disposal sites proposed by the Contractor must be commercially available and properly permitted sites which comply with all pertinent Federal and State environmental protection statutes. The Contractor shall submit

documentation verifying that the Contractor's proposed disposal site meets all Federal environmental statutes and is commercially available. District approval of a Contractor-proposed disposal site is predicated upon the Contractor's demonstration that the site is in compliance with Federal statutes and is commercially available.

1.7 DISPOSAL PLAN

The procedures proposed for the collection, handling, transporting and disposal of the various materials to be disposed of under this contract shall be submitted for approval. The procedures shall provide for the safe conduct of the work and compliance with applicable Federal, state and local laws and regulations. The disposal procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operation. The plan shall include the name and location of all disposal facilities to be utilized for disposal of materials under this contract. The Contractor shall also furnish evidence of all required Federal, State or local permits and approvals. (See also paragraph "FEDERAL ENVIRONMENTAL COMPLIANCE REQUIREMENTS FOR CONTRACTOR-PROPOSED DISPOSAL SITE".) The plan shall be updated prior to any new hazardous material being brought on site or removed from the site. No work shall commence until the disposal plan has been approved.

1.8 WASTE CLASSIFICATION, HANDLING, AND DISPOSAL PLAN

The Contractor is responsible for assuring the proper disposal of all hazardous and nonhazardous waste generated during the project. Therefore, the Contractor shall develop a Waste Classification, Handling, and Disposal Plan in accordance with the requirements of 40 CFR 261 and 40 CFR 262. The waste classification, handling, and disposal plan shall include the source of materials, special handling requirements, and proposed disposal site. In addition, the following provisions shall be included:

a. Hazardous waste shall be placed in closed containers and shall be shielded adequately to prevent dispersion of the waste by wind or water. Any evidence of improper storage shall be cause for immediate shutdown of the project until corrective action is taken.

b. Nonhazardous solid waste shall be stored in closed containers separate from hazardous waste storage areas.

c. All hazardous waste shall be transported by a licensed transporter in accordance with 40 CFR 263 and 49 CFR 171.

d. All nonhazardous waste shall be transported in accordance with local regulations regarding waste transportation.

e. A copy of a waste profile sheet, identifying the particular waste and the proposed disposal site shall be submitted for each load of waste material before it is transported offsite.

f. The Contractor shall obtain a "Non-Hazardous Waste Manifest Form" from the properly permitted and commercially available residual waste disposal facility for all wastes which are classified as non-hazardous, and submit the manifest to the Contracting Officer.

g. In addition to the number of manifest copies required by 40 CFR 262.22, one copy of each manifest for hazardous waste shall be supplied to the Contracting Officer prior to transportation.

h. Waste shall be disposed of on a daily basis.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 SPECIAL DISPOSAL REQUIREMENTS

3.1.1 Containment of Debris

Debris from demolition and construction operations shall not be permitted to enter the river, lake or stream. All materials shall be contained in a manner to permit complete removal from the site.

3.1.2 Disposal of Solid Wastes

Solid waste shall be placed in containers and disposed on a regular schedule. All handling and disposal shall be conducted in such a way as to prevent spillage and contamination. The Contractor shall transport all solid waste off Government property and dispose at a commercially available and properly permitted solid waste disposal facility in compliance with Federal, State, and local requirements.

3.1.3 Disposal of Demolition Debris

Demolition products, except that which is to be recycled or salvaged, shall be transported from Government property for proper disposal at a commercially available and properly permitted solid waste disposal facility in compliance with Federal, State, and local requirements. Metals which are removed may be recycled as scrap. Materials which are coated with lead based paints shall be disposed in accordance with paragraph "Disposal of Materials with Lead Coatings". Paving materials may be be disposed in accordance with paragraph "Recycling Materials".

3.1.4 Disposal of Waste Water

Waste water directly derived from construction activities, including but not limited to water used in drilling, concrete cutting, joint preparation, and dewatering of work areas, shall not be discharged before being treated to remove pollutants. Waste water shall be collected and placed in holding tanks so the suspended materials can settle prior to discharge to the stream or watercourse.

3.1.5 Disposal of Contractor Generated Hazardous Wastes

Hazardous waste generated by construction activities shall be removed from the work area and be disposed at a properly permitted commercially available disposal facility in compliance with Federal, State, and local requirements. The Contractor shall maintain separation and/or segregate hazardous waste from other materials and wastes, and shall protect it from the weather by placing it in a safe covered location; precautionary measures against accidental spillage such as berming or other appropriate measures shall be taken. Hazardous waste shall be removed from Government property within 60 days. Hazardous waste shall be transported in accordance with 40 CFR 263. The Contractor shall be responsible for preparing all waste manifests (EPA Form No. 8700-22 "Uniform Hazardous Waste Manifest Form"). A copy of each waste manifest and a copy of the disposal certificate from the Resource Conservation and Recovery Act (RCRA)

facility shall be furnished to the Contracting Officer. Hazardous waste shall not be dumped onto the ground, into storm sewers or open water courses, or into the sanitary sewer system.

3.1.6 Disposal of Materials with Lead Coatings

All metals coated with a lead primer or paint shall become the property of the Contractor, and shall be completely removed from the project site. These items may be sold as scrap (for basic steel processing) with the lead primer/paint adhered, or may be disposed of in accordance with the applicable Federal, State, County and local laws. Items with lead coatings, if not salvaged by the Contractor as scrap metal for reprocessing, shall be disposed of at an EPA approved disposal facility authorized to receive and process materials coated with lead product. The Contractor shall inform all workers involved with the removal of this material of the fact that the material is undercoated with lead primer. Safety and health measures shall conform to EM 385-1-1 and 29 CFR 1926, Part 62. If materials containing lead are disposed of, the Contractor shall perform all required testing of the coating system and submit a certified copy of the test results along with a certified Uniform Hazardous Waste Manifest to the Contracting Officer. The manifest shall document the testing, transport and disposal of the material, and shall attest that the materials were disposed at a facility approved by the Pennsylvania Department of Environmental Resources for processing or disposal of such materials.

3.1.7 Salvaged Materials

Paving materials and other construction debris may be recycled at a commercially available, properly permitted recycling facility. The Contractor shall identify materials proposed for recycling and the recycling facility that will be used.

3.1.8 Burning

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

3.1.9 Disposal of Fuel Oil

Fuel oil removed from tanks and pipes may be used by the Contractor for fuel in his equipment or shall be disposed at a reputable commercial waste petroleum product recycling facility. Fuel removed from equipment, tanks and piping shall not be reused in Government equipment.

3.1.10 Hauling Materials to Disposal Facilities

Care shall be exercised in hauling the materials to the disposal facilities to preclude spillage and damage to public and private property and thoroughfares. Any materials spilled from the hauling equipment shall be removed by the Contractor at the Contractor's expense. The Contractor shall make all necessary arrangements and comply with all requirements associated with hauling the materials over streets and roads.

3.2 DISPOSAL OF EXCAVATED MATERIAL

3.2.1 General

The material excavated which is not used for fill or backfill and

associated debris shall be disposed of in the vicinity of the work as directed by the Contracting Officer.

3.3 INSPECTION

If the Contracting Officer notifies the Contractor in writing of any observed noncompliance with contract requirements or Federal, State, or local laws, regulations and concerning disposal of materials, the Contractor shall inform the Contracting Officer of proposed corrective action and take such action to correct the noncompliance. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping all or part of the work related to the disposal until satisfactory corrective action is taken. No time extensions will be granted and no costs or damages allowed to the Contractor for any such suspension.

3.4 DISPOSAL REQUIREMENTS

The following general requirements apply to disposal of materials.

Table 1
Disposal Requirements

Material	Disposal Requirements	Testing Requirements
Solid Waste	Commercially Available and Properly Permitted Municipal Waste Facility	As required by facility
Demolition Debris other than concrete rubble (including Bituminous Pavement)	Commercially Available and Properly Permitted Municipal or Construction/Demolition Waste Facility	Heavy metals and as required by facility
Waste Water	Discharge after removal of suspended solids	As required by the sewer authority
Contractor Generated Hazardous Waste	Commercially Available and Properly Permitted Hazardous Waste Facility	As required by facility
Fuel	Commercial petroleum waste recycling facility	As required by facility

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DIVISION 03 - CONCRETE

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

-- End of Section Table of Contents --

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

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 CONCRETE INSTITUTE INTERNATIONAL (ACI)

ACI 117	(2010; Errata 2011) Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 121R	(2008) Guide for Concrete Construction Quality Systems in Conformance with ISO 9001
ACI 211.1	(1991; R 2009) Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
ACI 301	(2016) Specifications for Structural Concrete
ACI 304.2R	(1996; R 2008) Placing Concrete by Pumping Methods
ACI 304R	(2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(2010) Guide to Hot Weather Concreting
ACI 306.1	(1990; R 2002) Standard Specification for Cold Weather Concreting
ACI 306R	(2016) Guide to Cold Weather Concreting
ACI 308.1	(2011) Specification for Curing Concrete
ACI 318	(2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016) Building Code Requirements for Structural Concrete and Commentary
ACI 347	(2004; Errata 2008; Errata 2012) Guide to Formwork for Concrete
ACI SP-15	(2011) Field Reference Manual: Standard Specifications for Structural Concrete ACI 301-05 with Selected ACI References
ACI SP-2	(2007; Abstract: 10th Edition) ACI Manual

of Concrete Inspection

ACI SP-66 (2004) ACI Detailing Manual

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4 (1995; R 2004) Basic Hardboard

ASTM INTERNATIONAL (ASTM)

ASTM A1064/A1064M (2016b) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

ASTM A615/A615M (2016) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

ASTM A706/A706M (2016) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM A934/A934M (2016) Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars

ASTM C1017/C1017M (2013; E 2015) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete

ASTM C1077 (2016) Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

ASTM C1107/C1107M (2014a) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

ASTM C1116/C1116M (2010a; R 2015) Standard Specification for Fiber-Reinforced Concrete

ASTM C1218/C1218M (1999; R 2008) Standard Specification for Water-Soluble Chloride in Mortar and Concrete

ASTM C1260 (2014) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)

ASTM C138/C138M (2016a) Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

ASTM C143/C143M (2015) Standard Test Method for Slump of Hydraulic-Cement Concrete

ASTM C150/C150M (2016; E 2016) Standard Specification for

Portland Cement

ASTM C1602/C1602M	(2012) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete
ASTM C172/C172M	(2014a) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173/C173M	(2016) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231/C231M	(2014) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260/C260M	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C295/C295M	(2012) Petrographic Examination of Aggregates for Concrete
ASTM C31/C31M	(2015a; E 2016) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C311/C311M	(2013) Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete
ASTM C33/C33M	(2016) Standard Specification for Concrete Aggregates
ASTM C39/C39M	(2016b) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42/C42M	(2013) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C494/C494M	(2016) Standard Specification for Chemical Admixtures for Concrete
ASTM C618	(2012a) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM C94/C94M	(2016a) Standard Specification for Ready-Mixed Concrete
ASTM C989/C989M	(2014) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM D5759	(2012) Characterization of Coal Fly Ash

	and Clean Coal Combustion Fly Ash for Potential Uses
ASTM D6690	(2015) Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI 10MSP	(2009; 28th Ed) Manual of Standard Practice

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 1	(2009) DOC Voluntary Product Standard PS 1-07, Structural Plywood

1.2 DEFINITIONS

a. "Cementitious material" as used herein must include all portland cement, pozzolan, fly ash, ground granulated blast-furnace slag, and silica fume.

b. "Exposed to public view" means situated so that it can be seen from eye level from a public location after completion of the building. A public location is accessible to persons not responsible for operation or maintenance of the building.

c. "Chemical admixtures" are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.

d. "Supplementary cementing materials" (SCM) include coal fly ash, silica fume, granulated blast-furnace slag, natural or calcined pozzolans, and ultra-fine coal ash when used in such proportions to replace the portland cement that result in improvement to sustainability and durability and reduced cost.

e. "Design strength" (f'c) is the specified compressive strength of concrete at time(s) specified in this section to meet structural design criteria.

f. "Mass Concrete" is any concrete system that approaches a maximum temperature of 158 degrees F within the first 72 hours of placement. In addition, it includes all concrete elements with a section thickness of 3 feet or more regardless of temperature.

g. "Mixture proportioning" is the process of designing concrete mixture proportions to enable it to meet the strength, service life and constructability requirements of the project while minimizing the initial and life-cycle cost.

h. "Mixture proportions" are the masses or volumes of individual ingredients used to make a unit measure (cubic meter or cubic yard) of concrete.

i. "Pozzolan" is a siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing

cementitious properties.

j. "Workability (or consistence)" is the ability of a fresh (plastic) concrete mix to fill the form/mould properly with the desired work (vibration) and without reducing the concrete's quality. Workability depends on water content, chemical admixtures, aggregate (shape and size distribution), cementitious content and age (level of hydration).

1.3 SUBMITTALS

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

SD-01 Preconstruction Submittals

Concrete Curing Plan; G

Laboratory Accredidation; G, RE

Form Removal Schedule; G

SD-02 Shop Drawings

Formwork; G, RE

Reinforcing Steel; G, DO

SD-03 Product Data

Joint Sealants; G, RE

Joint Filler; G, RE

Materials for Forms; G, RE

Cementitious Materials; G, RE

Concrete Curing Materials; G, RE

Reinforcement; G, RE

Admixtures; G, RE

Mechanical Reinforcing Bar Connectors; G, RE

Biodegradable Form Release Agent; G, RE

Pumping Concrete; G, RE

SD-05 Design Data

Concrete Mix Design; G, RE

Formwork Calculations; G

SD-06 Test Reports

Concrete Mix Design

Fly Ash

Pozzolan

Ground Granulated Blast-Furnace Slag

Aggregates

Fiber-Reinforced Concrete

Tolerance Report

Compressive Strength Tests

Unit Weight of Structural Concrete

Ion Concentration

Air Content

Slump Tests

Water

SD-07 Certificates

Reinforcing Bars

Welder Qualifications

VOC Content for Form Release Agents, Curing Compounds, and Concrete Penetrating Sealers

Material Safety Data Sheets

Field Testing Technician and Testing Agency

SD-08 Manufacturer's Instructions

Curing Compound

1.4 DELIVERY, STORAGE, AND HANDLING

Follow ACI 301, ACI 304R and ASTM A934/A934M requirements and recommendations. Do not deliver concrete until vapor retarder, vapor barrier, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. Do not store concrete curing compounds or sealers with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store concrete curing compounds or sealers in occupied spaces.

1.4.1 Reinforcement

Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be

accurately identified after bundles are broken and tags removed.

1.4.1.1 Epoxy Coated Reinforcing Steel

Record coating lot on each shipping notice and carefully identify and re-tag bar bundles from bending plant. Provide systems for handling coated bars which have padded contact areas such as, nylon slings, all free of dirt and grit. Lift bundled coated bars with strong back, multiple supports, or platform bridge to prevent sagging and abrasion. Pad bundling bands where in contact with bars. Do not drop or drag bars or bundles. Store coated bars both in shop and in field, aboveground, on wooden or padded cribbing. Space the dunnage close enough to prevent excessive sags. Stack large quantities of straight bars with adequate protective blocking between layers. Schedule deliveries of epoxy coated bars to the job site to avoid the need for long term storage. Protect from direct sunlight and weather. Cover bars to be stored longer than 12 hours at the job site with opaque polyethylene sheeting or other suitable equivalent protective material.

1.5 QUALITY ASSURANCE

1.5.1 Formwork Calculations

ACI 347. Include design calculations indicating arrangement of forms, sizes and grades of supports (lumber), panels, and related components. Furnish drawings and calculations of shoring and re-shoring methods proposed for floor and roof slabs, spandrel beams, and other horizontal concrete members. Calculations must indicate concrete pressure with both live and dead loads, along with material types.

1.5.2 Concrete Mix Design

Sixty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, complementary cementitious materials, polypropylene fibers, and admixtures; and applicable reference specifications. Submit mill test and all other test for cement, complementary cementitious materials, aggregates, and admixtures. Provide documentation of maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Provide mix proportion data using at least three different water-cementitious material ratios for each type of mixture, which produce a range of strength encompassing those required for each type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Contracting Officer. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted. Resubmit data on concrete components if the qualities or source of components changes. For previously approved concrete mix designs used within the past twelve months, the previous mix design may be re-submitted without further trial batch testing if accompanied by material test data conducted within the last six months. Obtain mix design approval from the contracting officer prior to concrete placement.

1.5.3 Shop Drawings

1.5.3.1 Formwork

Drawings showing details of formwork including, but not limited to; joints, supports, studding and shoring, and sequence of form and shoring removal. Indicate placement schedule, construction, location and method of forming control joints. Include locations of inserts, conduit, sleeves and other embedded items. Reproductions of contract drawings are unacceptable. Submit form removal schedule indicating element and minimum length of time for form removal.

Design, fabricate, erect, support, brace, and maintain formwork so that it is capable of supporting without failure all vertical and lateral loads that may reasonably be anticipated to be applied to the formwork.

1.5.3.2 Reinforcing Steel

ACI SP-66. Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars. Reproductions of contract drawings are unacceptable.

1.5.4 Control Submittals

1.5.4.1 Concrete Curing Plan

Submit proposed materials, methods and duration for curing concrete elements in accordance with ACI 308.1.

1.5.4.2 Pumping Concrete

Submit proposed materials and methods for pumping concrete. Submittal must include mix designs, pumping equipment including type of pump and size and material for pipe, and maximum length and height concrete is to be pumped.

1.5.4.3 VOC Content for form release agents, curing compounds, and concrete penetrating sealers

Submit certification for the form release agent, curing compounds, and concrete penetrating sealers that indicate the VOC content of each product.

1.5.4.4 Material Safety Data Sheets

Submit Material Safety Data Sheets (MSDS) for all materials that are regulated for hazardous health effects. MSDS must be readily accessible during each work shift to employees when they are at the construction site.

1.5.5 Test Reports

1.5.5.1 Fly Ash and Pozzolan

Submit test results in accordance with ASTM C618 for fly ash and pozzolan. Submit test results performed within 6 months of submittal date.

1.5.5.2 Ground Granulated Blast-Furnace Slag

Submit test results in accordance with ASTM C989/C989M for ground

granulated blast-furnace slag. Submit test results performed within 6 months of submittal date.

1.5.5.3 Aggregates

Submit test results in accordance with ASTM C1260 for potential alkali-silica reactions, and ASTM C295/C295M for petrographic analysis.

1.5.5.4 Fiber-Reinforced Concrete

Test to determine flexural toughness index I5 in accordance with ASTM C1116/C1116M.

1.5.6 Concrete Quality Control for Quality Control Plan

As part of the Quality Control Plan submittal listed in Section 01 45 00.00 10 QUALITY CONTROL, the Contractor shall develop and submit for approval a concrete quality control program in accordance with the guidelines of ACI 121R and as specified herein. The plan must include approved laboratory accredidation. Provide direct oversight for the concrete qualification program inclusive of associated sampling and testing. All quality control reports must be provided to the Contracting Officer, Quality Manager and Concrete Supplier. Maintain a copy of ACI SP-15 and CRSI 10MSP at project site.

1.5.7 Quality Control Personnel Certifications

As part of the Quality Control Plan submittal listed in Section 01 45 00.00 10 QUALITY CONTROL, the Contractor must submit for approval the responsibilities of the various quality control personnel, including the names and qualifications of the individuals in those positions in the quality control organizational chart defining the quality control hierarchy and the responsibility of the various positions. Quality control personnel must be employed by the Contractor.

Submit American Concrete Institute certification for the following:

a. CQC personnel responsible for inspection of concrete operations.

b. Lead Foreman or Journeyman of the Concrete Placing, Finishing, and Curing Crews.

c. Field Testing Technicians: ACI Concrete Field Testing Technician, Grade I.

1.5.7.1 Field Testing Technician and Testing Agency

Submit data on qualifications of proposed testing agency and technicians for approval by the Contracting Officer prior to performing testing on concrete.

a. Work on concrete under this contract must be performed by an ACI Concrete Field Testing Technician Grade 1 qualified in accordance with ACI SP-2 or equivalent. Equivalent certification programs must include requirements for written and performance examinations as stipulated in ACI SP-2.

c. Testing agencies that perform testing services on concrete materials must meet the requirements of ASTM C1077.

1.6 ENVIRONMENTAL REQUIREMENTS

1.6.1 Submittals for Environmental Performance

a. Provide data indication the percentage of post-industrial pozzolan (fly ash, blast furnace slag) cement substitution as a percentage of the full product composite by weight.

b. Provide data indicating the percentage of post-industrial and post-consumer recycled content aggregate.

c. Provide product data indicating the percentage of post-consumer recycled steel content in each type of steel reinforcement as a percentage of the full product composite by weight.

d. Provide product data stating the location where all products were manufactured

e. Provide MSDS product information data showing that form release agents meet any environmental performance goals such as using vegetable and soy based products.

f. Provide MSDS product information data showing that concrete adhesives meet any environmental performance goals including low emitting, low volatile organic compound products.

PART 2 PRODUCTS

2.1 MATERIALS FOR FORMS

Provide wood, plywood, carton, or steel. Use plywood or steel forms where a smooth form finish is required.

2.1.1 Wood Forms

Provide lumber that is square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Provide plywood that complies with NIST PS 1, B-B concrete form panels or better or AHA A135.4, hardboard for smooth form lining.

2.1.1.1 Concrete Form Plywood (Standard Rough)

Provide plywood that conforms to NIST PS 1, B-B, concrete form, not less than 5/8-inch thick.

2.1.1.2 Overlaid Concrete Form Plywood (Standard Smooth)

Provide plywood that conforms to NIST PS 1, B-B, high density form overlay, not less than 5/8-inch thick.

2.1.2 Steel Forms

Provide steel form surfaces that do not contain irregularities, dents, or sags.

2.2 FORM TIES AND ACCESSORIES

Provide a form tie system that does not leave mild steel after break-off or

removal any closer than 2 inches from the exposed surface. Do not use wire alone. Form ties and accessories must not reduce the effective cover of the reinforcement.

2.3 CONCRETE MIX DESIGN

2.3.1 Contractor-Furnished Mix Design

ACI 211.1, ACI 301, ACI 318, and ACI 304.2R except as otherwise specified. Indicate the compressive strength (f'c) of the concrete for each portion of the structure(s) as specified below. Where faster set time is required, use Type III cement before using calcium chloride with approval from the contracting officer.

2.3.1.1 ~~Footings~~Performance Requirements

Proportion normal-weight concrete mixture as follows:

a. Pile Cap - Minimum Compressive Strength: ~~4500~~4000 psi at 28 days.

b. Headwall - Minimum Compressive Strength: 5000 psi at 28 days.

~~b~~c. Maximum Water-Cementitious Materials Ratio: 0.45.

~~c~~d. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture plus or minus 1 inch.

~~d~~e. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2 inch nominal maximum aggregate size.

~~e~~f. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1 inch nominal maximum aggregate size.

2.3.1.2 Required Average Strength of Mix Design

The selected mixture must produce an average compressive strength exceeding the specified strength by the amount indicated in ACI 301, but may not exceed the specified strength at the same age by more than 20 percent. When a concrete production facility has a record of at least 15 consecutive tests, the standard deviation must be calculated and the required average compressive strength must be determined in accordance with ACI 301.

2.3.2 Ready-Mix Concrete

Provide concrete that meets the requirements of ASTM C94/C94M.

Ready-mixed concrete manufacturer must provide duplicate delivery tickets with each load of concrete delivered. Provide delivery tickets with the following information in addition to that required by ASTM C94/C94M:

Type and brand cement

Cement and complementary cementitious materials content in 94-pound bags per cubic yard of concrete

Maximum size of aggregate

Amount and brand name of admixtures

Total water content expressed by water cementitious material ratio

2.3.3 Concrete Curing Materials

Provide concrete curing material in accordance with ACI 301 Section 5 and ACI 308.1 Section 2. Submit product data for concrete curing compounds. Submit manufactures instructions for placement of curing compound.

2.4 MATERIALS

2.4.1 Joint Sealants

Submit manufacturer's product data, indicating VOC content.

2.4.1.1 Horizontal Surfaces, 3 Percent Slope, Maximum

ASTM D6690 or ASTM C920, Type M, Class 25, Use T.

2.4.1.2 Vertical Surfaces Greater Than 3 Percent Slope

ASTM C920, Type M, Grade NS, Class 25, Use T [NT].

2.4.2 Cementitious Materials

For exposed concrete, use one manufacturer and one source for each type of cement, ground slag, fly ash, and pozzolan.

2.4.2.1 Fly Ash

ASTM C618, Class F, except that the maximum allowable loss on ignition must not exceed 6 percent. Class F fly ash for use in mitigating Alkali-Silica Reactivity must have a Calcium Oxide (CaO) content of less than 8 percent and a total equivalent alkali content less than 1.5 percent.

Add with cement. Fly ash content must be a minimum of 15 percent by weight of cementitious material, provided the fly ash does not reduce the amount of cement in the concrete mix below the minimum requirements of local building codes. Where the use of fly ash cannot meet the minimum level, provide the maximum amount of fly ash permittable that meets the code requirements for cement content. Report the chemical analysis of the fly ash in accordance with ASTM C311/C311M. Evaluate and classify fly ash in accordance with ASTM D5759.

2.4.2.2 Portland Cement

Provide cement that conforms to ASTM C150/C150M, Type I-II with tri-calcium aluminates (C3A) content less than 10 percent and a maximum cement-alkali content of 0.80 percent Na2Oe (sodium oxide) equivalent.. Use one brand and type of cement for formed concrete having exposed-to-view finished surfaces.

2.4.3 Water

Water must comply with the requirements of ASTM C1602/C1602M. Minimize the amount of water in the mix. Improve workability by adjusting the grading rather than by adding water. Water must be potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete. Submit test report showing water

complies with ASTM C1602/C1602M.

2.4.4 Aggregates

Aggregates should meet the requirements of ASTM C33/C33M, except as modified herein. Furnish aggregates for exposed concrete surfaces from one source. Provide aggregates that do not contain any substance which may be deleteriously reactive with the alkalies in the cement. Submit test report showing compliance with ASTM C33/C33M.

2.4.5 Nonshrink Grout

ASTM C1107/C1107M.

2.4.6 Admixtures

ASTM C494/C494M: Type A, water reducing; Type B, retarding; Type C, accelerating; Type D, water-reducing and retarding; and Type E, water-reducing and accelerating admixture. Do not use calcium chloride admixtures. Submit product data for admixtures used in concrete.

2.4.6.1 Air-Entraining

ASTM C260/C260M.

2.4.6.2 High Range Water Reducer (HRWR) (Superplasticizers)

ASTM C494/C494M, Type F , and ASTM C1017/C1017M.

2.4.7 Expansion/Contraction Joint Filler

ASTM D1751 or ASTM D1752 Type I or II. Material must be 1/2 inch thick.

2.4.8 Biodegradable Form Release Agent

Provide form release agent that is colorless, biodegradable, with a low (maximum of 55 grams/liter (g/l)) VOC content. Provide product that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces. Provide form release agent that does not contain diesel fuel, petroleum-based lubricating oils, waxes, or kerosene. Submit documentation indicating type of biobased material in product and biobased content. Indicate relative dollar value of biobased content products to total dollar value of products included in project.

2.5 REINFORCEMENT

2.5.1 Reinforcing Bars

ACI 301 unless otherwise specified. ASTM A615/A615M with the bars marked A, Grade 60. Submit mill certificates for reinforcing bars.

2.5.1.1 Weldable Reinforcing Bars

Provide weldable reinforcing bars that conform to ASTM A706/A706M and ASTM A615/A615M and Supplement S1, Grade 60, except that the maximum carbon content must be 0.55 percent.

2.5.1.2 Epoxy-Coated Reinforcing Bars

Provide epoxy-coated reinforcing bars that conform to ASTM A934/A934M, Grade 60.

2.5.2 Mechanical Reinforcing Bar Connectors

ACI 301. Provide 125 percent minimum yield strength of the reinforcement bar.

2.5.3 Wire

2.5.3.1 Welded Wire Reinforcement

ASTM A1064/A1064M.

2.5.3.2 Steel Wire

Wire must conform to ASTM A1064/A1064M.

2.5.4 Reinforcing Bar Supports

Supports include bolsters, chairs, spacers, and other devices necessary for proper spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place.

Provide wire bar type supports of coated or non-corrodible material conforming to ACI SP-66 and CRSI 10MSP.

Legs of supports in contact with formwork must be hot-dip galvanized, or plastic coated after fabrication, or stainless-steel bar supports.

PART 3 EXECUTION

3.1 EXAMINATION

Do not begin installation until substrates have been properly constructed; verify that substrates are level.

If substrate preparation is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before processing.

Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Contracting Officer and wait for instructions before beginning installation.

3.2 PREPARATION

Determine quantity of concrete needed and minimize the production of excess concrete. Designate locations or uses for potential excess concrete before the concrete is poured.

3.2.1 General

Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing.

Remove standing water without washing over freshly deposited concrete.

Divert flow of water through side drains provided for such purpose.

3.2.2 Subgrade Under Foundations and Footings

When subgrade material is semiporous and dry, sprinkle subgrade surface with water as required to eliminate suction at the time concrete is deposited, or seal subgrade surface by covering surface with specified vapor retarder. When subgrade material is porous, seal subgrade surface by covering surface with specified vapor retarder.

3.2.3 Reinforcement and Other Embedded Items

Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.

3.3 FORMS

Provide forms, shoring, and scaffolding for concrete placement in accordance with ACI 301 Section 2 and 5 and ACI 347. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch unless otherwise indicated. Provide formwork with clean-out openings to permit inspection and removal of debris.

3.3.1 Coating

Before concrete placement, coat the contact surfaces of forms with a form release agent.

3.3.2 Forms for Standard Rough Form Finish

Provide formwork in accordance with ACI 301 Section 5 with a surface finish, SF-1.0, for formed surfaces that are to be concealed by other construction.

3.3.3 Forms for Standard Smooth Form Finish

Provide formwork in accordance with ACI 301 Section 5 with a surface finish, SF-3.0, for formed surfaces that are exposed to view. Do not provide mockup of concrete surface appearance and texture.

3.3.4 Form Ties

Provide ties in accordance with ACI 301 section 2.

3.3.5 Tolerances for Form Construction

Construct formwork to ensure that after removal of forms and prior to patching and finishing of formed surfaces, provide concrete surfaces in accordance with tolerances specified in ACI 301 Section 5 and ACI 117.

3.3.6 Removal of Forms and Supports

After placing concrete, removal of forms must be in accordance with ACI 301 Section 2 except as modified by approved form removal schedule.

3.4 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

ACI 301 and ACI SP-66. Provide bars, welded wire reinforcement, wire ties,

supports, and other devices necessary to install and secure reinforcement. Reinforcement must not have rust, scale, oil, grease, clay, or foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross-sectional area or the nominal weight per unit length has been reduced. Remove loose rust prior to placing steel. Tack welding is prohibited.

3.4.1 General

Provide details of reinforcement that are in accordance with ACI 301 and ACI SP-66 and as specified.

3.4.2 Reinforcement Supports

Support reinforcement in accordance with ACI 301 Section 3. Supports for coated or galvanized bars must also be coated with electrically compatible material for a distance of at least 2 inches beyond the point of contact with the bars.

3.4.3 Epoxy Coated Reinforcing

Epoxy Coated Reinforcing must meet the requirements of "Guidelines for Job Site Practices" except as otherwise specified herein.

3.4.3.1 Epoxy Coated Reinforcing Steel Placement and Coating Repair

Carefully handle and install bars to minimize job site patching. Use the same precautions as described in paragraph EPOXY COATED REINFORCING STEEL. Do not drag bars over other bars or over abrasive surfaces. Keep bar free of dirt and grit. When possible, assemble reinforcement as tied cages prior to final placement into the forms. Support assembled cages on padded supports. It is not expected that coated bars, when in final position ready for concrete placement, are completely free of damaged areas; however, excessive nicks and scrapes which expose steel is cause for rejection. Criteria for defects which require repair and for those that do not require repair are as indicated. Inspect for defects and provide required repairs prior to assembly. After assembly, reinspect and provide final repairs.

a. Immediately prior to application of the patching material, manually remove any rust and debonded coating from the reinforcement by suitable techniques employing devices such as wire brushes and emery paper. Exercise cars during this surface preparation so that the damaged areas are not enlarged more than necessary to accomplish the repair. Clean damaged areas of dirt, debris, oil, and similar materials prior to application of the patching material.

b. Do repair and patching in accordance with the patching material manufacturer's recommendations. These recommendations, including cure times, must be available at the job site at all times.

c. Allow adequate time for the patching materials to cure in accordance with the manufacturer's recommendation prior to concrete placement.

d. Rinse placed reinforcing bars with fresh water to remove chloride contamination prior to placing concrete.

3.4.4 Splicing

As indicated. For splices not indicated ACI 301. Do not splice at points of maximum stress. Overlap welded wire reinforcement the spacing of the cross wires, plus 2 inches.

3.4.5 Future Bonding

Plug exposed, threaded, mechanical reinforcement bar connectors with a greased bolt. Provide bolt threads that match the connector. Countersink the connector in the concrete. Caulk the depression after the bolt is installed.

3.4.6 Setting Miscellaneous Material

Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement and support against displacement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

3.4.7 Fabrication

Shop fabricate reinforcing bars to conform to shapes and dimensions indicated for reinforcement, and as follows:

Provide fabrication tolerances that are in accordance with ACI 318 and ACI SP-66.

Provide hooks and bends that are in accordance with ACI 318 and ACI SP-66.

Reinforcement must be bent cold to shapes as indicated. Bending must be done in the shop. Rebending of a reinforcing bar that has been bent incorrectly is not be permitted. Bending must be in accordance with standard approved practice and by approved machine methods.

Tolerance on nominally square-cut, reinforcing bar ends must be in accordance with ACI SP-66.

Deliver reinforcing bars bundled, tagged, and marked. Tags must be metal with bar size, length, mark, and other information pressed in by machine. Marks must correspond with those used on the placing drawings.

Do not use reinforcement that has any of the following defects:

a. Bar lengths, depths, and bends beyond specified fabrication tolerances

b. Bends or kinks not indicated on drawings or approved shop drawings

c. Bars with reduced cross-section due to rusting or other cause

Replace defective reinforcement with new reinforcement having required shape, form, and cross-section area.

3.4.8 Placing Reinforcement

Place reinforcement in accordance with ACI 301 and ACI SP-66.

For slabs on grade (over earth or over capillary water barrier) and for

footing reinforcement, support bars or welded wire reinforcement on precast concrete blocks, spaced at intervals required by size of reinforcement, to keep reinforcement the minimum height specified above the underside of slab or footing.

For slabs other than on grade, supports for which any portion is less than 1 inch from concrete surfaces that are exposed to view or to be painted must be of precast concrete units, plastic-coated steel, or stainless steel protected bar supports. Precast concrete units must be wedge shaped, not larger than 3-1/2 by 3-1/2 inches, and of thickness equal to that indicated for concrete protection of reinforcement. Provide precast units that have cast-in galvanized tie wire hooked for anchorage and blend with concrete surfaces after finishing is completed.

Provide reinforcement that is supported and secured together to prevent displacement by construction loads or by placing of wet concrete, and as follows:

Provide supports for reinforcing bars that are sufficient in number and have sufficient strength to carry the reinforcement they support, and in accordance with ACI 318, ACI SP-66 and CRSI 10MSP. Do not use supports to support runways for concrete conveying equipment and similar construction loads.

Equip supports on ground and similar surfaces with sand-plates.

Support welded wire reinforcement as required for reinforcing bars.

Secure reinforcements to supports by means of tie wire. Wire must be black, soft iron wire, not less than 16 gage.

Reinforcement must be accurately placed, securely tied at intersections, and held in position during placing of concrete by spacers, chairs, or other approved supports. Point wire-tie ends away from the form. Unless otherwise indicated, numbers, type, and spacing of supports must conform to ACI SP-66.

Bending of reinforcing bars partially embedded in concrete is permitted only as specified in ACI SP-66 and ACI 318.

3.4.9 Spacing of Reinforcing Bars

Spacing must be as indicated. If not indicated, spacing must be in accordance with the ACI 318 and ACI SP-66.

Reinforcing bars may be relocated to avoid interference with other reinforcement, or with conduit, pipe, or other embedded items. If any reinforcing bar is moved a distance exceeding one bar diameter or specified placing tolerance, resulting rearrangement of reinforcement is subject to preapproval by the Contracting Officer.

3.4.10 Concrete Protection for Reinforcement

Concrete protection must be in accordance with the ACI 318 and ACI SP-66.

3.4.11 Welding

Welding must be in accordance with AWS D1.4/D1.4M.

3.5 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

ASTM C94/C94M, ACI 301, ACI 302.1R and ACI 304R, except as modified herein. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.

3.5.1 Measuring

Make measurements at intervals as specified in paragraphs SAMPLING and TESTING.

3.5.2 Mixing

ASTM C94/C94M, ACI 301 and ACI 304R. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 84 degrees F. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 84 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, provided that both the specified maximum slump and water-cementitious material ratio are not exceeded and the required concrete strength is still met. When additional water is added, an additional 30 revolutions of the mixer at mixing speed is required. If the entrained air content falls below the specified limit, add a sufficient quantity of admixture to bring the entrained air content within the specified limits. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch. Do not reconstitute concrete that has begun to solidify.

3.5.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.6 PLACING CONCRETE

Place concrete in accordance with ACI 301 Section 5.

3.6.1 Footing Placement

Concrete for footings may be placed in excavations without forms upon inspection and approval by the Contracting Officer. Excavation width must be a minimum of 4 inches greater than indicated.

3.6.2 Pumping

ACI 304R and ACI 304.2R. Pumping must not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment must not exceed 2 inches at discharge/placement. Do not convey concrete through pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Limit maximum size of course aggregate to 33 percent of the diameter of the pipe. Limit maximum size of well rounded aggregate to 40

percent of the pipe diameter. Take samples for testing at both the point of delivery to the pump and at the discharge end.

3.6.3 Cold Weather

ACI 306.1. Do not allow concrete temperature to decrease below 50 degrees F. Obtain approval prior to placing concrete when the ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 37 degrees F in any 1 hour and 50 degrees F per 24 hours after heat application.

3.6.4 Hot Weather

Maintain required concrete temperature using Figure 4.2 in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.6.5 Bonding

Surfaces of set concrete at joints, must be roughened and cleaned of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, nor damaged concrete at the surface.

Obtain bonding of fresh concrete that has set as follows:

At joints between footings and walls or columns, between walls or columns and the beams or slabs they support, and elsewhere unless otherwise specified; roughened and cleaned surface of set concrete must be dampened, but not saturated, immediately prior to placing of fresh concrete.

At joints in exposed-to-view work; at vertical joints in walls; at joints near midpoint of span in girders, beams, supported slabs, other structural members; in work designed to contain liquids; the roughened and cleaned surface of set concrete must be dampened but not saturated and covered with a cement grout coating.

Provide cement grout that consists of equal parts of portland cement and fine aggregate by weight with not more than 6 gallons of water per sack of cement. Apply cement grout with a stiff broom or brush to a minimum thickness of 1/16 inch. Deposit fresh concrete before cement grout has attained its initial set.

3.7 WASTE MANAGEMENT

Provide as specified in the Waste Management Plan and as follows.

3.7.1 Mixing Equipment

Before concrete pours, designate on-site area for cleaning out concrete mixing trucks. Minimize water used to wash equipment.

3.7.2 Reinforcing Steel

Collect reinforcing steel and place in designated area for recycling.

3.7.3 Other Waste

Identify concrete manufacturer's or supplier's policy for collection or return of construction waste, unused material, deconstruction waste, and/or packaging material.

3.8 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT FINISHES

3.8.1 Defects

Repair surface defects in accordance with ACI 301 Section 5.

3.8.2 Not Against Forms (Top of Walls)

Surfaces not otherwise specified must be finished with wood floats to even surfaces. Finish must match adjacent finishes.

3.8.3 Formed Surfaces

3.8.3.1 Tolerances

Provide tolerance report in accordance with ACI 117 and as indicated.

3.8.3.2 Standard Smooth Finish

Provide for surfaces exposed to public view a surface finish SF-3.0. Patch holes and defects in accordance with ACI 301.

3.9 JOINTS

3.9.1 Construction Joints

Make and locate joints not indicated so as not to impair strength and appearance of the structure, as approved. Joints must be perpendicular to main reinforcement. Reinforcement must be continued and developed across construction joints. Locate construction joints as follows:

3.9.1.1 Maximum Allowable Construction Joint Spacing

a. In walls at not more than 60 feet in any horizontal direction.

3.9.1.2 Construction Joints for Constructability Purposes

In walls, at top of footing; Provide keyways at least 1-1/2-inches deep in construction joints in walls and slabs and between walls and footings; approved bulkheads may be used for slabs.

3.10 CURING AND PROTECTION

ACI 301 Section 5, unless otherwise specified. Begin curing immediately following form removal. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer-hardener or epoxy coating. Allow curing compound/sealer installations to cure prior to the installation of materials that adsorb VOCs.

3.10.1 Curing Periods

ACI 301 Section 5, except 10 days for retaining walls, pavement or chimneys. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing are subject to approval by the Contracting Officer.

3.10.2 Curing Formed Surfaces

Accomplish curing of formed surfaces, including undersurfaces of girders, beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed before end of curing period, accomplish final curing of formed surfaces by any of the curing methods specified above, as applicable.

3.10.3 Curing Unformed Surfaces

Accomplish initial curing of unformed surfaces, such as monolithic slabs, floor topping, and other flat surfaces, by membrane curing.

Unless otherwise specified, accomplish final curing of unformed surfaces by any of curing methods specified, as applicable.

Accomplish final curing of concrete surfaces to receive liquid floor hardener of finish flooring by moisture-retaining cover curing.

3.10.4 Temperature of Concrete During Curing

When temperature of atmosphere is 41 degrees F and below, maintain temperature of concrete at not less than 55 degrees F throughout concrete curing period or 45 degrees F when the curing period is measured by maturity. When necessary, make arrangements before start of concrete placing for heating, covering, insulation, or housing as required to maintain specified temperature and moisture conditions for concrete during curing period.

When the temperature of atmosphere is 80 degrees F and above or during other climatic conditions which cause too rapid drying of concrete, make arrangements before start of concrete placing for installation of wind breaks, of shading, and for fog spraying, wet sprinkling, or moisture-retaining covering of light color as required to protect concrete during curing period.

Changes in temperature of concrete must be uniform and not exceed 37 degrees F in any 1 hour nor 80 degrees F in any 24-hour period.

3.10.5 Protection from Mechanical Injury

During curing period, protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration and from damage caused by rain or running water.

3.10.6 Protection After Curing

Protect finished concrete surfaces from damage by construction operations.

3.11 FIELD QUALITY CONTROL

3.11.1 Sampling

ASTM C172/C172M. Collect samples of fresh concrete to perform tests specified. ASTM C31/C31M for making test specimens.

3.11.2 Testing

3.11.2.1 Slump Tests

ASTM C143/C143M. Take concrete samples during concrete placement/discharge. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cementitious material ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 20 cubic yards (maximum) of concrete.

3.11.2.2 Temperature Tests

Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions below 50 degrees F and above 80 degrees F for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

3.11.2.3 Compressive Strength Tests

ASTM C39/C39M. Make six 6 inch by 12 inch test cylinders for each set of tests in accordance with ASTM C31/C31M, ASTM C172/C172M and applicable requirements of ACI 305R and ACI 306R. Take precautions to prevent evaporation and loss of water from the specimen. Test two cylinders at 7 days, two cylinders at 28 days, and hold two cylinder in reserve. Take samples for strength tests of each mix design of concrete placed each day not less than once a day, nor less than once for each 100 cubic yards of concrete for the first 500 cubic yards, then every 500 cubic yards thereafter, nor less than once for each 5400 square feet of surface area for slabs or walls. For the entire project, take no less than five sets of samples and perform strength tests for each mix design of concrete placed.

Each strength test result must be the average of two cylinders from the same concrete sample tested at 28 days. Concrete compressive tests must meet the requirements of ACI 318 Section 5.6. Retest locations represented by erratic core strengths. Where retest does not meet concrete compressive strength requirements submit a mitigation or remediation plan for review and approval by the contracting officer. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.

3.11.2.4 Air Content

ASTM C173/C173M or ASTM C231/C231M for normal weight concrete and ASTM C173/C173M for lightweight concrete. Test air-entrained concrete for air content at the same frequency as specified for slump tests.

3.11.2.5 Unit Weight of Structural Concrete

ASTM C567/C567M and ASTM C138/C138M. Determine unit weight of lightweight and normal weight concrete. Perform test for every 20 cubic yards maximum.

3.11.2.6 Ion Concentration

ACI 318. Determine water soluble ion concentration in accordance with ASTM C1218/C1218M. Perform test once for each mix design.

3.11.2.7 Strength of Concrete Structure

The strength of the concrete structure will be considered to be deficient if any of the following conditions are identified:

Failure to meet compressive strength tests as evaluated

Reinforcement not conforming to requirements specified

Concrete which differs from required dimensions or location in such a manner as to reduce strength

Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified

Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration

Poor workmanship likely to result in deficient strength

Where the strength of the concrete structure is considered deficient submit a mitigation or remediation plan for review and approval by the contracting officer.

3.11.2.8 Non-Conforming Materials

Factors that indicate that there are non-conforming materials include (but not limited to) excessive compressive strength, inadequate compressive strength, excessive slump, excessive voids and honeycombing, concrete delivery records that indicate excessive time between mixing and placement, or excessive water was added to the mixture during delivery and placement. Any of these indicators alone are sufficient reason for the Contracting Officer to request additional sampling and testing.

Investigations into non-conforming materials must be conducted at the

Contractor's expense. The Contractor must be responsible for the investigation and must make written recommendations to adequately mitigate or remediate the non-conforming material. The Contracting Officer may accept, accept with reduced payment, require mitigation, or require removal and replacement of non-conforming material at no additional cost to the Government.

3.11.2.9 Testing Concrete Structure for Strength

When there is evidence that strength of concrete structure in place does not meet specification requirements or there are non-conforming materials, make cores drilled from hardened concrete for compressive strength determination in accordance with ASTM C42/C42M, and as follows:

Take at least three representative cores from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by the Contracting Officer.

Test cores after moisture conditioning in accordance with ASTM C42/C42M if concrete they represent is more than superficially wet under service.

Air dry cores, (60 to 80 degrees F with relative humidity less than 60 percent) for 7 days before test and test dry if concrete they represent is dry under service conditions.

Strength of cores from each member or area are considered satisfactory if their average is equal to or greater than 85 percent of the 28-day design compressive strength of the class of concrete.

Fill core holes solid with patching mortar and finished to match adjacent concrete surfaces.

Correct concrete work that is found inadequate by core tests in a manner approved by the Contracting Officer.

3.12 REPAIR, REHABILITATION AND REMOVAL

Before the Contracting Officer accepts the structure the Contractor must inspect the structure for cracks, damage and substandard concrete placements that may adversely affect the service life of the structure. A report documenting these defects must be prepared which includes recommendations for repair, removal or remediation must be submitted to the Contracting Officer for approval before any corrective work is accomplished.

3.12.1 Crack Repair

Prior to final acceptance, all cracks in excess of 0.02 inches wide must be documented and repaired. The proposed method and materials to repair the cracks must be submitted to the Contracting Officer for approval. The proposal must address the amount of movement expected in the crack due to temperature changes and loading.

3.12.2 Repair of Weak Surfaces

Weak surfaces are defined as mortar-rich, rain-damaged, uncured, or containing exposed voids or deleterious materials. Concrete surfaces with weak surfaces less than 1/4 inch thick must be diamond ground to remove the weak surface. Surfaces containing weak surfaces greater than 1/4 inch thick

must be removed and replaced or mitigated in a manner acceptable to the Contracting Officer.

3.12.3 Failure of Quality Assurance Test Results

Proposed mitigation efforts by the Contractor must be approved by the Contracting Officer prior to proceeding.

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EXTERIOR SIGNAGE

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EXTERIOR SIGNAGE

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 WELDING SOCIETY (AWS)

AWS C1.1M/C1.1	(2012) Recommended Practices for Resistance Welding
AWS D1.1/D1.1M	(2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A653/A653M	(2015; E 2016) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A924/A924M	(2016a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM F2329	(2013) Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
ASTM F593	(2013a) Stainless Steel Bolts, Hex Cap Screws, and Studs

U.S. ARMY CORPS OF ENGINEERS (USACE)

EP 310-1-6a	(2006) Sign Standards Manual, VOL 1

1.2 GENERAL REQUIREMENTS

Submit exterior signage schedule including sign location, sign type, and message. Signs shall be complete with lettering, framing as detailed, and related components for a complete installation.

1.2.1 Wind Load Requirements

Exterior signage shall be designed to withstand 36 pounds per square foot windload. Submit design analysis and supporting calculations performed in support of specified signage.

1.2.2 Sign Placement, Materials, Typography, and Design Standards

Provide sign meeting the design standards in EP 310-1-6a and associated Appendix. Request copies of EP 310-1-6a from the Contracting Officer.

1.3 SUBMITTALS

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

SD-02 Shop Drawings

Approved Detail Drawings; G, RE

SD-03 Product Data

Installation; G, RE
Exterior Signage; G, RE
Wind Load Requirements; G, RE

SD-07 Certificates

Exterior Signage; G, RE

1.4 QUALIFICATIONS

Signs, plaques, and dimensional letters shall be the standard product of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

1.5 DELIVERY AND STORAGE

Materials shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area in accordance with manufacturer's instructions.

1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

PART 2 PRODUCTS

2.1 SIGNS

2.1.1 Material

Panel, cross braces, and hardware in accordance with EP 310-1-6a, Section

14. Panes: ASTM B209, 6061-T6 and FP-85 Section 719.03.

2.1.2 Mounting

Mounting in accordance with EP 310-1-6a, Appendix B, Detail 14, Fence Mounting. Location of fence mounting per EP 310-1-6a, Section B.5. restricted area signs.

2.2 GRAPHICS FOR EXTERIOR SIGNAGE SYSTEMS

2.2.1 Messages

~~Sign Schedule~~

~~- Fence line, spaced 20' to 30' apart in all areas:~~Sign in accordance with EP 310-1-6a, Sign Standards Manual, VOL 1, Section 14, sign type REG-04, dated 01 June 2006. Contractor to install five (5) signs along new chain link fence spaced 20' to 30' apart.

EP 310-1-6a

Sign: REG-04
Legend Size (A): 0.75"
Panel Size: 19.25" x 5.625"
Post Size: N/A - mount to fence
Specification Code: HD0-6*
Mounting Height: 60"
Background Color: MB
Legend Code: WH

2.3 ALUMINUM ALLOY PRODUCTS

Aluminum alloy products shall be as specified in EP 310-1-6a, and shall be Pacemaker Industries, Adam Metal Supply, Inc. or approved equal. Welding for aluminum products shall conform to AWS C1.1M/C1.1.

2.4 STEEL PRODUCTS

Sheeting shall be engineer grade retro-reflective sheeting, 3M Company Series 3200, Avery International T-9500 OmniView Series or approved equal. All sheeting shall be installed on aluminum substrate..

2.5 SHEETING

Vinyl sheeting shall be 5 to 7 year premium type and shall be in accordance with the flammability requirements of ASTM E84 and shall be a minimum 0.003 inch film thickness. Film shall include a precoated pressure sensitive adhesive backing, Class 1, or positionable pressure sensitive adhesive backing, Class 3.

2.6 ANCHORS, FASTENERS, AND MOUNTING HARDWARE

Exposed cross braces and mounting hardware shall be either Group 1 stainless steel per ASTM F593 or galvanized steel per ASTM F2329. Exposed fasteners shall be tamper-proof..

2.7 SHOP FABRICATION AND MANUFACTURE

2.7.1 Factory Workmanship

Work shall be assembled in the shop, as far as practical, ready for installation at the site. Work that cannot be shop assembled shall be given a trial fit in the shop to ensure proper field assembly. Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Welding to or on structural steel shall be in accordance with AWS D1.1/D1.1M. Welding shall be continuous along the entire area of contact. Exposed welds shall be ground smooth. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practical. Items specified to be galvanized shall be by hot-dip process after fabrication if practical. Galvanization shall be in accordance with ASTM A123/A123M and ASTM A653/A653M, as applicable. Other metallic coatings of steel sheet shall be in accordance with ASTM A924/A924M. Joints exposed to the weather shall be formed to exclude water. Drainage and weep holes shall be included as required to prevent condensation buildup.

2.7.2 Dissimilar Materials

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of asphalt varnish or a coat of zinc-molybdate primer to prevent galvanic or corrosive action.

2.7.3 Shop Painting

Surfaces of miscellaneous metal work, except nonferrous metal, corrosion resisting steel, and zinc-coated work, shall be given one coat of zinc-molybdate primer or an approved rust-resisting treatment and metallic primer in accordance with manufacturer's standard practice. Surfaces of items to be embedded in concrete shall not be painted. Upon completion of work, damaged surfaces shall be recoated.

2.8 COLOR, FINISH, AND CONTRAST

Color shall be in accordance with the requirements of EP 310-1-6a.

PART 3 EXECUTION

3.1 INSTALLATION

Signs, plaques, or dimensional letters shall be installed in accordance with approved manufacturer's instructions at three (3) locations along the proposed fence; submit approved detail drawings showing elevations of each type of sign; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction. A schedule showing the location, each sign type, and message shall be included. Signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs mounted on other surfaces shall not be installed until finishes on such surfaces have been completed. Submit manufacturer's installation instructions and cleaning instructions.

3.1.1 Anchorage

Anchorage and fastener materials shall be in accordance with approved

manufacturer's instructions for the indicated substrate.

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DIVISION 31 - EARTHWORK

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EARTHWORK

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SECTION 31 00 00

EARTHWORK

PART 1 GENERAL

1.1 SCOPE OF WORK

This section covers excavation, backfill and embankments for structures, utilities, roadways, channel improvement and bank protection.

1.2 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 ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 180	(2015) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
AASHTO T 224	(2010) Standard Method of Test for Correction for Coarse Particles in the Soil Compaction Test

ASTM INTERNATIONAL (ASTM)

ASTM C136/C136M	(2014) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C33/C33M	(2016) Standard Specification for Concrete Aggregates
ASTM D1140	(2014) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
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 D4318	(2017) Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PDT)

PDT 408	(2016) Specifications

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 600/4-79/020	(1983) Methods for Chemical Analysis of Water and Wastes
EPA SW-846.3-3	(1999, Third Edition, Update III-A) Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

1.3 DEFINITIONS

1.3.1 Satisfactory Materials

Satisfactory materials include sound, durable rock or aggregate, containing no organic material and not subject to rapid weathering or deterioration as would shorten the useful life of the project, and having the specified sizes, gradations, and characteristics as described for the rock fill embankment, structural backfill, and streambank armoring.

1.3.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. Notify the Contracting Officer if any contaminated materials are encountered.

1.3.3 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D698 abbreviated as a percent of laboratory maximum density. Since ASTM D698 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve as a percentage of the maximum density in accordance with AASHTO T 180 and corrected with AASHTO T 224. To maintain the same percentage of coarse material, use the "remove and replace" procedure as described in NOTE 8 of Paragraph 7.2 in AASHTO T 180.

1.3.4 Hard/Unyielding Materials

Weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" with stones greater than 3 inch in any dimension. These materials usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.3.5 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; also large boulders, buried masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to

increase production.

1.3.6 Unstable Material

Unstable materials are too wet to properly compact and/or support culverts or appurtenant structures.

1.3.7 Granular Material

1.3.7.1 General Requirements

Granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag comprised of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing then No. 200 mesh sieve and no less than 95 percent by weight passing the 1 inch sieve. The maximum allowable aggregate size shall be 1 inch.

1.3.8 Initial Backfill Material

Initial backfill consists of select granular material or satisfactory materials free from rocks three inches or larger in any dimension.

1.4 SYSTEM DESCRIPTION

As available, subsurface soil boring logs will be provided for information only with the Contract. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

1.4.1 Classification of Excavation

Unless otherwise specified in the Contract, no consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

1.4.2 Blasting

Blasting will not be permitted.

1.4.3 Dewatering Work Plan

Submit procedures for accomplishing dewatering work.

1.5 SUBMITTALS

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

SD-01 Preconstruction Submittals

Shoring; G, DO
Dewatering Work Plan; G, DO
Excavation Work Plan; G, DO, RE

SD-03 Product Data

Utilization of Excavated Materials; G, RE
Proposed Source of Commercial Stone; G, DO, RE

SD-06 Test Reports

Testing
Borrow Site Testing

Within 24 hours of conclusion of physical tests, submit three copies of test results, including calibration curves and results of calibration tests.

SD-07 Certificates

Testing

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR OFFSITE SOILS

Test offsite soils brought in for use as backfill for Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and full Toxicity Characteristic Leaching Procedure (TCLP) including ignitability, corrosivity and reactivity. Backfill shall contain a maximum of 100 parts per million (ppm) of total petroleum hydrocarbons (TPH) and a maximum of 10 ppm of the sum of Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and shall pass the TCPL test. Determine TPH concentrations by using EPA 600/4-79/020 Method 418.1. Determine BTEX concentrations by using EPA SW-846.3-3 Method 5030/8020. Perform TCLP in accordance with EPA SW-846.3-3 Method 1311. Provide Borrow Site Testing for TPH, BTEX and TCLP from a composite sample of material from the borrow site, with at least one test from each borrow site. Do not bring material onsite until tests have been approved by the Contracting Officer.

2.2 BURIED WARNING AND IDENTIFICATION TAPE

Provide polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inches 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. Provide permanent color and printing, unaffected by moisture or soil.

TABLE 1

WARNING TAPE COLOR CODE

Red	Electric
Yellow	Gas, Oil; Dangerous Materials
Orange	Telephone and Other Communications

TABLE 1 WARNING TAPE COLOR CODE	
Blue	Water Systems
Green	Sewer Systems
White	Steam Systems
Gray	Compressed Air

2.2.1 Warning Tape for Metallic Piping

Provide acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.003 inch and a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

2.2.2 Detectable Warning Tape for Non-Metallic Piping

Provide polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.004 inch, and a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Manufacture tape with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

PART 3 EXECUTION

3.1 WORK PLAN

The Contractor shall submit a Work Plan detailing procedures, equipment, and worker qualifications for each item of work under this section.

3.2 STRIPPING OF TOPSOIL

Where indicated or directed, strip topsoil to a depth of 4 inches. Spread topsoil on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Keep topsoil separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Stockpile in locations indicated or remove from the site any surplus of topsoil from excavations and gradings as specified in the Task Order. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide materials suitable for use as topsoil.

3.3 GENERAL EXCAVATION

Perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Perform the grading in accordance with the typical sections

shown and the tolerances specified in paragraph FINISHING. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Include such excavated material and the satisfactory material ordered as replacement in excavation. Dispose surplus satisfactory excavated material not required for fill or embankment in areas approved for surplus material storage or designated waste areas, or dispose offsite in accordance with Section 02 42 00 DISPOSAL OF MATERIALS. Dispose unsatisfactory excavated material in designated waste or spoil areas offsite in accordance with Section 02 42 00 DISPOSAL OF MATERIALS. During construction, perform excavation and fill in a manner and sequence that will provide proper drainage at all times. Excavate material required for fill or embankment in excess of that produced by excavation within the grading limits from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

3.3.1 Ditches, Gutters, and Channel Changes

Finish excavation of ditches, gutters, and channel changes by cutting accurately to the cross sections, grades, and elevations shown. Do not excavate ditches and gutters below grades shown. Backfill the excessive open ditch or gutter excavation with satisfactory, thoroughly compacted material or with suitable stone or cobbles to grades shown. Dispose of excavated material as shown or as directed, except in no case allow material be deposited a maximum 4 feet from edge of a ditch. Maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.3.2 Drainage Structures

Make excavations to the lines, grades, and elevations shown, or as directed. Provide trenches and foundation pits 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 other hard foundation material of loose debris and cut to a firm, level surface, stepped as needed. Remove loose disintegrated rock and thin strata. Do not disturb the bottom of the excavation when concrete or masonry is to be placed in an excavated area. Do not excavate to the final grade level until just before the concrete or masonry is to be placed.

3.3.3 Drainage

Provide for the appropriate collection and disposal of surface and subsurface water encountered during construction. Completely drain construction site during periods of construction to keep soil materials sufficiently dry. 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 or provide temporary ditches, swales, and other drainage features and equipment as required to prevent saturation of soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and furnish new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions present by comparing them to the plans and specifications and to employ necessary measures to permit construction to proceed.

3.3.4 Dewatering

Control groundwater flowing toward or into excavations to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. Provide dewatering measures when specified in the Erosion and Sediment Control Plan. 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. Effect control before the excavation extends to the water level in order to maintain the characteristics and integrity of the in situ material. While the excavation is open, maintain the water level continuously, at least two feet below the working level. Operate dewatering system continuously until construction work below existing water levels is complete. Submit performance records weekly. Relieve hydrostatic head in pervious zones below embankment crest elevation in layered soils to prevent uplift.

3.3.5 Underground Utilities

The Contractor is responsible for movement of construction machinery and equipment over pipes and utilities during construction. Perform work adjacent to non-Government utilities as indicated in accordance with procedures outlined by utility company. Excavation made with power-driven equipment is not permitted within 2 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 Contracting Officer. Report damage to utility lines immediately to the Contracting Officer.

3.3.6 Structural Excavation

Ensure that footing subgrades have been inspected and approved by the Contracting Officer prior to concrete placement. Backfill and compact over excavations and changes in grade to 95 percent of ASTM D698 maximum density and +/- 2% optimum moisture content for all except last 12 inches of fill. For last 12 inches of fill, compact to 98 percent of ASTM D698 maximum density and +/- 2% optimum moisture content.

3.4 SHORING

3.4.1 General Requirements

Submit a Shoring and Sheeting plan for approval ~~15 days prior to starting work~~once site conditions have been assessed. The shoring plan shall include shoring, sheeting, or benching required during construction based on the Contractor's sequence of work. Submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheeting of excavations. Finish shoring and install as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Remove shoring, bracing, and sheeting as excavations are backfilled, in a manner to prevent caving.

3.5 GEOTECHNICAL ENGINEER

Hire a licensed Professional Civil Engineer with a minimum of 3 years of experience in geotechnical work to provide inspection of excavations, soil/groundwater conditions, rock fill, and culvert placement throughout construction. The Civil Engineer is responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. The Civil Engineer is responsible for updating the excavation, sheeting, and dewatering plans as construction progresses to reflect changing conditions and submit an updated plan if necessary. Submit a monthly written report, informing the Contractor and Contracting Officer of the status of the plan and an accounting of the Contractor's adherence to the plan addressing any present or potential problems. The Contracting Officer is responsible for arranging meetings with the Civil Engineer at any time throughout the contract duration.

3.6 GRADING AREAS

Where indicated, divide work into grading areas within which satisfactory excavated material will be placed in embankments, fills, and required backfills. Do not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing. Place and grade stockpiles of satisfactory, unsatisfactory, and wasted materials as specified. Keep stockpiles in a neat and well drained condition, giving due consideration to drainage at all times. Clear, grub, and seal by rubber-tired equipment, the ground surface at stockpile locations; separately stockpile excavated satisfactory and unsatisfactory materials. Protect stockpiles of satisfactory materials from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, remove and replace such material with satisfactory material from approved sources at no additional cost to the Government.

3.7 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Do not excavate to final grade until just before concrete is to be placed. Only use excavation methods that will leave the foundation ~~rock~~soil in a solid ~~and unshattered~~ condition. ~~Roughen the level surfaces, and cut the sloped surfaces, as indicated, into rough steps or benches to provide a satisfactory bond.~~ Protect shales from slaking and all surfaces from erosion resulting from ponding or water flow.

3.8 GROUND SURFACE PREPARATION

3.8.1 General Requirements

Remove and replace unsatisfactory material with satisfactory materials, as directed by the Contracting Officer, in surfaces to receive soil fill or in excavated areas. Scarify the surface to a depth of 6 inches before the initial soil ~~fill~~lift is ~~started~~placed. Plow, step, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that the soil fill material will bond with the existing material. When subgrades for project features are less than the specified density, break up the ground surface to a minimum depth of 6 inches or the lift thickness, pulverizing, and compacting to the specified density.

3.8.2 Frozen Material

Do not place material on surfaces that are muddy, frozen, or contain

frost.

3.8.3 Compaction

Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.

3.9 UTILIZATION OF EXCAVATED MATERIALS

Dispose unsatisfactory materials ~~removing~~removed from excavations into designated waste disposal or spoil areas or offsite in accordance with Section 02 41 00DEMOLITION and Section 02 42 00 DISPOSAL OF MATERIALS. Use satisfactory material removed from excavations, insofar as practicable, in the construction of fills, embankments, bedding (as backfill), and for similar purposes. Submit procedure and location for disposal of unused satisfactory material. Submit proposed source of borrow material. Do not waste any satisfactory excavated material without specific written authorization. Dispose of satisfactory material, authorized to be wasted, in designated areas approved for surplus material storage or designated waste areas as directed. Stockpile PennDOT R-4 from embankment excavation. If directed by the Contracting Officer follo~~o~~wing inspection of the stockpiled material, re-use as embankment rock fill. Do not dispose of excavated material to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

3.10 BURIED TAPE AND DETECTION WIRE

3.10.1 Buried Warning and Identification Tape

Provide buried utility lines with utility identification tape. Bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of ground.

3.11 BACKFILLING AND COMPACTION

Place backfill adjacent to any and all types of structures, in successive horizontal ~~layers~~lifts of loose material not more than 8 inches in ~~depth~~ thickness. Compact each lift to at least ~~90~~95 percent~~ laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials, to prevent wedging action or eccentric loading upon or against the structure~~. All backfill material must be within the range of -2 to +2 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.

3.11.1 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.

3.11.2 Structure Backfill

Backfill around structures, including the conduit, headwall, and wing walls, shall consist of well-graded gravel, crushed gravel, crushed stone ~~or crushed slag~~ comprised of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing then No. 200 mesh sieve and not less than 95 percent by weight of material passing the 1-inch mesh sieve; or AASHTO No. 57 coarse aggregate, meeting at least the type C quality requirements in PennDOT Publication 408, Section 703.2, Table B. Place structure backfill to the extents and thicknesses shown and to a height of at least two feet above the culvert. Bring up the backfill evenly on both sides of the culvert for the full length of the culvert, and place geotextile conforming to Class 4, Type A geotextile per PDT 408 Section 735, Table A between the structure backfill and the embankment rock fill.

3.11.3 Embankment Crest Fill

The upper 5 feet of the embankment shall consist of select granular material (2RC), as specified in PennDOT Publication 408, Section 703.3. A transition zone consisting of a geotextile separation layer, AASHTO #57 stone, and AASHTO #1 stone shall be placed directly beneath the embankment crest fill, as shown. All embankment crest materials shall be compacted in accordance with PennDOT Publication 408, Section 210.

3.11.4 Backfill for Appurtenances

After footers, headwalls, wingwalls for conduits, or similar structures have been constructed and the concrete has been allowed to cure for no less than seven days, place structure and embankment backfill in such a manner that the structure is not be damaged by the shock of falling materials or compaction induced stress. Place the backfill material, compact it as specified for structure backfill, and bring up the backfill evenly on all sides of the structure to prevent eccentric loading and excessive stress.

3.11.5 Sand Bedding for Geotextile

Material for geotextile sand bedding layer shall meet the requirements for fine aggregate per ASTM C33/C33M.

3.12 STREAMBANK EXCAVATION

3.12.1 Special Work Practices

No soil or other erodible materials will be permitted to be stored on the streambank or within 30 feet of the bank crest. All excavated material shall be ~~loaded directly into trucks and transported to the disposal site~~ disposed of in the vicinity of the work as directed by the Contracting OFfficer, in accordance with Section 02 42 00 DISPOSAL OF MATERIALS. The clearing, grubbing, excavation and stone placement operations shall be performed in segments sufficiently small to allow covering of all exposed soils with geotextile and stone or with erosion control blanket by the end of the day or prior to any forecasted precipitation. The Contractor shall prepare an Excavation Work Plan to describe equipment and methods proposed for completion of the required excavation.

3.12.2 Excavation

Excavation shall consist of excavating the areas beyond the existing slopes

and regrading other areas to the required cross sections for placement of the stone protection, as indicated on the drawings. Loose or previously failed bank material shall be regraded prior to placement of stone protection. Excavation shall also consist of the disposal of surplus material. Excavation, regardless of its nature, unless otherwise classified, shall be considered common excavation. The Contractor shall perform all required common excavation, regardless of materials encountered, within the limits of the project, all to the lines and grades shown on the drawings. Grading of slopes shall be in conformance with the typical sections shown on the drawings or as specified in the Contract. The surface of all areas to receive geotextile material and stone protection shall be finished to a smooth surface in accordance with the lines, grades, and cross sections shown. Voids and depressions left from clearing operations and site preparation, and uneven areas shall be backfilled by regrading the immediate area. During construction, excavation and grading shall be performed in a manner and sequence that will provide proper drainage and a stable slope at all times. Excavated material not required for supplementary filling and grading operations shall be disposed of as specified in Section 02 42 00 DISPOSAL OF MATERIALS MANAGEMENT. Unauthorized over-excavation shall be backfilled with six-inch layers of free draining material and compacted in accordance with paragraph Filling, at no additional cost to the Government.

3.12.3 Stone Fill and Stone Slope Protection

Stone fill material for the rock fill embankment and streambank armoring (stone slope protection) features shall be placed in a manner which ensures interlock among stones. Stone shall conform to the characteristics for rock material listed in PDT 408, Section 850. Stone fill for the embankment rock fill shall conform to PennDOT R-4 gradations, and stone slope protection for streambank armoring shall conform to PennDOT R-5 gradations.

3.12.4 Quality Control

A proposed source of commercial stone shall be provided by the Contractor, for approval by the Contracting Officer, for use in this work. Suitable evidence in the form of applicable laboratory test results shall be provided to the Contracting Officer, which indicates that the source is capable of producing materials which meet all the required quality criteria described in PDT 408, Section 850. Preliminary evaluations shall include:

a. Visual inspection of the stone by Contracting Officer

b. Review of existing applicable laboratory test data

c. A visit to the quarry to evaluate proposed ledges

3.12.5 Erosion Control

The Contractor shall maintain erosion control measures during excavation operations in accordance with Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION.

3.13 EMBANKMENTS

3.13.1 Rock Fill Embankment

Construct the rock fill embankment from satisfactory materials free of organic material or excessive fines, meeting the gradations and

characteristics of R-4 rock as specified in PDT 408, Section 850.2, except where noted. Place the material in successive horizontal layers of loose material not more than ~~12~~18 inches in depth. Compact each layer by a minimum of four passes with a ~~heavy, tracked~~Caterpillar D3 or equivalent or larger size piece of tracked equipment except where heavy equipment is not permitted by Section 33 40 00 STORM DRAINAGE UTILITIES.

3.14 EMBANKMENT PREPARATION

3.14.1 Construction

Prepare and shape embankment to line, grade, and cross section using stone and geotextile as specified. 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 crest. Repair low areas resulting from removal of unsatisfactory material or excavation of rock to required grade with satisfactory materials, and shape the entire crest to line, grade, and cross section. Do not vary the elevation of the finished embankment crest more than 0.5 foot from the established grade and cross section.

3.14.1.1 Crest and Transition Zone

The embankment crest shall have a materials transition zone consisting of AASHTO No. 57 stone overlying AASHTO No. 1 stone, as shown. Place Class 4, Type A geotextile, as specified in PDT 408, Section 735, Table A to cover the top of the finished crest transition zone, extending along the sides of and partly beneath the upper layer of AASHTO No. 57 stone, as shown. Place crest fill material consisting of select granular material (2RC), as specified in PennDOT Publication 408, Section 703.3, to the lines and grades shown. A crest shoulder consisting of embankment rock fill material shall be constructed not less than ~~3~~2 feet in width, adjacent to the crest transition zone, as shown. Place crest and transition zone materials in conformance with PDT 408, Section 210.

3.15 FINISHING

Finish the surface of excavations, embankments, and embankment transition zone to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for the grades and elevations indicated~~graded areas within 0.1 foot of the grades and elevations indicated~~ per material type listed in Table 2. Finish gutters and ditches in a manner that will result in effective drainage. Finish the surface of areas to be turfed from settlement or washing to a smoothness suitable for the application of turfing materials. Repair graded, topsoiled, or backfilled areas prior to acceptance of the work, and re-establish grades to the required elevations and slopes.

TABLE 2
FINISH TOLERANCES BY MATERIAL TYPE

MATERIAL TYPE	FINISH TOLERANCE (ft.)
R-4 Rip Rap (Embankment Fill)	0.3
R-5 Rip Rap (Streambank, SSP)	0.5

TABLE 2 FINISH TOLERANCES BY MATERIAL TYPE	
All other materials	0.1

3.15.1 Excavations and Embankments

During construction, keep embankments and excavations shaped and drained. Maintain ditches and drains along all excavations and project features to drain effectively at all times. Do not disturb the finished embankment crest by traffic or other operation. Protect and maintain the finished embankment crest in a satisfactory condition. Do not permit the storage or stockpiling of materials ~~on~~within 30 feet of the finished embankment crest.

3.15.2 Grading Around Structures

Construct areas within 5 feet outside of each building and structure line true-to-grade, shape to drain, and maintain free of trash and debris until final inspection has been completed and the work has been accepted.

3.16 PLACING TOPSOIL

On areas to receive topsoil, prepare the compacted subsoil for the topsoil to a 2 inch depth for bonding of topsoil with subsoil. Spread topsoil evenly to a thickness of four inches and grade to the elevations and slopes shown. Do not spread topsoil when frozen or excessively wet or dry. Obtain material required for topsoil in excess of that produced by excavation within the grading limits from areas indicated or as otherwise specified in the Task Order.

3.17 TESTING

Testing shall be performed by an approved commercial testing laboratory or by the Contractor, subject to approval of the Contracting Officer. Submit qualifications of the Corps validated commercial testing laboratory or the Contractor's validated testing facilities. If the Contractor elects to establish testing facilities, do not permit work requiring testing until the Contractor's facilities have been inspected, Corps validated and approved by the Contracting Officer.

a. Determine field in-place density in accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938, where applicable. For embankment crest in-place densities, refer to ~~Section 3.15.1.1 Subgrade for Pavements and~~ PDT 408, Section 210. When ASTM D6938 is used, check the calibration curves and adjust using only the sand cone method as described in ASTM D1556/D1556M. ASTM D6938 results in a wet unit weight of soil in determining the moisture content of the soil when using this method.

b. Check the calibration curves furnished with the moisture gauges along with density calibration checks as described in ASTM D6938; check the calibration of both the density and moisture gauges at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, remove the material, replace and recompact to meet specification requirements.

c. Perform tests on recompacted areas to determine conformance with specification requirements. Appoint a registered professional civil engineer to certify inspections and test results. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.17.1 Fill and Backfill Material Gradation

Test stockpiled or in-place source material at the frequency indicated in the contract. Determine gradation and classification of fill and backfill material in accordance with ASTM C136/C136M, ASTM D~~422~~1140 or ASTM D~~1140~~4318, as applicable.

3.17.2 Displacement of Culverts

After other required tests have been performed and the structural backfill compacted to two (2), feet above the top of the culvert, inspect the pipe to determine whether significant displacement has occurred. Conduct this inspection in the presence of the Contracting Officer. Inspect the culvert by entrance. If, in the judgment of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, replace or repair the defects as directed at no additional cost to the Government.

3.18 DISPOSITION OF SURPLUS MATERIAL

Remove surplus material or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber in accordance with Section 02 42 00 DISPOSAL OF MATERIALS.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 31 - EARTHWORK

SECTION 31 05 19

GEOTEXTILES

-- End of Section Table of Contents --

SECTION 31 05 19

GEOTEXTILES

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.

ASTM INTERNATIONAL (ASTM)

ASTM D4354	(2012) Sampling of Geosynthetics for Testing
ASTM D4873/D4873M	(2015) Identification, Storage, and Handling of Geosynthetic Rolls and Samples
ASTM D4884/D4884M	(2014a) Strength of Sewn or Thermally Bonded Seams of Geotextiles

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 1110-2-1601	(1991; 1994 Change 1) Engineering and Design -- Hydraulic Design of Flood Control Channels

1.2 SUBMITTALS

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

SD-03 Product Data

Geotextiles; G, DO, RE

SD-06 Test Reports

Geotextiles; DO

SD-07 Certificates

Geotextiles; DO
Needle Punched Geotextile; DO

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver only approved geotextile rolls to the project site. All geotextile shall be labeled, shipped, stored, and handled in accordance with ASTM D4873/D4873M. No hooks, tongs, or other sharp instruments shall be

used for handling geotextile.

1.3.1 Delivery

Notify the Contracting Office a minimum of 24 hours prior to delivery and unloading of geotextile rolls packaged in opaque, waterproof, protective plastic wrapping. The plastic wrapping shall not be removed until deployment. If quality assurance samples are collected, immediately rewrap rolls with the plastic wrapping. Geotextile or plastic wrapping damaged during storage or handling shall be repaired or replaced, as directed. Label each roll with the manufacturer's name, geotextile type, roll number, roll dimensions (length, width, gross weight), and date manufactured.

1.3.2 Storage

Protect rolls of geotextile from construction equipment, chemicals, sparks and flames, temperatures in excess of 160 degrees F (71 degrees C), or any other environmental condition that may damage the physical properties of the geotextile. To protect geotextile from becoming saturated, either elevate rolls off the ground or place them on a sacrificial sheet of plastic in an area where water will not accumulate.

1.3.3 Handling

Handle and unload geotextile rolls with load carrying straps, a fork lift with a stinger bar, or an axial bar assembly. No hooks, tongs, or other sharp instruments shall be used for handling geotextile. Rolls shall not be dragged along the ground, lifted by one end, or dropped to the ground.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 General

TABLE 1
MINIMUM REQUIREMENTS FOR
GEOTEXTILE (GT)

PROPERTY	UNITS	ACCEPTABLE VALUES	TEST METHOD
GRAB STRENGTH	N (lb)	1690 (380)	ASTM D4632/D4632M
PUNCTURE	N (lb)	8900 (2000)	ASTM D6241
TRAP TEAR	N (lb)	800 x 1200 (180 x 275)	ASTM D4533/D4533M
MAXIMUM APPARENT OPENING SIZE (AOS)	mm (U.S. Sieve)	0.595 (30)	ASTM D4751
UV DEGRADATION	PERCENT	50 at 500hrs	ASTM D4355/D4355M

Provide geotextile that is a nonwoven needlepunched polypropylene or woven polpropylene pervious sheet of polymeric material consisting of long-chain synthetic polymers composed of at least 95 percent by weight polyolefins, polyesters, or polyamides. The use of woven slit film geotextiles (i.e. geotextiles made from yarns of a flat, tape-like character) will not be

allowed. Add stabilizers and/or inhibitors to the base polymer, as needed, to make the filaments resistant to deterioration by ultraviolet light, oxidation, and heat exposure. Regrind material, which consists of edge trimmings and other scraps that have never reached the consumer, may be used to produce the geotextile. Post-consumer recycled material shall not be used. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the edges. Geotextiles shall meet the requirements specified in the table above. Where applicable, the table property values represent minimum average roll values (MARV) in the weakest principal direction. Values for Apparent Opening Size (AOS) represent maximum average roll values (MARV). Geotextiles to be placed as a separation layer for structure backfill and within the embankment crest transition zone shall also meet the requirements for Class 4, Type A geotextiles per PennDOT Publication 408, Section 735, Table A.

2.1.2 Securing Pins

Secure the geotextile to the embankment or foundation soil by pins to prevent movement prior to placement of revetment materials. Other appropriate means to prevent movement such as staples, sand bags, and stone could also be used. Insert securing pins through both strips of overlapped geotextile along the line passing through midpoints of the overlap. Remove securing pins as revetment materials are placed to prevent tearing of geotextile or enlarging holes. Maximum spacing between securing pins depends on the steepness of the embankment slope. The maximum pins spacing shall be equal to or less than the values listed in TABLE 3. When windy conditions prevail at the construction site, increase the number of pins upon the demand of the Contracting Officer. Anchor terminal ends of the geotextile with key trench or apron at crest, toe of the slope and upstream and downstream limits of installation.

TABLE 3
MAXIMUM SPACING FOR SECURING PINS

EMBANKMENT	SPACING, feet
STEEPER THAN 1V ON 3H	2
1V ON 3H TO 1V ON 4H	3
FLATTER THAN 1V ON 4H	5

2.2 INSPECTIONS, VERIFICATIONS, AND TESTING

2.2.1 Manufacturing Quality Control Sampling and Testing

The Manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specifications. A minimum of 7 days prior to the scheduled usage, submit manufacturer's quality control manual. Documentation describing the quality control program shall be made available upon request. Perform manufacturing quality control sampling and testing in accordance with the manufacturer's approved quality control manual. As a minimum, geotextiles shall be randomly sampled for testing in accordance with ASTM D4354, Procedure A. Acceptance of geotextile shall be in accordance with ASTM D4759. Tests not meeting the specified requirements will result in the rejection of applicable rolls. Geotextiles and factory seams shall meet the

requirements specified in paragraph General.

2.2.1.1 Conformance Testing

Perform conformance testing in accordance with the manufacturers approved quality control manual. Submit manufacturer's quality control conformance test results.

2.2.1.2 Factory Sampling

Randomly sample geotextiles in accordance with ASTM D4354 (Procedure Method A). Sample factory seams at the frequency specified in ASTM D4884/D4884M. Provide all samples from the same production lot as will be supplied for the contract, of the full manufactured width of the geotextile by at least 10 feet long, except that samples for seam strength may be a full width sample folded over and the edges stitched for a length of at least 5 feet. Samples submitted for testing shall be identified by manufacturers lot designation.

2.2.1.3 Needle Punched Geotextile

For needle punched geotextile, provide manufacturer certification that the geotextile has been inspected using permanent on-line metal detectors and does not contain any needles.

2.2.1.4 Manufacturer Certification

All brands and characteristics of geotextile as designated for use and all seams to be used will be accepted on the basis of mill certificates or affidavits. Submit duplicate copies of the mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile. The mill certificate or affidavit shall attest that the geotextile meets the chemical, physical and manufacturing requirements stated in this specification.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Prepare surface on which the bedding layer and geotextile will be placed to a relatively smooth condition ~~in accordance with the applicable portion of this specification~~. This placement surface shall be free from obstruction, debris, depressions, erosion feature, vegetation, ruts or protrusions that could damage the geotextile. Remove irregularities so as to ensure continuous, intimate contact of the bedding layer~~geotextile~~ with the entire surface area. Any loose material, soft or low density pockets of material, shall be removed; erosion features such as rills, gullies etc. shall be graded out of the surface before bedding layer~~geotextile~~ placement.

3.2 INSTALLATION OF THE GEOTEXTILE

3.2.1 General

Place the geotextile in the manner and at the locations shown on the plans. At the time of installation, reject the geotextile if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage.

3.2.2 Placement

A sand bedding layer of 6 inches thickness, conforming to fine aggregate as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE, shall be placed between geotextile and the prepared surface. Place the geotextile with the long dimension parallel to the slope and laid smooth and free of tension, stress, folds, wrinkles, or creases. Place the strips to provide a minimum width of 36 inches of overlap for each joint. ~~The actual length of the geotextile for placement will be based on experience. Adjust the actual length of the geotextile used based on initial installation experience.~~ Temporary pinning of the geotextile to help hold it in place until the stone protection is placed will be allowed. Other methods, such as sandbagging, may be used to temporarily secure the geotextile during placement if the method will not cause damage to the geotextile. Remove the temporary pins or other temporary holding mechanisms as the stone protection is placed to relieve high tensile stress which may occur during placement of material on the geotextile. Place streambank protection riprap in compliance with EM 1110-2-1601. Perform trimming in such a manner that the geotextile is not damaged.

3.2.3 Underwater Placement

The materials that comprise the geotextile typically have a density of less than 1.0 and when placed in water will float. Ballast (sand bags, bedding material or gravel) or pins or staples are needed to secure the geotextile's underwater location prior to fill placement. Upon ballasting/securing the geotextiles location per the plans and/or manufacturer's recommendations, fill materials may be placed upon the geotextile per the details on the plans. All placement of fill materials atop the geotextile shall begin at the toe and proceed up the slope. Placement shall take place so as to avoid stretching and subsequent tearing of the geotextile. Material shall not be dropped from a height of more than 12 inches. Stone shall not, as possible, be allowed to roll down the slope. In underwater applications, the geotextile and backfill material shall be placed the same day. All void spaces in the armor stone shall be backfilled with AASHTO #57 stone to ensure full coverage. Construction equipment is prohibited from transiting atop the geotextile.

3.3 PROTECTION

Protect the geotextile at all times during construction from contamination by surface runoff, clogging, tears, and other damage; remove any geotextile contaminated and replaced with uncontaminated geotextile. Repair or replace any geotextile damaged during its installation or during placement of stone protection at no cost to the Government. Schedule the work so that the covering of the geotextile with a layer of the specified material is accomplished within 3 calendar days after placement of the geotextile. Failure to comply shall require replacement of geotextile. Protect the geotextile from damage prior to and during the placement of riprap or other materials. Embankment rock fill (PennDOT R-4) shall not be placed directly over geotextile. A sand bedding layer of ~~12~~6 inches thickness, conforming to fine aggregate as specified in ~~Division~~Section 03 30 00 CAST-IN-PLACE CONCRETE, shall be placed between geotextile and R-4 embankment fill. Before placement of riprap or other materials, demonstrate that the placement technique will not cause damage to the geotextile. In no case shall any type of equipment be allowed on the geotextile.

3.4 OVERLAPPING AND SEAMING

3.4.1 Overlapping

The overlap of geotextile rolls shall be a minimum of 36 inches. ~~Appropriate measures shall be taken to ensure required overlap exists after cushion placement.~~ When overlapping, successive sheets of geotextile shall be overlapped upstream over downstream and/or upslope over downslope.

~~3.5 PENETRATIONS~~

~~Construct engineering penetrations of the geotextile as shown on the drawings.~~

3.5 REPAIRS

Repair torn or damaged geotextile. Clogged areas of geotextile shall be removed. Perform repairs by placing a patch of the same type of geotextile over the damaged area. The patch shall extend a minimum of 12 inches beyond the edge of the damaged area. Patches shall be continuously fastened using approved methods. The machine direction of the patch shall be aligned with the machine direction of the geotextile being repaired. Remove and replace geotextile rolls which cannot be repaired. Repairs shall be performed at no additional cost to the Government.

3.6 COVERINGS

Do not cover geotextile prior to inspection and approval by the Contracting Officer. Where applicable, ~~backfill~~sand bedding layer and embankment fill shall be placed from the bottom of the slope upward. Cover shall not be dropped onto the geotextile from a height greater than 1 foot. No equipment shall be operated directly on top of the geotextile.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 31 - EARTHWORK

SECTION 31 11 00

CLEARING AND GRUBBING

-- End of Section Table of Contents --

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 GENERAL

This section is in reference to the work required to remove trees and brush from within the contractor work limits. Plan drawings identify trees and wooded area to be removed.

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having an "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals
Work Plan; G, RE

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 WORK PLAN

The Contractor shall submit a Work Plan detailing procedures, equipment, and worker qualifications for each item of work under this section

3.2 PROTECTION

3.2.1 Roads and Walks

Keep roads and walks free of dirt and debris at all times.

3.2.2 Trees, Shrubs, and Existing Facilities

Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.2.3 Utility Lines

Protect existing utility lines that are indicated to remain from damage. Notify the Contracting Officer immediately of damage to or an encounter with an unknown existing utility line. The Contractor is responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines which are to be removed are encountered within the area of operations, notify the Contracting Officer in ample time to minimize interruption of the service. Refer to Section 01 11 00 GENERAL

REQUIREMENTS for additional utility protection.

3.3 CLEARING

Clearing shall consist of the felling and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Trees, stumps, roots, brush, and other vegetation within areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing.

3.4 TREE REMOVAL

Where indicated or directed, trees and stumps that are designated for removal shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Trees shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

3.5 GRUBBING

Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas. Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3.6 DISPOSAL OF MATERIALS

3.6.1 Saleable Timber

All timber on the project site noted for clearing and grubbing shall become the property of the Contractor, and shall be removed from the project site and disposed of off-site.

3.6.2 Nonsalable Materials List

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, except for salable timber, shall be disposed of outside the limits of Government-controlled land at the Contractor's responsibility, except when otherwise directed in writing. Disposal shall be in accordance with Section 02 42 00 DISPOSAL OF MATERIALS.

-- End of Section --

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DIVISION 31 - EARTHWORK

SECTION 31 32 11

SOIL SURFACE EROSION CONTROL

-- End of Section Table of Contents --

SECTION 31 32 11

SOIL SURFACE EROSION CONTROL

PART 1 GENERAL

1.1 SUMMARY

The work consists of furnishing and installing soil surface erosion control materials, including fine grading, blanketing, stapling, mulching and miscellaneous related work, within project limits and in areas outside the project limits where the soil surface is disturbed from work under this contract at the designated locations. This work includes all necessary materials, labor, supervision and equipment for installation of a complete system. Submit a listing of equipment to be used for the application of erosion control materials. Coordinate this section with the requirements of Section 31 00 00 EARTHWORK and Section 32 92 19 SEEDING.

1.2 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.

ASTM INTERNATIONAL (ASTM)

ASTM D5852	(2000; R 2007; E 2014) Standard Test Method for Erodibility Determination of Soil in the Field or in the Laboratory by the Jet Index Method
ASTM D6629	(2001; E 2012; R 2012) Selection of Methods for Estimating Soil Loss by Erosion

1.3 SUBMITTALS

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

SD-03 Product Data

Erosion Control Blankets Type II and Type III; G, RE

Submit manufacturer's literature including physical characteristics, application and installation instructions.

SD-07 Certificates

Erosion Control Blankets Type II and Type III; G, RE

1.4 QUALITY ASSURANCE

1.4.1 Erosion Potential

Assess potential effects of soil management practices on soil loss in accordance with ASTM D6629. Assess erodibility of soil with dominant soil structure less than 2.8 to 3.1 inches in accordance with ASTM D5852.

1.4.2 Substitutions

Substitutions will not be allowed without written request and approval from the Contracting Officer.

1.4.3 SUSTAINABLE DESIGN REQUIREMENTS

1.4.3.1 Biobased Materials

Use biobased materials when feasible and as specified. Submit documentation indicating type of biobased material in product and biobased content.

1.5 DELIVERY, STORAGE, AND HANDLING

Prior to delivery of materials, submit certificates of compliance attesting that materials meet the specified requirements. Store materials in designated areas and as recommended by the manufacturer protected from the elements, direct exposure, and damage. Do not drop containers from trucks. Material shall be free of defects that would void required performance or warranty.

a. Furnish erosion control blankets in rolls with suitable wrapping to protect against moisture and extended ultraviolet exposure prior to placement. Label erosion control blanket to provide identification sufficient for inventory and quality control purposes.

b. Inspect seed upon arrival at the jobsite for conformity to species and quality. Seed that is wet, moldy, or bears a test date five months or older, shall be rejected.

1.6 SCHEDULING

The work schedule shall coordinate the timing of land disturbing activities with the provision of erosion control measures to reduce on-site erosion and off-site sedimentation. Coordinate installation of temporary erosion control features with the construction of permanent erosion control features to assure effective and continuous control of erosion, pollution, and sediment deposition.

1.7 WARRANTY

Erosion control material shall have a warranty for use and durable condition for project specific installations.

PART 2 PRODUCTS

2.1 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region.

2.1.1 Straw

Straw shall be stalks from oats, wheat, rye, barley, or rice, furnished in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment.

2.1.2 Hay

Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, furnished in an air-dry condition suitable for placing with commercial mulch-blowing equipment.

2.1.3 Coir

Coir shall be manufactured from 100 percent coconut fiber cured in fresh water for a minimum of 6 months.

2.2 EROSION CONTROL BLANKETS

2.2.1 Erosion Control Blankets Type II

Erosion control blankets shall be a machine-produced mat of 100 percent straw. The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. Cover the blanket on the top side with a polypropylene netting having an approximate 1/2 by 1/2 inch mesh with photodegradable accelerators to provide breakdown of the netting within approximately 45 days, depending upon geographic location and elevation. Sew the blanket together on a maximum 1.5 inch centers with degradable thread. The erosion control blanket shall have the following properties:

Material Content	
Straw	100 percent with approximately 0.50 lb/yd^2 weight
Netting	One side only, lightweight photodegradable with photo accelerators and approximately 1.64 lb/1,000 ft^2 weight
Thread	Degradable
Note 1: Photodegradable life a minimum of 10 months with a minimum 90 percent light penetration. Apply to slopes up to a maximum 3:1 gradient.	

2.2.2 Erosion Control Blankets Type III

Type III blankets shall be used for erosion control and vegetation establishment on roadside embankments, abutments, berms, shoulders, and median swales where natural vegetation will provide long term stabilization. Erosion control blanket shall be a machine-produced mat consisting of 70 percent straw and 30 percent coconut fiber. The blanket shall be of consistent thickness with the straw and coconut fiber evenly distributed over the entire area of the mat. Cover the blanket on the top side with heavyweight photodegradable polypropylene netting having UV additives to delay breakdown and an approximate 5/8 by 5/8 inch mesh, and on the bottom side with a lightweight photodegradable polypropylene netting with an approximate 1/2 by 1/2 inch mesh. Sew the blanket together on 1.5 inch centers with degradable thread. The erosion control blanket shall

have the following properties:

Material Content	
Straw	70 percent by approximately 0.35 lb/yd^2
Coconut Fiber	30 percent by approximately 0.15 lb/yd^2 weight
Netting	Top side heavyweight photodegradable with UV additives and approximately 3 lb/1,000 ft^2 weight
	Bottom side lightweight photodegradable with approximately 1.64 lb/1,000 ft^2 weight
NOTE: Photodegradable life a minimum of 10 months with a minimum 90 percent light penetration. Apply to slopes with a gradient less than 1.5:1.	

2.2.3 Staples

Staples shall be as recommended by the manufacturer.

PART 3 EXECUTION

3.1 WEATHER CONDITIONS

Perform erosion control operations under favorable weather conditions; when excessive moisture, frozen ground or other unsatisfactory conditions prevail, the work shall be stopped as directed. When special conditions warrant a variance to earthwork operations, submit a revised construction schedule for approval. Do not apply erosion control materials in adverse weather conditions which could affect their performance.

3.1.1 Finished Grade

Provide condition of finish grade status prior to installation, location of underground utilities and facilities. Verify that finished grades are as indicated on the drawings; complete finish grading and compaction in accordance with Section 31 00 00 EARTHWORK, prior to the commencement of the work. Verify and mark the location of underground utilities and facilities in the area of the work. Repair damage to underground utilities and facilities at the Contractor's expense.

3.1.2 Placement of Erosion Control Blankets

Before placing the erosion control blankets, ensure the subgrade has been graded smooth; has no depressed, void areas; is free from obstructions, such as tree roots, projecting stones or other foreign matter. Vehicles will not be permitted directly on the blankets.

3.2 SITE PREPARATION

3.2.1 Protecting Existing Vegetation

When there are established lawns in the work area, the turf shall be covered and/or protected or replaced after construction operations. Identify existing trees, shrubs, plant beds, and landscape features that

are to be preserved on site by appropriate tags and barricade with reusable, high-visibility fencing along the dripline. Mitigate damage to existing trees at no additional cost to the Government. Damage shall be assessed by a state certified arborist or other approved professional using the National Arborist Association's tree valuation guideline.

3.2.2 Obstructions Below Ground

When obstructions below ground affect the work, submit shop drawings showing proposed adjustments to placement of erosion control material for approval.

3.3 INSTALLATION

Immediately stabilize exposed soil using mulch and seed. Provide inlet and outlet protection at the ends of new drainage systems. Remove temporary erosion control measures at the end of construction and provide permanent seeding.

3.3.1 Erosion Control Blankets

a. Install erosion control blankets as indicated and in accordance with manufacturer's recommendations. The extent of erosion control blankets shall be as indicated.

b. Orient erosion control blankets in vertical strips and anchored with staples, as indicated. Abut adjacent strips to allow for installation of a common row of staples. Overlap horizontal joints between erosion control blankets sufficiently to accommodate a common row of staples with the uphill end on top.

c. Where exposed to overland sheet flow, locate a trench at the uphill termination. Staple the erosion control blanket to the bottom of the trench. Backfill and compact the trench as required.

d. Where terminating in a channel containing an installed blanket, the erosion control blanket shall overlap installed blanket sufficiently to accommodate a common row of staples.

3.4 CLEAN-UP

Dispose of excess material, debris, and waste materials offsite at an approved landfill or recycling center. Clear adjacent paved areas. Immediately upon completion of the installation in an area, protect the area against traffic or other use by erecting barricades and providing signage as required, or as directed.

3.5 MAINTENANCE RECORD

Furnish a record describing the maintenance work performed, record of measurements and findings for product failure, recommendations for repair, and products replaced.

3.5.1 Maintenance

Maintenance shall include eradicating weeds; protecting embankments and ditches from surface erosion; maintaining the performance of the erosion control materials and mulch; protecting installed areas from traffic.

3.5.2 Patching and Replacement

Unless otherwise directed, material shall be placed, seamed or patched as recommended by the manufacturer. Remove material not meeting the required performance as a result of placement, seaming or patching from the site. Replace the unacceptable material at no additional cost to the Government.

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STONE PROTECTION

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SECTION 31 37 16.00 08

STONE PROTECTION

PART 1 GENERAL

1.1 REFERENCES

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto or as required.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 43	(2005; R 2009) Standard Specification for Sizes of Aggregate for Road and Bridge Construction

ASTM INTERNATIONAL (ASTM)

ASTM C295/C295M	(2012) Petrographic Examination of Aggregates for Concrete
ASTM D5519	(2014) Particle Size Analysis of Natural and Man-Made Riprap Materials

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PDT)

PDT 408	(2016) Specifications

1.2 SUBMITTALS

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

SD-01 Preconstruction Submittals

Selection of Sources; G, DO, RE

The sources from which the Contractor proposes to obtain the material shall be submitted to the Contracting Officer at least 21 days in advance of the time when the material will be required in the work.

SD-06 Test Reports

Gradation Testing; G, DO

Test reports showing the results of testing the proposed materials. The Government reserves the right to sample and test all materials proposed for use.

SD-07 Certificates

Stone; G, DO
Granular Fill; G, DO

Prior to the delivery of materials, certificates of compliance shall be submitted certifying that materials meet the requirements specified.

SD-11 Closeout Submittals

Waybills and Delivery Tickets

1.3 STONE SELECTION

Listed Stone Sources

Stone sources listed have been evaluated and found to be capable of producing stone of the required quality and gradation. No guarantee is implied that any of the current production of any of the sources meets the quality requirements stated in Subpart GRADED STONE, Paragraph "Stone Quality."

LISTED STONE SOURCES

Company Name	Quarry Name	Quarry Location	Telephone
Acme Company	Honey Creek	Petersburg, OH	800-441-2522
Allegheny Minerals Corp.	Harrisville Quarry	Harrisville, PA	724-548-8101
Allegheny Minerals Corp.	Slippery Rock Quarry	Slippery Rock, PA	724-794-6911
Better Materials Corp.	Rich Hill Quarry	Connellsville, PA	724-626-9500
Better Materials Corp.	Springfield Pike Quarry	Connellsville, PA	724-626-0880
Essroc, Inc	Hillsville Quarry	Mahoning County, OH near PA/OH border	216-536-6275
Greer Limestone Company	Buckeye Quarry	Morgantown, WV	304-296-1751
Hanson Building Materials	Torrance Quarry	Torrance, PA	724-459-6031
Hanson Building Materials	Whitney Quarry	Whitney, PA	724-423-3601

Keystone Lime Company, Inc.	Eichorn Quarry	Springs, PA	814-662-2711
Marsolino, Inc	Coolsprings Quarry	Collsprings-Uniontown, PA	724-437-5200
Martin Marietta	Cave-In-Rock Quarry	Paducah, KY	412-771-8294
Mulzer Bros. Stone Company	Cape Sandy Quarry	Cape Sandy, IN	812-547-7921
New Enterprise Stone and Lime Company	Bakersville Quarry	Bakersville, PA	814-766-2211

1.3.1 Selection of Sources

Stone may be furnished from the stone sources listed or, at the option of the Contractor, may be furnished from any other source designated by the Contractor, subject to approval by the Contracting Officer. After award of the contract, the Contractor shall designate, in writing, ~~only one Source of Materials or combination of sources~~the source of materials selected from which ~~he proposes~~ to obtain stone.

All sources, regardless of whether the source is listed or not, shall be inspected by representatives of the Contracting Officer. The Government representatives will inspect existing locations where material from the source has been previously placed to evaluate the long-term serviceability of the material.

1.3.2 Approval of Sources

Approval of a source of stone and aggregate is not to be construed as approval of all material from that source. The Government reserves the right to reject localized areas, strata, ledges, or channels within an approved area or zone when, in the opinion of the Contracting Officer, the material has disintegrated, weathered badly, or is otherwise unsatisfactory for the intended use.

1.3.3 Waybills and Delivery Tickets

Certified copies of waybills and delivery tickets for all materials actually used.

PART 2 PRODUCTS

2.1 GRANULAR FILL MATERIAL

Granular fill material shall be a select granular material, consisting of well-graded crushed limestone or sandstone composed of hard, tough and durable particles, and shall conform to the gradation specified in PDT 408, Section 703.3. Slag or river gravel will not be permitted.

2.2 TESTING

2.2.1 General

The Government reserves the right to perform tests on any stone proposed for use as scour protection. Test reports that show the stone meets the quality and gradation requirements of this Specification, and service records that demonstrate the satisfactory performance of the stone in similar applications, shall be used to determine the acceptability of all stone.

2.2.2 Stone Quality

Stone shall be of a suitable quality to ensure permanence in the structure and climate in which it is to be used. Stone shall be free from cracks, seams, and other defects that would tend to increase unduly its deterioration from natural causes. The inclusion of quantities of ~~dirt,~~ sand, silt, clay, and rock fines exceeding 3% of the weight of stone will not be permitted. Stone shall be well-cemented limestone or calcareous, fine-grained sandstone and shall meet or exceed the following requirements:

Test	Acceptable Test Value or Finding
Petrographic Examination (ASTM C295/C295M)	Must be well-cemented limestone or calcareous, fine-grained sandstone
Los Angeles Abrasion Test (ASTM C131, grading B)	Loss no more than 40 percent
Bulk Specific Gravity (ASTM D6473)	Greater than or equal to 2.7
Absorption (ASTM D6473)	Less than or equal to 2.5%
Freezing and Thawing ASTM D5312)	Loss shall be less than or equal to 3.5%
Wetting and Drying (ASTM D5313)	Loss shall be less than or equal to 2%

The Government reserves the right to inspect the stone source or sources from which the Contractor proposes to obtain infill and scour protection stone to determine whether the stone being proposed for use under this Section meets the requirements set forth above.

2.2.2.1 State Highway Specifications

~~When permitted, t~~The stone quality shall conform to the requirements of PDT 408, Section 850.

2.2.3 Gradation Requirements

Stone Size is defined as the side dimension of the smallest square opening through which an individual stone is able to pass. Stone shall be generally block shaped~~, and f~~. Flat, thin, elongated, and slab-shaped stone will not be accepted. Not more than 25 percent of the stone reasonably well distributed throughout the gradation shall have a length more than 2.5 times the breadth or thickness. Not more than 5% of the stone shall have a

length exceeding 3.0 times its breadth or thickness. Stone gradation shall be determined using ASTM D5519, Test Method A.

The following gradations of stone shall be used as specified.

FILTER OR BEDDING MATERIAL

AASHTO No. 1 (AASHTO M 43)
AASHTO No. 3 (AASHTO M 43)
AASHTO No. 57 (AASHTO M 43)

PDT 408, Section 703.2

RIPRAP OR STONE PROTECTION

Riprap or stone protection may specified to conform to the following specifications or may be specified by a specific gradation.

PDT 408, Section 850, NCSA Size Nos. R-4, R-5, R-6, and R-7

NOTE: For the Contractor's information, the stone gradations below correspond to the gradations of PDT 408, Section 850 for NCSA Sizes.

Percent Passing (Square Openings)				
Rock Size (inches)	R-7	R-6	R-5	R-4
42				
30	100			
24		100		
18	15-50		100	
15				
12	0-15	15-50		100
9			15-50	
6		0-15		15-50
4			0-15	
3				0-15
2				

2.2.4 Gradation Testing

The Contractor shall perform gradation tests on all scour protection stone in accordance with the following method. At least one test shall be performed on each 500 cubic yards to be delivered to the project site, or a minimum of one test for each material type, whichever is greater. Samples of stone will be selected at random by the Contracting Officer and determination shall be made by the Contractor under the supervision of the Contracting Officer of the size range of the material in the selected samples. Individual stones in each sample shall be sorted by their ability

to pass square openings of the gradation sizes specified. The stones shall be weighed and the percentage by ~~by~~ weight smaller than each size specified shall be calculated. The total size of each sample shall be approximately 5 cubic yards, or 8 tons. For each gradation test, the Contractor shall report the date, location, sample weight, weights of component sizes, comparison with specification limits, personnel conducting the test, equipment used, and the method of determining stone weights. Gradation test reports shall be furnished to the Contracting Officer prior to delivery of the stone represented by the test to the site.

PART 3 EXECUTION

3.1 PLACEMENT OF STONE PROTECTION

Materials shall be placed as specified below. Where materials are required to be placed below the water surface, dewatering of the area will not be required and the materials shall be placed in the wet. Stone shall be placed within the limits shown on the drawings or where otherwise required by the Contracting Officer. Stone shall be placed in a manner that will produce a reasonably uniform surface providing the full thickness shown on the drawings. Geotextile displaced prior to or during stone placement shall be replaced at the expense of the Contractor. The placement of stone shall progress upward from the bottom of the slopes. Stone shall be placed with ~~no~~a free fall no more than 12 inches. Any defects in the geotextile shall be corrected before stone is placed. The larger stones shall be well distributed in the mass. The finished work shall be free from pockets of small stones and clusters of larger stones. Placing by dumping into chutes or by similar methods likely to cause segregation of the various sizes will not be permitted. The desired distribution of the various sizes of stones throughout the mass shall be obtained by selective loading of the material at the source, by controlled dumping of successive loads during final placing, or by other methods of placement which will produce the specified results. Rearranging of individual stones by mechanical equipment or by hand will be required to the extent necessary to break down bridging and to obtain a reasonably well graded distribution of stone sizes in the completed stone protection. The Contractor shall maintain the stone protection, including the removal of weeds, until accepted and any material displaced by any cause shall be replaced at his expense to the lines and grades shown on the drawings except that the provisions of this paragraph shall not be construed to negate the provisions of Section 01 35 00.00 08 SPECIAL PROCEDURES paragraph DAMAGE TO WORK.

3.2 TOLERANCES

3.2.1 Stone Protection

Stone protection shall have the minimum layer thickness shown on the drawings. The top surfaces of the scour protection stone shall be permitted to deviate from the lines shown on the drawings in order to extend to the top of slope, if feasible.

TYPE R-4

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MICROPILES

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SECTION 31 63 33

MICROPILES

PART 1 GENERAL

1.1 SUMMARY

The work described in this section consists of furnishing all plant, labor, equipment, and materials for the fabrication and installation of the micropiles to support the ~~existing abutment wall~~foundation and culverts.

1.2 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A 722/A 722M	(2007) Standard Specification for Uncoated High-Strength Steel Bar for Prestressing Concrete
ASTM C 109/C 109M	(2008) Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
ASTM C 144	(2004) Standard Specification for Aggregate for Masonry Mortar
ASTM C 150	(2007) Standard Specification for Portland Cement
ASTM C 33/C 33M	(2008) Standard Specification for Concrete Aggregates
ASTM C 494/C 494M	(2008a) Standard Specification for Chemical Admixtures for Concrete
ASTM D 3350	(2008) Polyethylene Plastics Pipe and Fittings Materials

ACI INTERNATIONAL (ACI)

ACI 301	(2005; Errata 2008) Specifications for Structural Concrete

AMERICAN PETROLEUM INSTITUTE (API)

API Spec 5CT	(2005; Errata 2006; Errata 2006) Specification for Casing and Tubing

POST-TENSIONING INSTITUTE (PTI)

PTI 4	(June 1996) Recommendations for

1.3 SYSTEM DESCRIPTION

The work includes fabrication and installation of the micropiles system. The micropiles shall be fabricated and installed as shown on the drawings. The Contractor shall prepare installation drawings and an installation plan for approval by the Contracting Officer. The materials, installation, and acceptance shall be in accordance with these specifications. Micropiles shall be the steel casing type, with ~~threaded~~deformed centralized bar.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Fabrication and Installation Drawings; G, DO, RE

The submittal shall include drawings and detailed installation procedures and sequences showing complete details of the installation procedure and equipment; micropile fabrication; casing and ~~threaded~~deformed bar details; grouting methods; grout mix designs; anticipated ultimate grout bond strengths at each interface (grout-to-concrete, grout-to-casing, grout-to-threaded bar, grout-to-rock); casing joint and threaded construction details; ~~threaded~~ bar joint and connection details; and ~~thread~~ bar and casing placement and installation for approval by the Contracting Officer. Shop drawings shall include locations and details of the spacers, centralizers, couplers, and banding. Once reviewed by the Contracting Officer, no changes or deviation from shop drawings shall be permitted without further review and approval by the Contracting Officer. The submittal shall also include the proposed methods for achieving the required minimum ultimate grout bond strength at each interface (grout-to-concrete, grout-to-casing, grout-to-threaded bar, grout-to-rock).

Equipment; G, DO, RE

The Contractor shall submit catalog cuts, brochures, or other descriptive literature describing the equipment to be used for drilling, grouting, handling, and installing the micropiles. The Contractor shall also submit sketches, drawings, or details showing the access and temporary supports where required for the drilling equipment.

Fabricator Qualifications; G, RE
Installer Qualifications; G, RE

The qualifications and experience records shall be submitted for approval. Experience records shall identify all the individuals responsible for the micropiles and shall include a listing of projects of similar scope performed within the specified period along with points of contact. The Contractor shall submit the qualifications prior to the installation of any micropiles

specified in this section.

Installation Plan; G, DO, RE

The Contractor shall submit to the Contracting Officer for review and comment, a plan for installing the micropiles. The proposal shall describe the sequence for installation and other restrictions as outlined on the drawings or specified. The micropile installation procedures shall be determined by the Contractor as part of the micropile design. The installation plan shall also include descriptions of methods and equipment to be used by the Contractor for watertightness testing and alignment checking of micropile holes.

SD-06 Test Reports

Micropile Steel Casing; G, RE

Certified test reports for each heat or lot of micropile steel casing shall be submitted with materials delivered to the site.

Cement Grout Mixture Proportions; G, RE

Thirty days prior to installation of micropiles, the Contractor shall submit the mixture proportions that will produce grout of the quality and strength required. Applicable test reports shall be submitted to verify that the grout mixture proportions selected will produce grout of the quality and strength specified.

SD-07 Certificates

~~Threaded~~Deformed steel bars; G, RE

The Contractor shall furnish five (5) copies of mill reports and five (5) copies of a certificate from the manufacturer stating chemical properties, ultimate strengths, yield strengths, modulus of elasticity, and any other physical properties needed for the required computations, for the type of steel furnished.

SD-11 Closeout Submittals

Driller Logs; G, DO, RE

The original handwritten log and three (3) copies in typed format shall be submitted to the Contracting Officer within two days of the completion of each hole.

Micropile Records; G, DO, RE

Upon completion of installation of each micropile, the Contractor shall furnish watertightness test results and report of remedial action taken, top of bond zone elevation in rock, bond length in rock, and grout mix.

1.5 QUALIFICATIONS FOR MICROPILES

Micropile fabricator and installer qualifications shall be submitted for approval in accordance with paragraph "Submittals". The submittals shall, where applicable, identify individuals who will be working on this contract

and their relevant experience. No changes shall be made in approved personnel without prior approval of the Contracting Officer.

1.5.1 Fabricator Qualifications

The micropile components shall be fabricated by a manufacturer that has been in the practice of designing and fabricating micropiles similar in size and scope to this project for at least ten years.

1.5.2 Installer Qualifications

The micropiles shall be installed by a firm which is regularly engaged in the installation of micropiles and has at least ten years experience in the installation of similar micropiles. The superintendent shall have installed micropiles on at least five (5) projects of similar scope and size.

1.6 PREPARATORY MEETING

Prior to commencing any work on the micropiles, the Contractor, including all field personnel to be involved in drilling and installation of the micropiles, shall meet with representatives of the Contracting Officer to review the plans and specifications, work plans, and submittals. Drilling may commence upon approval of the micropiles installation plan and procedures described in paragraph "Submittals" and after closing of the Preparatory Meeting.

1.7 DELIVERY, STORAGE AND HANDLING

Materials shall be suitably wrapped, packaged or covered at the factory or shop to prevent being affected by dirt, water, oil, grease, and rust. Materials shall be protected against abrasion or damage during shipment and handling. Materials stored at the site shall be placed above ground on a well supported platform and covered with plastic or other approved material. Materials shall be protected from adjacent construction operations. Steel casing and threaded bars which are damaged by abrasion, cuts, nicks, heavy corrosions, pitting, welds or weld spatter shall be rejected and removed from the site.

1.8 PROJECT SITE CONDITIONS

The natural alluvial soils generally consists of silty gravels, some sand, and calyey sands with little gravel. The bedrock consists of sandstone interbedded with thinly bedded shale. If material is encountered that is suspected to be contaminated, the Contracting Officer shall be notified immediately for direction on the handling and management of the suspect material.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 High Strength ~~Threaded~~Deformed Steel Bars

ASTM A 722/A 722M Type II, meeting all supplementary requirements.

2.1.2 Steel Casing

API Spec 5CT, Grade N-80, Oil Field Seconds/Mill Secondary Tubing. The

surfaces of the steel casing shall be roughened or prepared as required in order to obtain the required minimum ultimate grout bond strength. These details shall be shown on the Fabrication and Installation Drawings.

2.1.3 Smooth Polyethylene Tubing

ASTM D 3350, Type III.

2.2 MANUFACTURED ITEMS

2.2.1 Couplers and Joints

Couplers for bars shall be capable of developing 100 percent of the minimum specified ultimate tensile strength of the bar or casing.

2.2.2 Centralizers

Centralizers shall be fabricated from plastic, steel, or other approved material which is nondetrimental to the casing or bar steel. Wood shall not be used. The centralizer shall be able to support the bar and casing in the drill hole and position the bar and casing so a minimum of 1-inch of grout cover is provided. Centralizers and spacers shall permit grout to freely flow up the drill hole.

2.3 GROUT

2.3.1 Cement

ASTM C 150, Type I, II, III and shall be the product of one manufacturer. If the brand or type of cement is changed during the project, additional grout tests shall be conducted to ensure consistency of quality and performance in situ.

2.3.2 Water

Water shall be fresh, clean, potable, and free from injurious amounts of sewage, oil, acid, alkali, salts, or organic matter.

2.3.3 Sand

Sand for sand-cement grout shall conform to ACI 301, and either ASTM C 144 or ASTM C 33/C 33M, as directed by the Contracting Officer. Sand shall not contain substances which may be deleteriously reactive with alkalis in the cement.

2.3.4 Admixtures

Admixtures shall conform to the requirements of ASTM C 494/C 494M. Admixtures which control bleed, improve flowability, reduce water content, and retard set may be used in the grout, subject to the review and acceptance by the Contracting Officer. Expansive admixtures shall only be added to the grout if required to achieve the specified minimum ultimate grout bond strengths, and shall be subject to the review and acceptance by the Contracting Officer. Admixtures shall be compatible with the grout and mixed in accordance with the manufacturer's recommendations. Their use will only be permitted after appropriate field tests on fluid and set grout properties. Admixtures with chlorides shall not be permitted.

2.3.5 Cement Grout for Micropiles

Grout for grouting micropiles shall consist of a homogenous, pumpable, stable mixture of Portland cement and water. The Contractor shall submit this proposed cement grout mixture proportions to the Contracting Officer for approval. The water content shall be the minimum necessary for proper placement, but the water-cement ratio shall not exceed 0.45 by weight. Field proportions of materials shall be based on results of tests made on sample mixtures of grout. The minimum compressive strength of 2-inch cube samples shall be 5,000 psi after 28 days. The Contractor shall be responsible for taking, curing, and breaking of grout test cubes for determining mix design, and all testing shall be done by an independent laboratory approved by the Contracting Officer.

Unless approved and directed otherwise by the Contracting Officer, cement grout shall also be used for waterproofing tests, grouting holes which fail the watertightness test, and for backfilling holes which are abandoned.

The cement grout mixture proportions shall be capable of obtaining a minimum ultimate grout bond strength of 300 psi at all interfaces (grout-to-concrete, grout-to-casing, grout-to-threaded bar, and grout-to-rock).

2.3.6 Sand-Cement Grout

If approved and directed by the Contracting Officer, sand-cement grout may be used for waterproofing tests, grouting holes which fail the watertightness test, and for backfilling holes which are abandoned. Sand-cement grout shall consist of a mixture of portland cement, sand, and water. The grout shall consist of one part Portland cement and two parts sand by volume, mixed with sufficient water to provide a uniform consistency. The water content shall be the minimum amount necessary for proper placement, and shall be approved by the Contracting Officer.

2.4 BAR AND CASING FABRICATION

2.4.1 General

Fabrication of the micropile bars and casings shall be as recommended by the suppliers. Bars and casings shall be completely assembled with all centralizers, grout tubes, and corrosion protection prior to insertion into the hole. Fabricated bars and casings shall be protected, transported, and stored in a manner to prevent contamination or damage to any components.

2.4.2 ~~Threaded Rod~~Deformed Bar and Casing

~~Threaded rod~~Bar and casing material shall be unblemished and free of pitting, nicks, grease, or injurious defects. When required to maintain the ~~threaded rod~~bar and casing location within the hole, centralizers shall be provided at a maximum of 10 foot intervals center-to-center throughout the micropile length. The entire bond length of the ~~threaded rod~~bar and casing shall be free of dirt, lubricants, loose rust, corrosion-inhibiting coatings, or other contaminants.

2.4.3 Vent Tubes

Vent tubes used during grouting operations, if necessary, shall be any appropriate type for the job, as recommended by the supplier of the micropiles.

2.4.4 Grout Tubes

Grout tubes shall be polyethylene tubing or as recommended by the micropile manufacturer and approved by the Contracting Officer. Inside diameter of grout tubes shall be adequate to fully grout the entire hole.

2.5 TESTS, INSPECTIONS, AND VERIFICATIONS OF MICROPILES

The Contractor shall have required material tests performed on steel ~~threaded~~ bar, casing, and accessories by an approved laboratory to demonstrate that the materials are in conformance with the specifications. Grout shall be tested in accordance with ASTM C 109/C 109M. These tests shall be at the Contractor's expense. Steel threaded bars and casing test results shall be furnished prior to beginning fabrication of any micropiles. Grout test results shall be provided to the Contracting Officer within 24 hours of testing.

PART 3 EXECUTION

3.1 EQUIPMENT

The Contractor's Quality Control Manager shall verify that the equipment used onsite is the same as the equipment submitted for approval.

3.1.1 Drilling Equipment

Drilling equipment shall be suitable for advancing the drill tools to the depths and at the alignment specified.

3.1.2 Grouting Equipment

3.1.2.1 Grout Mixer

The grout mixer shall be a high-speed, high-shear, colloidal type grout mixer capable of continuous mechanical mixing that will produce uniform and thoroughly mixed grout which is free of lumps and undispersed cement. The mixer shall be equipped with a suitable water and admixture measuring devices calibrated to read in cubic feet to the nearest tenth and so designed that after each delivery, the hands can be conveniently set back to zero.

3.1.2.2 Grout Pump

The grout pump shall be of the positive displacement type, and shall be capable of pumping at all flow rates below 20 gallons per minute, and shall be capable of pumping at the pressure of at least 50 psi at zero flow rate.

For neat cement grout, the pump shall have a screen with 0.125-inch maximum clearance to sieve the grout before being introduced into the pump. Screens are not required for shear type mixers. A pump shall also be available which is capable of pumping both neat cement grout mixes and sand-grout mixes. The pumping equipment shall have a pressure gage capable of measuring pressures of at least 150 psi or twice the required grout pressure, whichever is greater. The grouting equipment shall be sized to enable the grout to be pumped in one continuous operation. The grout should be kept in constant agitation prior to pumping.

3.2 DRILLING HOLES

3.2.1 General

The top of bedrock indicated on the drawings were determined based on the results of core borings (see also paragraph "Project Site Conditions"). Holes shall be drilled at the locations and inclinations shown and to the depths and diameters indicated on the drawings. The micropile installation sequence shall be as shown on the drawings. The locations of the holes may be changed only as approved by the Contracting Officer. Any redesign of the micropiles due to relocation of micropile holes shall be performed by the Contractor. Core drilling or percussion type drilling are both acceptable drilling methods in concrete ~~(except as specified in paragraph "Drilling Through Concrete")~~ and rock. The use of a "down-the-hole" hammer or other percussion type drilling methods are permissible, and do not require permission from the Contracting Officer. No holes shall be drilled within 15 feet of a grouted hole until the grout has set at least 24 hours. Care shall be taken while drilling to avoid damage of any kind to the existing structures. Damages of any nature will be evaluated by the Contracting Officer and repairs or replacements shall be made at his discretion. Waste water from drilling operations shall be collected and recycled or treated; it shall not be discharged directly into the river in accordance with Section 01 57 20.00 10 ENVIRONMENTAL PROTECTION. Holes in concrete and rock shall be roughened or prepared as required in order to obtain a minimum ultimate grout bond strength at all interfaces (grout-to-concrete and grout-to-rock) of 300 psi.

3.2.2 Drilling in Soil

Holes through soil may be drilled by the duplex method using an inner and outer temporary casing with return water flow between the casings. Casing shall not be flushed in. Duplex drilling method using air flush only, or using high pressure air will not be permitted. The Contracting Officer may consider proposals to drill micropiles with a single casing (drilling with permanent casing only) through soil and into rock, provided the Contractor can demonstrate reasonable control of soil flush, hole diameter, and hole outgrowth; meet prescribed tolerances for hole diameter and verticality; and demonstrate that the alternate configuration provides equivalent structural capacity and perimeter surface area grouted into competent rock.

3.2.3 Temporary Casing

Temporary casing may be utilized for drilling through soil. Temporary casing shall be removed during micropile grouting.

3.2.4 Drilling in Rock

Unless otherwise specified, holes in rock shall be drilled by core drilling or percussion type drilling methods using equipment suitable for the intended purpose. The drilling method shall not cause structural damage to existing structures. If damage is observed, the drilling method shall be modified. Overdrilling of holes by a maximum length of 1 foot beyond the required elevation will be permitted if complete removal of cuttings and other material cannot be accomplished.

3.2.5 Records

The Contractor shall submit driller logs and records as specified in

paragraph "Driller Logs". The presence of a Government Inspector or the keeping of separate drilling records by the Contracting Officer shall not relieve the Contractor of the responsibility for the work specified in this paragraph. Payment will not be made for any work for which the required records have not been furnished by the Contractor.

3.2.6 Tolerances

The entry angle for the micropile hole shall be within 2 degrees of the inclination and direction shown on the drawings. The alignment of the drilled hole shall be within 2 degrees of the theoretical alignment. If the hole alignment is not within these tolerances, the hole shall be backfilled with cement or sand-cement grout and a new hole drilled at the location and elevation directed by the Contracting Officer.

3.2.7 Pregrouting Micropile

The rock portion of all micropile holes shall be tremie grouted with cement or sand-cement grout. Grouted holes shall be redrilled for watertightness testing while the grout strength is considerably less than that of the surrounding rock, but not less than 24 hours after grouting.

3.2.8 Watertightness Testing

The rock portion of all drilled holes shall be watertightness tested in accordance with the procedures of PTI 4, paragraph 7.4. A packer shall be used where necessary to facilitate pressure testing of the bond zone. The packer shall be placed at the top of the hole in rock. The packer shall not be placed within casing. Holes which have a water loss in excess of 2.5 gallons in ten minutes shall be grouted as specified in paragraph "Waterproofing Micropiles", redrilled, and retested. This sequence shall be repeated until the rock portion of each drilled hole passes the watertightness testing. The rock bond zone of the holes shall be watertightness tested to a hydrostatic pressure within the bond zone of 5 psi in excess of the hydrostatic head measured at the top of the bond zone.

The Contractor may use a method of watertightness testing that does not use a packer, if submitted with the Installation Plan and approved by the Contracting Officer. However, if the Contractor performs the watertightness test without a packer and the micropile hole fails the watertightness test, the Contractor shall repeat the watertightness test with a packer at no additional cost to the Government.

3.2.9 Waterproofing Micropiles

The rock portion of micropiles which fail the watertightness test shall be tremie grouted with cement grout, or sand-cement grout, if so directed by the Contracting Officer. Grouted holes shall be redrilled while the grout strength is considerably less than that of the surrounding rock, but not less than 24 hours after grouting.

3.3 INSTALLATION OF MICROPILES

3.3.1 General

The Contractor shall be responsible for each drilled hole until the micropile has been installed, grouted, and accepted. Holes in rock and casings shall be cleaned by pressurized air and/or water to remove drill cuttings and mud. The micropile installation shall be as shown on the

drawings.

3.3.2 Placing

All the equipment used in handling and placing the micropiles shall be such that it does not damage or deteriorate the steel ~~thread~~ bar or casing. Each micropile threaded bar or micropile steel casing shall be inspected prior to insertion into the hole. Any damage shall be repaired prior to insertion or, if determined by the Contracting Officer to be not repairable, the micropile shall be replaced.

3.3.3 Cement Grouted Micropile

Grouting equipment shall be of type and capacity required for successful installation of the micropiles. All micropiles shall use single stage grouting to encase the ~~threaded~~ bar and casing. Grouting shall commence at the bottom of the grout zone and proceed to the top of the zone. Grouting shall be gravity flow. After the micropile has been grouted for at least 24 hours, the micropile hole shall be "topped off" with grout if any settlements of the grout in the cored hole has occurred. Competent grout shall extend the entire vertical height of the micropiles through existing structure.

3.4 FIELD QUALITY CONTROL

3.4.1 General

Final acceptance of each micropile will be made by the Contracting Officer. All tests shall be run in the presence of the Contracting Officer or his authorized representative.

3.4.2 Driller Logs

The Contractor shall keep accurate driller logs and records of all work accomplished under this contract and shall deliver complete, legible copies of these logs and records to the Contracting Officer upon completion of the work, or at such other time or times as he may be directed. All such records shall be preserved in good condition and order by the Contractor until they are delivered and accepted, and the Contracting Officer shall have the right to examine such records at any time prior to their delivery. Separate logs shall be made for each hole. The Contractor shall use the DRILLING LOG (ENG FORM 1836 and 1836A), or other approved form which provides the required information for his logs. The following information shall be included on the logs or in the records for each hole:

a. Hole number or designation and elevation of top of hole.

b. Inclination of the hole.

c. Make and manufacturer's model designation of drilling equipment.

d. Dates and time when drilling operations were performed.

e. Time required for drilling each run.

f. Elevation of top of rock.

g. Steel casing seat elevation.

h. Depth and elevation of rod drops and other unusual occurrences.

i. Depth and elevation at which groundwater is encountered.

j. Depths and elevations at which drill water is lost and regained and amounts.

k. Depth and elevation of bottom of hole, determined by measuring the drill steel length.

3.4.3 Micropile Records

Upon completion of installation of each micropile, the micropile records shall be furnished to the Contracting Officer as specified in paragraph "Submittals". In addition, as-built drawings showing the completed installation of the micropiles shall be furnished upon completion of installation of all micropiles.

3.5 ACCEPTANCE

3.5.1 General

Acceptance of micropiles shall be determined by the Contracting Officer. Acceptance shall be based primarily on the Contractor's conformance with the approved installation plan and procedure for each micropile.

3.5.2 Replacement of Rejected Micropiles

Any micropile that is rejected by the Contracting Officer shall be replaced. A replacement micropile, including a new micropile hole, shall be provided by the Contractor at no expense to the Government. The location of the replacement micropile shall be as directed by the Contracting Officer. The Contractor shall provide all materials, supplies, equipment, and labor necessary to provide a new micropile assembly to the satisfaction of the Contracting Officer. No drilling shall be performed for a replacement micropile until the grouting of all micropiles within 15 feet of the replacement micropile has set for at least 24 hours. Payment will not be made for rejected or failed micropiles. The Contractor shall either remove failed micropiles, and thoroughly ream and clear the hole or install a replacement micropile at the location directed by the Contracting Officer.

-- End of Section --

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GROUTING

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SECTION 31 73 00.00 08

GROUTING

PART 1 GENERAL

1.1 SUMMARY

This section describes the equipment, materials, and procedures to perform grouting work. It covers the equipment and materials to use; furnishing, handling, transporting, storing, mixing, and injecting grout; handling, controlling, and disposing of waste water and waste grout. The work consists of completely filling the annular space between the new structural plate in the culvert replacement portion of the project and both the existing structural plate and stone arch culverts with low-strength (minimum 300 psi) cementitious grout. The annular space consists of the new culvert replacement structural plate overlapping the smaller radius existing culverts by 18 inches. In addition, non-shrink grout shall be placed in the keyway of the structural plate footers~~. The total amount of grouting required is not known and will be determined by conditions encountered as the work progresses~~, for both the replacement and extension culvert sections. Work under this section shall be in accordance with EM 1110-1-3500, EM 1110-2-2901, and EM 1110-2-3506.

1.2 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.

ASME INTERNATIONAL (ASME)

ASME B16.3	(2011) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.5	(2013) Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.9	(2012) Standard for Factory-Made Wrought Steel Buttwelding Fittings

ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM C117	(2013) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136/C136M	(2014) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C150/C150M	(2016; E 2016) Standard Specification for

Portland Cement

ASTM C494/C494M	(2016) Standard Specification for Chemical Admixtures for Concrete
ASTM C618	(2012a) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C937	(2016) Grout Fluidifier for Preplaced-Aggregate Concrete
ASTM C939/C939M	(2016a) Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
ASTM C1090	Standard Test Method for Measuring Changes in Height of Cylindrical Specimens of Hydraulic-Cement Grout

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 1110-1-3500	(1995) Engineering and Design -- Chemical Grouting
EM 1110-2-2901	(1997) Engineering and Design -- Tunnels and Shafts in Rock
EM 1110-2-3506	(1984) Engineering and Design -- Grouting Technology
EM 385-1-1	(2014) Safety and Health Requirements Manual

1.3 SEQUENCING

Perform grouting in the work sequence as shown and as specified. Grouting between the new structural plate and existing arch culverts shall be done at a reasonable time following the installation of the structural plate and prior to the placement of structure backfill and the CCCP liner. Grouting, once started, shall normally proceed to completion at each injection location without significant interruption.

1.4 SUBMITTALS

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

SD-01 Work Plan

Pressure Washing and Pressure Testing Operations; G, DO
Cement Grouting Operations; G, DO

SD-03 Grouting

Grouting Report

1.5 GROUTING REPORT

The CONTRACTOR shall provide six (6) bound copies of the following information to the ~~COR~~Contracting Officer for review and approval prior to construction; G:

Qualifications and experience of grout mix applicator and Project Superintendent and support personnel.

Grout mix design and trial mix tests, with set time, compressive strength, viscosity, and density test results.

Grouting Equipment

Initial set time of the grout.

The 24 hour and 28 day minimum grout compressive strengths.

The grout working time before a 15% change in density or viscosity occurs.

The proposed grouting methods and procedures. Contractor shall submit a layout detail to include proposed locations for blocking, grout injection tubes and air vent tubes.

Method for waste grout recovery.

Estimated grout volume for each ~~pipe~~annular space and each structual plate keyway per stage.

The maximum injection pressures proposed as well as maximum allowable grout injection pressures ~~as provided by the pipe manufacturer~~.

~~Proposed grout stage volumes. Define the location and lengths of grout pipes for each stage. Stage lengths are limited to 20-30' unless justification can be provided as to the need for longer stages.~~

Bulkhead designs and locations including vent and injection port location and proposed materials to be used in bulkhead construction. ~~In addition the lengths of each port shall be shown.~~

Method of flow control during grouting.

For each different type of grout or variations in procedure of installation, a complete package shall be submitted. The submittal shall include each of the above items and the locations of conditions to which it applies.

Detail measures or procedures to equalize the pressure between the inside and outside of the structural plate and existing failures so as to resist buoyant or bursting forces and to prevent damage to existing structural plate and stone arch culvert and associated appurtenances.

1.6 QUALIFICATIONS

Grouting shall be performed by a specialty Contractor or subcontractor experienced and competent in cement grouting. Submit evidence that the

grouting specialist or grouting foreman has had at least 3 years experience within the past 5 years on similar grouting type projects.

Perform all grouting work under the direct field supervision of a qualified grouting specialist or grouting foreman whose qualifications have been provided to the Contracting Officer. The foreman or specialist shall supervise the performance of the work in compliance with these specifications.

PART 2 PRODUCTS

2.1 GROUTING MATERIALS

Provide grout of a nonshrink type and normally composed of water, cement, and fluidifier with shrinkage compensators (expanding agents). Use admixtures to vary grout properties, and mineral fillers as specified or approved. The grout mixes will be designed or approved by the Contracting Officer and will be varied to meet the characteristics of each hole or situation as determined by the conditions encountered. The various materials furnished shall conform to the following paragraphs.

2.1.1 Sand

Sand for grout shall consist of hard, tough, durable, uncoated particles. It may be composed of natural sand. The shape of the particles shall be generally rounded or cubical and shall not contain more than 5 percent of flat or elongated pieces having a maximum dimension in excess of five times the minimum dimension. If the sand is a combination of separately processed sizes or classification, the different components shall be batched separately, or, subject to written approval, blended prior to delivery to the mixing plant. The sand shall be well-graded from fine to coarse, and the gradation, as determined in accordance with ASTM C136/C136M and ASTM C117, shall conform to the following requirements:

SIEVE DESIGNATION (U.S. STANDARD SQAURE MESH)	**CUMULATIVE PERCENTAGE BY WEIGHT**	
	PASSING	RETAINED
8	100	0
16	95-100	0-5
30	60-85	15-40
50	20-50	50-80
100	10-30	70-90
200	0-5	95-100

In addition to the grading limits shown, all sand used in the work shall have a fineness modulus within the range of ~~1.50 to 2.00~~2.30 to 3.10. The grading of the sand as delivered to the mixes, during any 24-hour period of operation, shall be controlled so that the fineness moduli of samples taken

will not vary more than 0.10 from the average fineness modulus. The results of previous tests and the service record may be used to determine the acceptability of the sand. Sand shall be stored in a manner to facilitate drainage and avoid the inclusion of any foreign materials in the grout. The storage piles shall be constructed to prevent segregation and contamination.

2.1.2 Water

Use only potable water obtained from a municipal water distribution system and transported, when required, in a clean, dedicated container designed specifically for such.

2.1.3 Cement

Provide cement used in grout conforming to the requirements of ASTM C150/C150M. Store cement in accordance with Section 03 30 00 CAST-IN-PLACE CONCRETE. Employ methods of handling, transporting, and storage that are satisfactory to the Contracting Officer. Only cement furnished in cloth or paper bags will be accepted for use in the work unless bulk cement is approved. Store a sufficient quantity of cement at or near the site of the work to ensure that grouting operations will not be delayed due to shortage of cement. Care shall be taken in storage and handling to protect the cement from contamination and moisture. In the event the cement contains lumps or foreign matter that will not pass through a standard #100 mesh screen, remove the cement from the work site and replace it at no cost to the Government.

2.1.4 Admixtures

An admixture is any material other than water, sand, and cement added to the grout immediately before or during its mixing to alter its chemical or physical properties to a desired characteristic during its fluid or plastic state. Admixtures shall conform to ASTM C494/C494M at the time of acceptance testing sample submittal; furnish certification from the manufacturer that the material meets all the requirements of these specifications. All admixtures to be used in each batch of grout shall be separately packaged and weighed prior to use. Grout fluidifier and expanding agents shall conform to the requirements of ASTM C937. Accelerator additive shall be calcium chloride ($CaCl_2$) in amounts up to 2 percent of the cement by weight or an approved product manufactured for the specific purpose of accelerating grout set-up time. The calcium chloride shall be granular or flaked and added to the grout by dissolving it in a portion of the mix water. Admixtures shall be selected by the slip-lining grout manufacturer to meet performance requirements, improve pumpability, control set time, and reduce segregation. Admixtures shall not be biodegradable.

2.1.5 Mineral Filler

Fillers used in grout as replacement for a portion of the cement shall be fly ash composed of finely divided siliceous residue and in accordance with ASTM C618, Class F. The maximum amount of fly ash should not exceed 30 percent of the cement by weight.

2.2 EQUIPMENT

Grouting equipment shall be of a type, capacity, and mechanical condition suitable for the work, as approved by the Contracting Officer. Power,

compressed air, all other equipment, and the layout thereof shall meet the requirements of local, State, and Federal regulations and codes, both with respect to safety and otherwise. The use of gasoline internal combustion engines for operation of grouting equipment underground is not permitted. Internal combustion engines shall be diesel powered fitted with suitable and efficient scrubbers and in compliance with EM 385-1-1.

2.2.1 Grouting Equipment

2.2.1.1 Cement Grouting Equipment

Submit a plan of the proposed grouting equipment types and layout for approval. An example of a typical grouting equipment layout is included at the end of this section. The grouting system shall have sufficient gages, monitoring devices, and tests to determine the effectiveness of the grouting operation and to ensure compliance with the structural plate specifications and design parameters. Grouting equipment to be furnished shall include the following:

2.2.1.1.1 Grout Pump and Mixer

The materials shall be mixed in equipment of sufficient size and capacity to provide the desired amount of grout material for each stage in a single operation. The system shall mix the grout to a homogeneous consistency and deliver grout to the injection point at a steady pressure with a non-pulsating pump at the mix tank. The equipment shall be capable of mixing the grout at densities required for the approved procedures and shall also be capable of changing density as dictated by field conditions at any time during the grouting operation. The grout mixer shall be a high-speed, high-shear, colloidal type grout mixer capable of continuous mechanical mixing that will produce uniform and thoroughly mixed grout which is free of lumps and undispersed cement. The mixer shall be equipped with suitable water and admixture measuring devices calibrated to read in gallons and tenths and so designed that after each delivery the hands can be conveniently set back to zero. A paddle storage tank shall be used to agitate the mix prior to pumping.

2.2.1.1.2 Holding Tank or Sump

Holding tank(s) or sump(s) of the mechanically agitated type to provide a high volume and continuous injection of grout. The sump shall be capable of holding the solids of the mix in suspension and have a capacity of at least 12 cubic feet of grout or three times the capacity of the mixing system. Volume of grout used from the agitator holding tank(s) or sump(s) shall be measured by a vertical graduated stick or marks at different levels in the tank(s)/sump(s).

2.2.1.1.3 Supply and Pressure Control

Valves, pressure gauges, grout lines, header arrangements, and accessories as necessary to provide a continuous supply of grout and accurate pressure control. The distance between the hole and the pump or holding tanks shall be as short as possible to minimize the accumulation of solids and possible clogging. Pressure gauges shall be high precision, graduated with divisions not greater than 2 psi on the dial face, calibrated and certified correct prior to use. Gauges shall be tested for accuracy during the work by cross comparison with a standard set of oil-filled gauges. The moving parts of all gauges shall be protected from dust, grit, and direct contact with grout. Pressure gauges shall be suitable for use in the grouting

environment and have a working range between 1.5 to 2.0 times the design grout pressures, and have accuracy within 0.5% of full range. Provide, at a minimum, one pressure gauge at the point of injection and one pressure gauge at the grout pump.

2.2.1.1.4 Flow Cone

Flow cone(s) to ascertain the fluidity of grout mixtures. The flow cone and method of test shall be in accordance with ASTM C939/C939M.

2.2.1.1.5 Testing Equipment

A Baroid Mud Balance shall be used to check the specific gravity during pumping operations.

2.3 GROUT

2.3.1 Cement Grout

Design the grout mixture to meet the change in height requirements of ASTM C1090. Grout flow time-of-efflux, when tested in accordance with ASTM C939/C939M shall be between 10 and 30 seconds.

The grout shall have a minimum penetration resistance of 100 psi in 24 hours when tested in accordance with ASTM C403 and a minimum compressive strength of 300 psi in 28 days when tested in accordance with ASTM C495. The CONTRACTOR shall develop one or more mix designs to completely fill the annular space based upon, but not restricted to, the following requirements:

A. Size of annular void

B. Absence or presence of water

C. Sufficient strength and durability to prevent movement of the structural plate

D. Provide adequate retardation for placement

E. Provide less than 1 percent shrinkage by volume

F. Heat of hydration compatible with pipe material in accordance with pipe manufacturer's recommendations

G. Shall have zero bleed

H. Specific Gravity greater than 1.0 when outer pipe is full of water (if applicable).

2.4 PIPE AND FITTINGS

All pipe shall conform to ASTM A53/A53M standard weight. The fittings shall be malleable iron Type I in accordance with ASME B16.3, ASME B16.5, and ASME B16.9, Class 150. Pipe shall be black steel of the diameter shown or as directed.

PART 3 EXECUTION

3.1 Embedded Pipe

Provide all metal pipe and fittings required for constructing grout holes, grout hole connections, and air vents. All pipe and fittings embedded in concrete shall be cleaned thoroughly of dirt, grease, grout, and mortar immediately before embedding and shall be firmly held in position and protected from damage or displacement while the concrete is being placed. Great care shall be taken to avoid premature clogging of pipes and any pipe that becomes clogged or obstructed before completion of operations shall be cleaned out in a satisfactory manner or replaced at the expense of the Contractor. All piping required for the work shall be cut, threaded, fabricated, and installed, as required.

3.2 GROUTING PROCEDURES

Perform grouting in the presence and under the direction of the Contracting Officer. Notify the Contracting Officer Representative at least 24 hours in advance of grouting operations. After installation of the injection ports and bulkheads, PVC caps shall be placed over the pipes to prevent any debris from entering the annular space.

3.2.1 Contact Grouting

Contact grouting is defined as the injection of grout behind cast-in-place concrete lining (shaft and/or tunnel), or grouting behind the initial support system, to achieve continuous contact between the lining and the surrounding rock or soil. Tunnel plug contact grouting is also included in this definition. Perform contact grouting in such a manner as to ensure that all voids between the concrete or initial support members and the rock or soil face will be filled with grout. No pressure washing or testing is required prior to injecting grout. Grout shall be a neat cement mixture. The grouting of any hole shall not be terminated until all voids have been filled to the maximum extent practicable and the Government Representative directs the Contractor to stop grouting. Vent pipes, for the release of air and water during grouting of crown overbreak cavities shall be provided in such locations as directed or approved. The installation requirements of paragraph EMBEDDED PIPE shall apply to vent pipes. Contact grouting shall be done at the highest safe pressure as directed but initially not exceeding 10 psi. Grouting shall be initiated from the lower end and at the invert of a tunnel and the grout behind the structural plate displaced upward. Grouting in the tunnel crown area may require secondary grouting to completely fill all the void space due to overbreak. Such secondary grouting shall be done with expansive grout mixtures after the initial contact grout has been injected and set up.

3.2.2 Grouting Between Structural Plate and Existing Arches

This type of grouting shall consist of placing neat cement grout in the annular space surrounding the existing structural plate arch and stone arch culverts to fill the void between the new structural plate overlapping the existing features by 18 inches.. Grouting procedures are the same as those described in paragraph CONTACT GROUTING with the following exceptions:

a. Grout holes and sealing plugs shall be provided in the structural plate during fabrication.

b. Grouting equipment shall be such that sudden surges in pressure at

refusal do not occur.

c. Grout hole plugs shall be ground flush with the structural plate and finished smooth.

d. After grouting is completed, the Government Representative will sound the structural plate with hammer blows to determine if all voids are filled. If directed, additional grout holes shall be drilled and tapped to receive a nipple. The use of a cutting torch to cut-in and weld-on a nipple is prohibited.

3.2.3 Tunnel, shaft, and Ring Curtain Grouting

3.2.3.1 Grout Injection

Once the culvert replacement structural plate has been installed, construct temporary forms for grout injection. Following construction of the forms, the CONTRACTOR shall fill the annular space between the structural plate and existing culverts along its entire length with cementitious grout. Grouting should commence at the injection port on the form and continue until:

A. Grout of similar specific gravity to that being mixed has been observed flowing from the form vent and it has been closed.

B. The air or water displacing from the pipe stops flowing

C. The estimated total volume plus a percentage (approx. 10%), to allow for a tremie seal on the pipe, has been pumped.

Grouting should proceed from the longest line and progress through the successively shorter grout lines. Grout lines should be switched when:

A. The air or water displacing from the next shorter grout pipe stops flowing.

B. The estimated volume plus a percentage (approx. 10%), to allow for a tremie seal on the next shorter pipe, has been pumped.

Remove or control standing or running water in annular spaces to maintain the correct water ratio of the grout mixture. Limit pressure on the annular space to prevent damage to the structural plate and stone arch culvert. The gauged grout pressure at the pipe shall not exceed that of the pipe manufacturer's recommendation or 10 psi, whichever is smaller. Regardless of the pressure, the CONTRACTOR shall be solely responsible for any damage or distortion to structural plate and stone arch culvert due to grouting. Injection of grout shall continue until all of the following conditions have been achieved unless otherwise approved by the COR:

A. The total estimated volume of grout for all stages on a given pipe has been injected

B. The estimated volume of grout has been injected

C. The exhausted grout recovered at each vent is not less than 85% of the density of the freshly injected grout

D. The exhausted grout at each vent is not less than 85% of the original viscosity of the freshly injected grout

E. Grout recovered from the vent is the same specific gravity as that being injected, per the use of the Baroid Mud Balance

F. The grout installer recommends ceasing grouting operations.

Cold weather grouting where the temperature is between 32-40° F during and after grouting the following conditions shall be met:

A. Temperature of the grout mix must be 60° F or higher at the time of pumping.

B. The use of insulation/concrete blankets over areas of the culvert behind the headwalls where the minimum cover above the frost line is not met for a period of 7 days.

Cold weather grouting when the temperature is below 32° F during and after grouting the following conditions shall be met:

A. Temperature of the grout mix must be 60° F or higher at the time of pumping.

B. The use of insulation/concrete blankets over areas of the culvert behind the headwalls where the minimum cover above the frost line is not met for a period of 7 days.

C. The use of an interior heater in the pipe that does not exceed the pipes maximum localized temperature for the first 24 hours after grouting.

Hot weather grouting is permitted however, the CONTRACTOR shall use caution to prevent flash-setting of the grout. The CONTRACTOR is responsible for any replacement/repair necessary as a result of grouting in hot weather at no additional cost to the Government and to the satisfaction of the COR.

3.2.4 Waste Water and Grout

Waste grout that cannot be placed or injected prior to initial set or maximum specified time limit. If such grout is mixed at the direction or approval of the Government Representative, it will be paid for at the applicable contract unit prices for the material constituents of the wasted grout. During the progress of the work, provide for adequate disposal of all wash and waste water and remove all waste grout, on a daily basis if necessary, to maintain a safe and effective grouting operation.

3.3 RECORDS

Prepare, on a daily basis, records of all grout hole and drain hole drilling operations, all pressure washing and pressure testing operations and all cement grouting operations. These records shall include: driller's logs of all grout holes, drain holes, and exploratory holes; pressure washing information and pressure testing results; grouting data including time of each change of operation, rate of pumping, grouting pressures, changes in water-cement ratio, changes in proportions of additives such as fluidifier, accelerator, or sand, and amounts of various materials injected; and other data considered necessary as determined by the Government Representative. Blank report forms of the type to be used are attached at the end of this specification.

Duplicate records of all grout hole and drain hole drilling operations, all pressure washing and pressure testing operations, and all cement grouting operations. The Government must receive the originals of all such records before final payment will be processed.

3.4 CONTRACTOR QUALITY CONTROL

In accordance with Section 01 45 00.00 10 QUALITY CONTROL, establish and maintain quality control that specifically includes, but is not limited to, inspections to assure that:

a. The specified qualification requirements are met.

b. Drilling and grouting equipment is provided as specified and maintained in satisfactory condition.

c. The required amount of cement is kept on hand during grouting operations.

d. Grouting is performed in the presence of a Government Representative.

e. Required records are kept and submitted as specified.

f. Accurate cement grout mixture proportions are maintained as recommended by the manufacturer or supplier.

g. Materials are properly protected from moisture and contamination after delivery and transportation to the site.

h. Only approved materials are used.

i. The quantity of bulk materials used equals the computed amount.

-- End of Section --

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DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 32 11 23

AGGREGATE BASES

-- End of Section Table of Contents --

SECTION 32 11 23

AGGREGATE BASES

PART 1 GENERAL

1.1 SUMMARY

This section addresses the requirements for furnishing and placing aggregate and aggregate base courses.

1.2 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C—136	(2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D—1556	(2007) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D—422	(1963; R 2007) Particle-Size Analysis of Soils
ASTM D4253	(2016) Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D—75/D—75M	(2009) Standard Practice for Sampling Aggregates
ASTM E—11	(2010a) Wire Cloth and Sieves for Testing Purposes
ASTM D—2922	(2005) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D—3017	(2005) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PDT)

PDT 408	(2011) Specifications

1.3 DEFINITIONS

1.3.1 Aggregate Base

Aggregate base as used herein is well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction.

1.3.2 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ~~ASTM D 698~~ASTM D4253 abbreviated hereinafter as percent laboratory maximum density.

1.4 GENERAL

The work specified herein consists of the construction of aggregate base course. The work shall be performed in accordance with this specification and shall conform to the lines, grades, notes and typical sections shown in the plans. Sources of all materials shall be selected well in advance of the time that materials will be required in the work.

1.5 SUBMITTALS

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

SD-07 Certificates

Aggregates

Certificates from the supplier attesting that the aggregate meets the specification requirements shall be submitted to the Contracting Officer.

SD-11 Closeout Submittals

Waybills and Delivery Tickets

Certified copies of waybills and delivery tickets for all materials actually used.

1.6 WAYBILLS AND DELIVERY TICKETS

Copies of waybills or delivery tickets shall be submitted during the progress of the work. Before the final payment is allowed, waybills and certified delivery tickets shall be furnished for all aggregates actually used in the construction.

1.7 WEATHER LIMITATIONS

Base shall not be constructed when the atmospheric temperature is less than 35 degrees F. Base shall not be constructed on subgrades that are frozen or contain frost. If the temperature falls below 35 degrees F, completed areas shall be protected against any detrimental effects of freezing.

1.8 EQUIPMENT

All plant, equipment and tools used in the work shall be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements specified.

1.9 STOCKPILING MATERIALS

Materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at locations designated. Before stockpiling of material, storage sites shall be cleared, and sloped to drain. Materials obtained from different sources shall be stockpiled separately.

1.10 SAMPLING AND TESTING

1.10.1 General Requirements

Sampling and testing shall be performed by an approved commercial testing laboratory. No work requiring testing shall be permitted until the facilities have been inspected and approved. The first inspection shall be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the facilities to pass the first inspection will be charged to the Contractor. Tests shall be performed in sufficient numbers and at the locations and times directed to insure that materials and compaction meet specified requirements. Copies of test results shall be furnished to the Contracting Officer within 24 hours of completion of tests.

1.10.2 Test Results

Results shall verify that materials comply with this specification. When a material source is changed, the new material will be tested for compliance. When deficiencies are found, the initial analysis shall be repeated and the material already placed shall be retested to determine the extent of unacceptable material. All in-place unacceptable material shall be replaced or modified as directed by the Contracting Officer.

1.10.3 Sampling

Aggregate samples for laboratory tests shall be taken in accordance with ASTM D—75/D—75M. When deemed necessary, the sampling will be observed by the Contracting Officer.

1.10.4 Sieve Analysis

Sieve analyses shall be made in accordance with ASTM C—136 and ASTM D—422 on sieves conforming to ASTM E—11.

1.10.5 Field Density

In-place density of the base shall be determined by ASTM D—2922, with calibration tests by ASTM D—1556.

1.10.6 Maximum Dry Weight Density

Maximum dry weight density of the base materials shall be determined in accordance with ~~ASTM D 698~~ASTM D4253~~, Method D~~.

1.10.7 Smoothness and Thickness Tests

Tests shall be in accordance with paragraphs "Smoothness" and "Thickness Control".

PART 2 PRODUCTS

2.1 MATERIALS

Aggregates shall consist of clean, sound durable particles of crushed limestone. Sandstone, slag or river deposited gravel will not be accepted.

2.1.1 Aggregate Base

Coarse aggregate shall be crushed limestone meeting the requirements of PDT 408, Section 703, Table C, for size No. 2A, No. 57, and No. 1 coarse aggregate. Gradation of aggregate for each feature as shown on drawings or per contractor's design

2.1.2 Geotextile

Geotextile shall conform to the requirements of Section 31 05 19 GEOTEXTILES.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

When the base is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 PREPARATION OF UNDERLYING COURSE

3.2.1 General Requirements

Before constructing aggregate base, the previously constructed underlying course shall be cleaned of foreign substances. Surface of underlying course shall meet the specified compaction and surface tolerances. Subgrade shall conform to Section 31 00 00 EARTHWORK. Ruts or soft, yielding spots that may appear in the underlying course, areas having inadequate compaction, and deviations of the surface from requirements specified shall be corrected. For cohesionless underlying materials containing sands, sand-gravels, or any other cohesionless material in harmful quantities, the surface shall be mechanically stabilized with aggregate prior to placement of the aggregate or base. Stabilization may be accomplished by mixing base material into the underlying course and compacting by approved methods. Properly compacted material will be considered as part of the underlying course and shall meet all requirements for the underlying course. Finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until base is placed.

3.2.2 Grade Control

Underlying material shall be excavated to sufficient depth for the required thickness so that the finished base with the subsequent surface course will meet the final grade. Finished and completed area shall conform to the

lines, grades, cross section, and dimensions indicated.

3.3 INSTALLATION OF GEOTEXTILE

3.3.1 General

Place the geotextile in accordance with 31 05 19 and at the locations shown. At the time of installation, reject the geotextile if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage.

3.4 AGGREGATE BASE COURSE, PDT NO. 2A

3.4.1 Mixing and Placing

Materials shall be placed in such a manner as to obtain uniformity of the aggregate base material and at a uniform optimum water content for compaction. The Contractor shall make such adjustments in placing procedures or in equipment to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to ensure a satisfactory base.

3.4.2 Edges of base

Approved material shall be placed along edges of aggregate base in such quantities as will compact to thickness of the course being constructed, or to the thickness of each layer in a multiple layer course, allowing in each operation at least a 1 foot width of the shoulder to be rolled and compacted simultaneously with rolling and compacting of each layer of base.

3.4.3 Compaction

Each layer of aggregate base including shoulders shall be compacted. Water content shall be maintained at optimum. Density of compacted mixture shall be at least 98 percent of laboratory maximum density. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. Areas inaccessible to the rollers shall be compacted with mechanical tampers, and shall be shaped and finished by hand methods.

3.4.4 Layer Thickness

Compacted thickness of the aggregate base shall be as indicated in the contract drawings. ~~Layers shall 6 inches per lift~~Lifts shall be maximum 9 inch loose lifts.

3.4.5 Finishing

The surface of the top layer shall be finished to grade and cross section shown. Finished surface shall be of uniform texture. Light blading during compaction may be necessary for the finished surface to conform to the lines, grades, and cross sections. Should the surface for any reason become rough, corrugated, uneven in texture, or traffic marked prior to completion, such unsatisfactory portion shall be scarified, reworked, recompacted, or replaced as directed.

3.4.5.1 Smoothness

Surface of each layer shall show no deviations in excess of 3/8 inch when tested with the 12-foot straightedge. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting, as directed.

3.4.5.2 Thickness Control

Compacted thickness of the base shall be within 1/2 inch of the thickness indicated. Where the measured thickness is more than 1/2 inch deficient, such areas shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 1/2 inch thicker than indicated, the base shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 1/4 inch of the thickness indicated.

3.5 FIELD QUALITY CONTROL

3.5.1 Field Density

Field in-place density shall be determined in accordance with ASTM D—2922. When ASTM D—2922 is used, the calibration curves shall be checked, and adjusted if necessary, using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D—2922 results in a wet unit weight of soil, and when using this method, ASTM D—3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D—3017. Calibration curves and calibration test results shall be furnished within 24 hours of the conclusion of the tests. At least one field density test shall be performed for each ~~1000~~1,000 square yards of each layer of base material.

3.5.2 Smoothness

Measurements for deviation from grade and cross section shown shall be taken in successive positions parallel to the road centerline with a 12 foot straightedge. Measurements shall also be taken perpendicular to the road centerline at 50 foot intervals.

3.5.3 Thickness

Thickness of the base shall be measured at intervals in such a manner as to ensure one measurement for each 25 linear feet along the centerline of the roadway by use of Contractor furnished grade stakes, string lines or other approved methods.

3.6 MAINTENANCE

The aggregate base shall be maintained in a satisfactory condition until accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact.

-- End of Section --

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DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

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.

ASTM INTERNATIONAL (ASTM)

ASTM A116	(2011) Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
ASTM A153/A153M	(2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A702	(2013) Standard Specification for Steel Fence Posts and Assemblies, Hot Wrought
ASTM A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A90/A90M	(2013) Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
ASTM C94/C94M	(2016) Standard Specification for Ready-Mixed Concrete
ASTM F1083	(2016) Standard Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded, for Fence Structures
ASTM F567	(2014a) Standard Practice for Installation of Chain Link Fence
ASTM F626	(2014) Standard Specification for Fence Fittings

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-F-191/3	(Rev E; Am 1) Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)
FS RR-F-191/4	(Rev F) Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Fence Assembly; G, RE

Location of Gate, Corner, End, and Pull Posts; G, RE

Gate Hardware and Accessories; G, RE

Erection/Installation Drawings; G, RE

SD-03 Product Data

Fence Assembly; G, RE

Gate Hardware and Accessories; G, RE

Zinc Coating; G, RE

Fabric; G, RE

Stretcher Bars; G, RE

Concrete; G, RE

SD-07 Certificates

Certificates of Compliance

SD-08 Manufacturer's Instructions

Fence Assembly

Gate Assembly

Hardware Assembly

Accessories

1.3 ASSEMBLY AND INSTALLATION INSTRUCTIONS

Submit manufacturer's erection/installation drawings and instructions that detail proper assembly and materials in the design for fence, gate, hardware and accessories.

Submit erection/installation drawings along with manufacturer's catalog data for complete fence assembly, gate assembly, hardware assembly, and accessories.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to site in an undamaged condition. Store materials off

the ground to provide protection against oxidation caused by ground contact.

1.5 QUALITY ASSURANCE

1.5.1 Required Report Data

Submit reports of listing of chain-link fencing and accessories regarding weight in ounces for zinc coating.

1.5.2 Certificates of Compliance

Submit certificates of compliance in accordance with the applicable reference standards and descriptions of this section for the following:

a. Zinc coating

b. Fabric

c. Stretcher bars

d. Gate hardware and accessories

e. Concrete

PART 2 PRODUCTS

2.1 GENERAL

Provide fencing materials conforming to the requirements of ASTM A116, ASTM A702, ASTM F626, and as specified.

2.2 ZINC COATING

Provide hot-dip galvanized (after fabrication) ferrous-metal components and accessories, except as otherwise specified.

Provide zinc coating of weight not less than 1.94 ounces per square foot, as determined from the average result of two specimens, when tested in accordance with ASTM A90/A90M.

Provide zinc coating conforming to the requirements of the following:

a. Pipe: FS RR-F-191/3 Class 1 Grade A in accordance with ASTM F1083.

b. Hardware and accessories: ASTM A153/A153M, Table 1

Provide galvanizing repair material that is cold-applied zinc-rich coating conforming to ASTM A780/A780M.

2.3 FABRIC

FS RR-F-191 and detailed specifications as referenced and other requirements as specified.

FS RR-F-191/1; Type I, zinc-coated steel. Height of fabric, as indicated.

Provide fabric consisting of No. 9-gage wires woven into a 2-inch diamond mesh, with dimensions of fabric and wire conforming to ASTM A116, ASTM A702 and ASTM F626, with 1.2 ounces per square foot zinc galvanizing.

Provide one-piece fabric widths for fence heights up to 8 feet.

2.4 TOP AND BOTTOM SELVAGES

Provide knuckled selvages at top and bottom for fabric with 2 inch mesh and up to 60 inches high, and if over 60 inches high, provide twisted and barbed top selvage and knuckled bottom selvage.

Knuckle top and bottom selvages for 1-3/4-inch and 1-inch mesh fabric.

2.5 POSTS, TOP RAILS AND BRACES

FS RR-F-191/3 line posts; Class 1, steel pipe, Grade A. End, corner, and pull posts; Class 1, steel pipe, Grade A. Braces and rails; Class 1, steel pipe, Grade A, in size as shown on the drawings.

2.6 STRETCHER BARS

Provide bars that have one-piece lengths equal to the full height of the fabric with a minimum cross section of 3/16 by 3/4 inch, in accordance with ASTM A116, ASTM A702 and ASTM F626.

2.7 POST TOPS

Provide tops that are steel, wrought iron, or malleable iron designed as a weathertight closure cap. Provide one cap for each post, unless equal protection is provided by a combination post-cap and barbed-wire supporting arm. Provide caps with an opening to permit through passage of the top rail.

2.8 STRETCHER BAR BANDS

Provide bar bands for securing stretcher bars to posts that are steel, wrought iron, or malleable iron spaced not over 15 inches on center. Bands may also be used in conjunction with special fittings for securing rails to posts. Provide bands with projecting edges chamfered or eased.

2.9 GATE POSTS

PProvide FS RR-F-191/3 gate post for supporting each gate leaf.

2.10 GATE HARDWARE AND ACCESSORIES

Provide gate hardware and accessories that conforms to ASTM A116, ASTM A702, ASTM F626, and be as specified:

Provide malleable iron or forged steel hinges to suit gate size, non-lift-off type, offset to permit 180-degree opening.

Provide stops and holders of malleable iron for vehicular gates. Provide stops that automatically engage the gate and hold it in the open position until manually released.

Provide double gates with a cane bolt and ground-set keeper, with latch or locking device and padlock eye designed as an integral part.

2.11 MISCELLANEOUS HARDWARE

Provide miscellaneous hot-dip galvanized hardware as required.

2.12 WIRE TIES

Provide 16-gage galvanized steel wire for tying fabric to line posts,spaced 12 inches on center. For tying fabric to rails and braces, space wire ties 24 inches on center. For tying fabric to tension wire, space 0.105-inch hog rings 24 inches on center.

Manufacturer's standard procedure will be accepted if of equal strength and durability.

FS RR-F-191/4. Provide wire ties constructed of the same material as the fencing fabric.

2.13 CONCRETE

Provide concrete conforming to ASTM C94/C94M, and obtaining a minimum 28-day compressive strength of 4,000 psi.

2.14 PADLOCKS

Provide 5200 Series padlocks with 2 keys (NSN 5340-00-158-3805) per gate.

PART 3 EXECUTION

Provide complete installation conforming to ASTM F567.

3.1 GENERAL

Requirements for field verifying existing utilities in fence post hole locations are described in Section 01 35 00.00 08 SPECIAL PROCEDURES.

3.2 EXCAVATION

Install post holes as indicated on the drawings.

Uniformly spread soil from excavations adjacent to the fence line or on areas of Government property, as directed. Install post holes as indicated on the drawings.

When solid rock is encountered near the surface, drill into the rock at least 12 inches for line posts and at least 18 inches for end, pull, corner, and gate posts. Drill holes at least 1 inch greater in diameter than the largest dimension of the placed post.

If solid rock is below the soil overburden, drill to the full depth required except that penetration into rock need not exceed the minimum depths specified above.

3.3 SETTING POSTS

Remove loose and foreign materials from holes and the soil moistened prior to placing concrete.

Provide tops of footings that are trowel finished and sloped or domed to

shed water away from posts. Set hold-open devices, sleeves, and other accessories in concrete.

Keep exposed concrete moist for at least 7 calendar days after placement or cured with a membrane curing material, as approved.

Grout all posts set into sleeved holes in concrete with an approved grouting material.

Maintain vertical alignment of posts set in concrete construction until concrete has set.

3.3.1 Earth and Bedrock

PProvide concrete bases of dimensions indicated except in bedrock. Compact concrete to eliminate voids, and finish to a dome shape. In bedrock, set posts with a minimum of 1 inch of grout around each post. Work grout into hole to eliminate voids, and finish to a dome shape. Trowel finish concrete in accordance with ACI 301, Section 5.

Take samples and test concrete to determine strength as specified.

3.3.2 Bracing

Brace gate, corner, end, and pull posts to nearest post with a horizontal brace used as a compression member, placed at least 12 inches below top of fence, and a diagonal tension rod.

3.4 CONCRETE STRENGTH

Provide concrete that has attained at least 75 percent of its minimum 28-day compressive strength, but in no case sooner than 7 calendar days after placement, before rails, tension wire, or fabric are installed. Do not stretch fabric and wires or hang gates until the concrete has attained its full design strength.

Take samples and test concrete to determine strength as specified.

3.5 TOP RAILS

Provide top rails that run continuously through post caps or extension arms, bending to radius for curved runs. Provide expansion couplings as recommended by the fencing manufacturer.

3.6 CENTER RAILS

Provide single piece center rails between posts set flush with posts on the fabric side, using special offset fittings where necessary.

3.7 BRACE ASSEMBLY

Provide bracing assemblies at end and gate posts and at both sides of corner and pull posts, with the horizontal brace located at midheight of the fabric.

Install brace assemblies so posts are plumb when the diagonal rod is under proper tension.

Provide two complete brace assemblies at corner and pull posts where

required for stiffness and as indicated.

3.8 FABRIC INSTALLATION

Provide fabric in single lengths between stretch bars with bottom barbs placed approximately 1-1/2-inches above the ground line. Pull fabric taut and tied to posts, rails, and tension wire with wire ties and bands.

Install fabric on the security side of fence, unless otherwise directed.

Ensure fabric remains under tension after the pulling force is released.

3.9 STRETCHER BAR INSTALLATION

Thread stretcher bars through or clamped to fabric 4 inches on center and secured to posts with metal bands spaced 15 inches on center.

3.10 GATE INSTALLATION

Re-install existing gate plumb, level, and secure, with full opening without interference. Adjust hardware for smooth operation and lubricated where necessary.

3.11 TIE WIRES

Provide tie wires that are U-shaped to the pipe diameters to which attached. Twist ends of tie wires not less than two full turns and bent so as not to present a hazard.

3.12 FASTENERS

Install nuts for tension bands and hardware on the side of the fence opposite the fabric side. Peen ends of bolts to prevent removal of nuts.

3.13 ZINC-COATING REPAIR

Clean and repair galvanized surfaces damaged by welding or abrasion, and cut ends of fabric, or other cut sections with specified galvanizing repair material applied in strict conformance with the manufacturer's printed instructions.

3.14 TOLERANCES

Provide posts that are straight and plumb within a vertical tolerance of 1/4 inch after the fabric has been stretched. Provide fencing and gates that are true to line with no more than 1/2 inch deviation from the established centerline between line posts. Repair defects as directed.

3.15 FENCE INSTALLATION

3.15.1 Post Spacing

Provide line posts spaced as shown on the drawings or directed by the Contracting Officer. Provide gate posts spaced as necessary for size of gate openings. Do not exceed 500 feet on straight runs between braced posts. Provide corner or pull posts, with bracing in both directions, for changes in direction of 15 degrees or more, or for abrupt changes in grade. Provide drawings showing location of gate, corner, end, and pull posts.

3.16 ACCESSORIES INSTALLATION

3.16.1 Post Caps

Design post caps to accommodate top rail. Install post caps as recommended by the manufacturer.

3.16.2 Padlocks

Provide padlocks for gate openings and provide chains that are securely attached to gate or gate posts.

3.17 CLEANUP

Remove waste fencing materials and other debris from the work site.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 32 92 19

SEEDING

-- End of Section Table of Contents --

SECTION 32 92 19

SEEDING

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 basic designation only.

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PDT)

PDT 408 (2011) Specifications

U.S. DEPARTMENT OF AGRICULTURE (USDA)

AMS Seed Act (1940; R 1988; R 1998) Federal Seed Act

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-01 Preconstruction Submittals

Delivery Schedule; G, RE

SD-03 Product Data

Seed; G, RE
Fertilizer; G, RE
Mulch; G, RE
Lime; G, RE
Off-Site Topsoil; G, RE

SD-06 Test Reports; G, RE

Equipment Calibration; G, RE

Certification of calibration tests conducted on the equipment used in the seeding operation.

SD-07 Certificates

Quantity Check; G, RE

Bag count or bulk weight measurements of material used compared with area covered to determine the application rate and quantity installed.

Seed Establishment Period; G, RE

Calendar time period for the seed establishment period. When there is more than one seed establishment period, the boundaries of the seeded area covered for each period shall be described.

Maintenance Record; G, RE

Maintenance work performed, area repaired or reinstalled, diagnosis for unsatisfactory stand of grass plants.

Prior to the delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following:

Seed; G, RE
Fertilizer; G, RE
Mulch; G, RE
Lime; G, RE
Off-Site Topsoil; G, RE

1.3 SOURCE INSPECTION

The source of delivered topsoil shall be subject to inspection.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Delivery Schedule

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

1.4.1.1 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

1.4.2 Inspection

Seed shall be inspected upon arrival at the job site for conformity to species and quality. Seed that is wet, moldy, or bears a test date five months or older, shall be rejected. Other materials shall be inspected for compliance with specified requirements. The following shall be rejected: open soil amendment containers or wet soil amendments; topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter; and topsoil that contains viable plants and plant parts. Unacceptable materials shall be removed from the job site.

1.4.3 Storage

Materials shall be stored in designated areas. Seed, lime, and fertilizer shall be stored in cool, dry locations away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with seeding operation materials.

1.4.4 Handling

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

PART 2 PRODUCTS

2.1 SEED

2.1.1 Seed Classification

State-approved seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with AMS Seed Act and applicable state seed laws.

2.1.2 Permanent Seed Species and Mixtures

Permanent seed species and mixtures shall be proportioned by weight. The following seed mixture shall be used for the projects under this contract:

PDT 408, Section 804.2, Formulas B.

2.1.3 Quality

Weed seed shall be a maximum 1 percent by weight of the total mixture.

2.1.4 Seed Mixing

The mixing of seed may be done by the seed supplier prior to delivery, or on site as directed.

2.1.5 Substitutions

Substitutions will not be allowed without written request and approval from the Contracting Officer.

2.2 SOIL AMENDMENTS

Soil amendments shall consist of pH adjuster, fertilizer, and organic material meeting the following requirements. Vermiculite shall not be used.

2.2.1 Fertilizer

The nutrients ratio shall be 10 percent nitrogen, 20 percent phosphorus, and 20 percent potassium. Fertilizer shall be controlled release commercial grade, free flowing, uniform in composition, and consist of a nitrogen-phosphorus-potassium ratio. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.3 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region.

2.3.1 Straw

Straw shall be stalks from oats, wheat, rye, barley, or rice, furnished in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment.

2.3.2 Hay

Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, furnished in an air-dry condition suitable for placing with commercial mulch-blowing equipment.

2.4 WATER

Water shall be the responsibility of the Contractor, unless otherwise noted. Water shall not contain elements toxic to plant life.

PART 3 EXECUTION

3.1 INSTALLING SEED TIME AND CONDITIONS

3.1.1 Seeding Time

Seed shall be installed from April 15 to June 1 for spring establishment; from August 15 to October 15 for fall establishment. Seed planted from June 2 to August 15 shall be carefully maintained to provide sufficient water. If, in the opinion of the Contracting Officer, a satisfactory stand of vegetation cannot be established prior to 1 October, or if an area is ready to be seeded prior to 1 March, the Contractor shall implement appropriate temporary erosion protection measures as approved by the Contracting Officer to prevent erosion during the winter, and shall complete seeding operations in the spring at no additional cost to the Government.

3.1.2 Seeding Conditions

Seeding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail at the determination of the Contracting Officer, the work shall be stopped when directed. When special conditions warrant a variance to the seeding operations, proposed alternate times shall be submitted to the Contracting Officerfor approval.

3.1.3 Equipment Calibration

Immediately prior to the commencement of seeding operations, calibration tests shall be conducted on the equipment to be used. These tests shall confirm that the equipment is operating within the manufacturer's specifications and will meet the specified criteria. The equipment shall be calibrated a minimum of once every day during the operation. The calibration test results shall be provided within 1 week of testing.

3.2 SITE PREPARATION

Prior to stockpiling topsoil, treat growing vegetation with application of appropriate specified non-selective herbicide. Clear and grub existing vegetation three to four weeks prior to stockpiling topsoil.

Surface soil stripped and stockpiled on site and modified as necessary to

be in accordance with ASTM D4972. Topsoil shall be existing surface soil stripped and stockpiled on-site in accordance with Section 31 00 00 EARTHWORK.

3.2.1 Off-Site Topsoil

Contractor shall furnish additional topsoil, containing from 5 to 10 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR 42. Maximum particle size, 3/4 inch, with maximum 3 percent retained on 1/4 inch screen. The pH shall be tested in accordance with ASTM D4972. Topsoil shall be free of sticks, stones, roots, and other debris and objectionable materials.

3.2.2 Finished Grade and Topsoil

Provide 4 inches of on-site or off-site topsoil to meet indicated finish grade. After areas have been brought to indicated finish grade, incorporate fertilizer and lime into soil a minimum depth of 3 inches by disking, harrowing, tilling or other methods approved by the Contracting Officer. Remove debris and stones larger than 3/4 inch in any dimension remaining on the surface after finish grading. Correct irregularities in finish surfaces to eliminate depressions. Protect finished topsoil areas from damage by vehicular or pedestrian traffic.

The Contractor shall verify that finished grades are as indicated on drawings, and the placing of topsoil, smooth grading, and compaction requirements have been completed, prior to the commencement of the seeding operation.

3.2.3 Applying Fertilizer

The application rate shall be 2 tons per acre. Fertilizer shall be incorporated into the soil to a maximum 3 inch depth or may be incorporated as part of the tillage.

3.2.4 Tillage

Soil on slopes up to a maximum 3-horizontal-to-1-vertical shall be tilled to a minimum 4 inch depth. On slopes between 3-horizontal-to-1-vertical and 1-horizontal-to-1 vertical, the soil shall be tilled to a minimum 2 inch depth by scarifying with heavy rakes, or other method. Rototillers shall be used where soil conditions and length of slope permit. On slopes 1-horizontal-to-1 vertical and steeper, no tillage is required. Drainage patterns shall be maintained as indicated on drawings. Areas compacted by construction operations shall be completely pulverized by tillage. Soil used for repair of surface erosion or grade deficiencies shall conform to topsoil requirements. The pH adjuster and fertilizer may be applied during this procedure.

3.2.5 Prepared Surface

3.2.5.1 Preparation

The prepared surface shall be a maximum 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas. The prepared surface shall be completed with a light raking to remove debris.

3.2.5.2 Field Area Debris

Debris and stones over a minimum 3 inch in any dimension shall be removed from the surface.

3.2.5.3 Protection

Areas with the prepared surface shall be protected from compaction or damage by vehicular or pedestrian traffic and surface erosion.

3.3 INSTALLATION

Prior to installing seed, any previously prepared surface compacted or damaged shall be reworked to meet the requirements of paragraph SITE PREPARATION. Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution.

3.3.1 Installing Seed

Seeding method shall be Broadcast Seeding, Drill Seeding,or Hydroseeding. Seeding procedure shall ensure even coverage. Gravity feed applicators, which drop seed directly from a hopper onto the prepared soil, shall not be used because of the difficulty in achieving even coverage, unless otherwise approved.

3.3.1.1 Broadcast Seeding

Seed shall be uniformly broadcast at the rate of 2 pounds per 1000 square feet using broadcast seeders. Half the total rate of seed application shall be broadcast in 1 direction, with the remainder of the seed rate broadcast at 90 degrees from the first direction. Seed shall be covered a maximum 1/4 inch depth by disk harrow, steel mat drag, cultipacker, or other approved device.

3.3.2 Mulching

3.3.2.1 Hay or Straw Mulch

Hay or straw mulch shall be spread uniformly at the rate of 2 tons per acre. Mulch shall be spread by hand, blower-type mulch spreader, or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of steep slopes, and continued uniformly until the area is covered. The mulch shall not be bunched or clumped. Sunlight shall not be completely excluded from penetrating to the ground surface. All areas installed with seed shall be mulched on the same day as the seeding. Mulch shall be anchored immediately following spreading.

3.3.3 Watering Seed

Watering shall be started immediately after completing the seeding of an area. Water shall be applied to supplement rainfall at a rate sufficient to ensure moist soil conditions to a minimum 1 inch depth. Run-off and puddling shall be prevented. Watering trucks shall not be driven over turf areas, unless otherwise directed. Watering of other adjacent areas or plant material shall be prevented.

3.4 QUANTITY CHECK

For materials provided in bags, the empty bags shall be retained for recording the amount used. For materials provided in bulk, the weight certificates shall be retained as a record of the amount used. The amount of material used shall be compared with the total area covered to determine the rate of application used. Differences between the quantity applied and the quantity specified shall be adjusted as directed.

3.5 RESTORATION AND CLEAN UP

3.5.1 Restoration

Existing turf areas, pavements, and facilities that have been damaged from the seeding operation shall be restored to original condition at Contractor's expense.

3.5.2 Clean Up

Excess and waste material shall be removed from the seeded areas and shall be disposed offsite. Adjacent paved areas shall be cleaned.

3.6 PROTECTION OF INSTALLED AREAS

Immediately upon completion of the seeding operation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed.

3.7 SEED ESTABLISHMENT PERIOD

3.7.1 Commencement

The seed establishment period to obtain a healthy stand of grass plants shall begin on the first day of work after seeding is completed in an area and shall end 3 months after the last day of the seeding operation. Written calendar time period shall be furnished for the seed establishment period. When there is more than 1 seed establishment period, the boundaries of the seeded area covered for each period shall be described. The seed establishment period shall be modified for inclement weather, shut down periods, or for separate completion dates of areas.

3.7.2 Satisfactory Stand of Grass Plants

Grass plants shall be evaluated for species and health when the grass plants are a minimum 1 inch high.

3.7.2.1 Field Area

A satisfactory stand of grass plants from the seeding operation for a field area shall be a minimum 10 grass plants per square foot. The total bare spots shall not exceed 2 percent of the total seeded area.

3.7.3 Maintenance During Establishment Period

Maintenance of the seeded areas shall include eradicating weeds, insects and diseases; protecting embankments and ditches from surface erosion; maintaining erosion control materials and mulch; protecting installed areas from traffic; mowing; watering; and post-fertilization.

3.7.3.1 Mowing

Field areas shall be mowed once during the season to a minimum 3 inch height. Clippings shall be removed when the amount cut prevents sunlight from reaching the ground surface.

3.7.3.2 Repair or Reinstall

Unsatisfactory stand of grass plants and mulch shall be repaired or reinstalled, and eroded areas shall be repaired in accordance with paragraph SITE PREPARATION.

3.7.3.3 Maintenance Record

A record of each site visit shall be furnished, describing the maintenance work performed; areas repaired or reinstalled; and diagnosis for unsatisfactory stand of grass plants.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 33 - UTILITIES

SECTION 33 01 30.72 08

RELINING CULVERTS

-- End of Section Table of Contents --

SECTION 33 01 30.72 08

RELINING CULVERTS

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 SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE MOP 120	(2009) Trenchless Renewal of Culverts and Storm Sewers

ASTM INTERNATIONAL (ASTM)

ASTM C109/C109M	(2016a) Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
ASTM C1090/C1090M	(2015) Standard Test Method for Measuring Changes in Height of Cylindrical Specimens of Hydraulic-Cement Grout
ASTM C1202	(2017) Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
ASTM C1609/C1609M	(2012) Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam with Third-Point Landing)
ASTM C293/C293M	(2016) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading)
ASTM C309	(2011) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C403/C403M	(2008) Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
ASTM C469/C469M	(2014) Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression
ASTM C496/C496M	(2011) Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens
ASTM C666/C666M	(2015) Resistance of Concrete to Rapid

	Freezing and Thawing
ASTM C76	(2015) Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C882/C882M	(2013a) Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear

1.2 DEFINITIONS

1.2.1 Culverts

Unless otherwise specified or indicated, see ASCE MOP 120 for definitions.

1.3 SUBMITTALS

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

SD-01 Preconstruction Submittals

Contractor's Qualifications

Equipment; G, DO, RE

Sequence Of Liner Installation; G, DO, RE

Diversion Plan; G, DO, RE

SD-03 Product Data

Manufacturer's Technology Data; G, RE

SD-05 Design Data

Engineering Design Calculations; G, DO

~~SD-06 Test Reports~~

~~Pre-TV Videos on CD or DVD; G~~
~~Post-TV Video Inspection; G~~

SD-07 Certificates

Contractor's Qualifications; G, DO, RE

Certificate of QC Laboratory Accreditation; G, DO, RE

SD-11 Closeout Submittals

As-Built Drawings; G, RE

1.4 QUALITY CONTROL

1.4.1 Contractor's Qualifications

Lining System certification; including third-party validation of in place performance data shall be provided prior to award and/or beginning the project. Mortar/material MUST be specifically designed for the horizontal pipelining process/CCCP, and manufacturer must show 10 years of experience as manufacturer of said process and equipment. The Contractor must be certified by the manufacturer prior to beginning any project with regards to this specification ~~and/or Statement of Work~~.

1.4.2 QC Specialist

The Quality Control (QC) Specialist is responsible for monitoring and documenting activities related to QC of the liner system from manufacturing through installation. The QC Specialist is to have a minimum of three years of continuous experience installing ~~FFPCIPP~~CCCP liners of similar size, length and configuration as contained in this contract. The QC Specialist is to be certified by the liner system supplier as qualified to perform work with the proposed liner system.

1.4.3 QC Laboratory

Select a QC Laboratory that has provided QC testing for at least three completed projects with the proposed liner system; and is independent from, and not associated with, the Contractor. ~~QC Laboratory certification in accordance with time standards in the paragraph titled REFERENCES.~~ Submit the Certificate of QC Laboratory Accreditation.

1.5 DELIVERY, STORAGE, AND HANDLING

Include test reports certifying that the materials conform to the applicable ASTM standards listed herein with materials shipped to the project site. Ship, store, and handle materials in a manner consistent with the written specifications of the liner system manufacturer to avoid damage. Damage may include, but is not limited to, gouging, abrasion, flattening, cutting, puncturing, or ultra-violet (UV) degradation. Select on site storage locations for approval by the Contracting Officer. Promptly remove and dispose of damaged materials.

1.6 PROJECT/SITE CONDITIONS

The use of the product is not to result in the formation or production of any detrimental compounds or by-products, including cuttings and pipe coupons, within the culvert that may enter the natural channel or environment. Cool superheated water to below 38 degrees C (100 degrees F) before discharge. Notify the Contracting Officer and identify any by-products produced as a result of the installation operations. Comply with local waste discharge requirements.

PART 2 PRODUCT

2.1 SYSTEM DESCRIPTION

The work specified herein consists of the repair of culverts by the installation of a~~n~~ two-part engineered cementitious lining system. The primary lining material, commonly known as centrifugally cast concrete pipe (CCCP) and referenced herein as CCCP Liner Mortar, shall be centrifugally

cast in place for the waterproofing, sealing, structural reinforcement and corrosion protection of the existing stone arch culvert and corrugated metal arch culvert at the locations shown for the contract awarded~~extension~~. The secondary lining material, herein known as Invert Repair Mortar, shall be placed to protect the flowline from scour from the upstream brick-stone transition at Station 4+26 to the downstream new headwall footer. The ~~centrifugally cast concrete pipe (~~CCCP~~)~~ liner should extend over the specified length and ~~include the flowline/invert, forming~~perform in conjunction with the Invert Repair Mortar to form a continuous concrete culvert within a culvert. The upstream transition from natural streambed to cementitious liner material shall include a key, as shown, to prevent scour and outflanking by flows through the channel. A high-speed bi-directional spincaster shall be used to apply the ~~primary liner material~~ CCCP Liner Mortar. These repair means and methods shall be engineered for the depth, diameter, shape, traffic loading, groundwater pressures and condition of each ~~pipe~~culvert segment.

2.1.1 Engineering Design Calculations

The ~~proposed liner's~~CCCP Liner thickness shall be calculated for the load behavior response mode expected of the ~~new~~ liner within the existing soil-structure interaction system based on the existing or ~~proposed future~~ design height of the soil cover, the angle of the critical arc element where it is expected the loading will be transferred onto the liner, the current radius of this arc element, and the proposed liner's anticipated in-situ physical properties.

The wall thickness design methodology embodying this engineering approach shall be made a part of the design calculations submittal. It shall be provided in a written form and in sufficient technical detail by the design engineer of record so that the ~~owner~~Contracting Officer may review it and be able to concur with the design methodology; including any technical references that justify and support it.

~~The calculated liner thickness shall be measured from the crest of the corrugations in corrugated pipes or the peaks of the irregularities in the wall surface for smooth wall pipes. Further, the minimum required installed liner thickness shall be the engineer's calculated liner thickness or the thickness required to provide at least 0.5 inches of coverage over any projecting assembly bolts or rivets; whichever is greater. As per ASTM A979 this thickness is to be measured from the I.D. of the pipe, or top of the inward corrugation's crest.~~

The proposed engineered concrete lining system shall be designed for adequate long-term in-place structural performance and durability and shall have been evaluated on all parameters pertinent to this purpose, including compressive strength, ductility, and toughness. The system shall also be impermeable, resistant to freeze-thaw cycles, and generally durable to withstand weathering, corrosive attack, and punctures and impacts which may be expected from debris. Some aspects of durability may be achieved by mix designs that produce self-controlled crack widths in the presence of liner movement due to temperature variations, live loads, and/or material shrinkage. Ductility is the design parameter that increases the allowable tensile strain in the finished liner, limiting the need for additional reinforcement. The concrete liner material system submittal documents must show that the in-place performance of the liner has been addressed by the materials engineering, structural design, and installation methods proposed. To that end, a third-party load-deflection curve is required relative to the ductility, thin-shell toughness, and modulus of rupture to

be used for the design. This documentation shall be in the form of ASTM C1609/C1609M testing, which shall demonstrate the residual modulus of rupture of the hardened material at the L/300 deflection point and that this occurs in a region of "strain hardening". A calculated minimum finished thickness of the liner shall be based on a maximum possible crack width of 0.0625-inches with a factor of safety of 2.0.

2.1.1.1 CCCP Liner Mortar

The calculated finished liner thickness shall be measured from the crest of the corrugations in corrugated pipes or the peaks of the irregularities in the wall surface for smooth wall pipes. Further, the minimum required installed liner thickness shall be the engineer's calculated liner thickness or the thickness required to provide at least 0.5-inches of coverage over any projecting assembly bolts or rivets; whichever is greater. As per ASTM A979 this thickness is to be measured from the I.D. of the pipe, or top of the inward corrugation's crest.

2.1.1.2 Invert Repair Mortar

The minimum Invert Repair Mortar thickness shall be designed to perform in conjunction with the CCCP Liner Mortar to effect the characteristics of a continuous culvert within a culvert, as described in 2.1 above. The in-place Invert Repair Mortar thickness may vary due to natural streambed irregularities but shall be no less than the designed minimum thickness. The Invert Repair Mortar may be installed directly over the existing streambed without excavation of the native material except where large debris or other material would preclude the installation of the Invert Repair Mortar to a uniform surface and positive bed slope; these such materials shall be removed prior to installation of the Invert Repair Mortar.

~~Contractor shall provide an Engineering Design Guide upon request to prove the authenticity of calculations. In addition, a registered professional engineer's stamp will be required to approve the final design.~~

2.2 ASSEMBLY

2.2.1 Equipment

Provide sufficient equipment to divert or pump channel flow, clean and CCTV the existing culvert and culvert extension, install and cure liners, and re-instate service connections as indicated in the Contract documents.

Mortar mixers, compressors and pumps may be standard commercial models. A high-speed, rotating applicator device shall be used to achieve a densely compacted liner of uniform thickness and complete coverage, as determined by the design.

2.2.2 Manholes and Branch Connections

Pipes, manholes, and other utility branch connections encountered inside the culvert shall be covered and/or plugged as appropriate during application of the liner material and invert repair material. Plugs and covers shall be removed from these features prior to the initial set of the materials so that they are not permanently obstructed by the liner. Covers for manholes shall be placed such that no structural loads are transferred

to the manholes once the lining is cured. Additional tensile reinforcement consisting of non-ferrous materials shall be added as required to bridge manholes or other utility branch connections such that the structural integrity of the liner is not compromised at these locations. The existing 21-inch concrete-encased sewer line running parallel to and within the existing culvert shall not be covered ~~or plugged~~ during liner placement.

2.2.3 Materials

2.2.3.1 Manufacturer's Technology Data

a. Submit manufacturer's technology data for ~~FFPCIPP~~CCCP products and associated technologies.

2.2.3.2 Invert Repair Mortar

The material used in the repair and scour protection of the unprotected and partially deteriorated natural streambed shall be an ultra-high strength, high build, abrasion resistant and corrosion resistant mortar, based on advanced cements and additives including rust inhibitors. It shall be mixed with the appropriate amount of water to create a self-consolidating free flowing material that develops a high 24-hour compressive strength and adhesion.

The finished, hardened material shall be dense and highly impermeable~~; the result of a complex formulation of mineral, organic and densifying agents and chemical admixtures~~. No more than 10 percent fly ash shall be included in the material composition. Graded quartz sands shall be used to enhance particle packing and further improve the fluidity and hardened density. The composition shall possess excellent thin-section toughness, a high modulus of elasticity in flexure and strong self-bonding capability.

The physical properties of the invert repair mortar, as per laboratory tests, shall be as listed in Table 1.

Table 1: Physical Properties for I~~i~~nvert Repair Mortar	
Set Time at 70 degrees F: ASTM C403/C403M	
Initial Set	Approx. 150 minutes
Final Set	Approx. 240 minutes
Flexural Strength: ASTM C293/C293M	
28 days	Min. 1530 psi
Compressive Strength: ASTM C109/C109M	
24 hours	Min. 5,000 psi
28 days	Min. 11,500 psi
Split Tensile Strength: ASTM C496/C496M	Min. 700 psi

Table 1: Physical Properties for I~~i~~nvert Repair Mortar	
Shear Bond: ASTM C882/C882M	Min. 1,720 psi
Modulus of Elasticity: ASTM C469/C469M	
28 days	Min. 3.48x10^6 psi ~~(max. 5x10^6 psi)~~
Freeze Thaw: ASTM C666/C666M	300 Cycle Pass
Height change of Cylindrical Specimens: ASTM C1090/C1090M	0 change in 28 days

2.2.3.3 ~~Culvert~~CCCP Liner ~~Lining~~ Mortar

The ~~culvert~~CCCP ~~l~~Liner Mortar~~ing~~ material shall be a high strength, high build, abrasion resistant and corrosion resistant engineered mortar, based on advanced cements and additives. When mixed with the appropriate amount of water, a paste-like material which can be sprayed, cast or pumped into areas ¼ inch and larger shall be obtainable.

The hardened, finished liner shall be a dense and highly impermeable culvert within the host culvert and not dependent upon the host material for strength. ~~The above stated performance shall be achieved by a complex formulation of mineral, organic and densifying agents and chemical admixtures including rust inhibitors.~~ Graded quartz sands are to be used to enhance particle packing and further improve the fluidity and hardened density. The resulting composition shall possess excellent thin-section toughness, a high modulus of elasticity in flexure and strong self-bonding capabilities. Fibers are to be added as an aid to the centrifugal casting process, for increased cohesion and to enhance flexural strength. Additional additives shall be incorporated that enhance the autogenous healing process, and this characteristic shall be documented.

Per ASTM C76, in no case, however, shall the proportion of Portland cement, blended with hydraulic cement, or a combination of Portland cement and supplementary cementing materials, be less than 470 pounds per cubic yard. No products containing more than 10% fly ash shall be considered.

The water content shall be adjusted to achieve consistencies ranging from plastic to modeling clay. The lining mortar shall be capable of being cast against soil, metals, stone, brick, wood, plastic or other construction materials. The mortar shall have excellent wet adhesion and not sag or run after placement. Troweling in general is not considered an appropriate application option.

Material shall be tested and certified by an independent company for strain.

The physical properties of the culvert lining mortar, as per laboratory tests, shall be as listed in Table 2.

Table 2: Physical Properties for ~~Culvert~~CCCP Liner~~ing~~ Mortar	
Set Time at 70 degrees F: ASTM C403/C403M	

Table 2: Physical Properties for ~~Culvert~~CCCP Liner~~ing~~ Mortar	
Initial Set	Approx. 150 minutes
Final Set	Approx. 240 minutes
Flexural Strength: ASTM C293/C293M	
24 hours	Min. 1200 psi
28 days	Min. 1530 psi
Residual Flexural Strength at L/300: ASTM C1609/C1609M	Min. 500 psi
Compressive Strength: ASTM C109/C109M	
24 hours	~~5~~Min. 4,000 psi
28 days	~~11,500~~Min. 10,000 psi
Modulus of Rupture ASTM C1609	
28 days	Min. 1,340 psi
Split Tensile Strength: ASTM C496/C496M	~~700~~Min. 835 psi
Shear Bond: ASTM C882/C882M	~~1,720~~Min. 2,900 psi
Modulus of Elasticity: ASTM C469/C469M	
28 days	~~Min. 3.48x10^6 psi (m~~Max. 5x10^6 psi~~)~~
Chloride Ion Penetration: ASTM C1202	<50 Coulombs
Freeze Thaw: ASTM C666/C666M	300 Cycle Pass (<1% loss allowable)
Height change of Cylindrical Specimens: ASTM C1090/C1090M	0 change in 28 days

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Set-Up and Sequence

Submit a Sequence of Liner Installation plan.

3.2 CLEANING OF CULVERTS

Remove internal debris from the existing pipe line that will interfere with the installation of the liner as required in these specifications.

Legally dispose of solid debris and deposits removed from the system.

It shall be the responsibility of the Contractor to remove all debris from the ~~sewer~~culvert. The interior surface, not including the invert, shall be

cleaned with a high-pressure water-blast sufficient to remove all laitance and loose material and flush debris from the culvert. Upon final inspection, the culvert shall be free of sand, dirt and all other laitance that may impede the placement of the lining material.

As required, install a flow bypass diversion and/or pumping system to facilitate the proper cleaning the culvert.

Exercise care and caution in the use of cleaning equipment in order to avoid damage to the existing ~~pipe~~culvert.

3.3 PATCHING AND SURFACE PREPARATION

Areas of water seepage or concentrated leaks through the existing culvert walls shall be sealed off by an approved method prior to application of the liner material. Pooled water shall be removed; however, a dry surface is not required. The Contractor shall patch holes and fill voids in and around existing culvert as directed by the ~~Engineer~~Contracting Officer.

3.4 BYPASSING EXISTING CHANNEL FLOWS

Provide for the flow of the natural channel around or adjacent to the section or sections of culvert designated for liner installation. This flow diversion may be facilitated by damming the upstream inflows and installing a pipe or other bypass structure.

Plug or cover service branch connections only after proper notification to the Contracting Officer. Service branch connections are to be uncovered or unplugged prior to the end of the initial set time for the liner material.

Begin work after plugs/covers and flow diversion system have been installed and tested under full operating conditions.

Coordinate culvert diversion and flow interruptions with the Contracting Officer at least 14 days in advance.

Provide diversion structure/pipe(s) of adequate capacity and size to handle typical flows as would be expected during construction and installation activities. No construction or installation activities shall take place during flows that exceed the capacity of the diversion system.

Submit a detail of the ~~e~~Culvert Diversion ~~p~~Plan and design to the Contracting Officer before proceeding with liner installation.

~~3.5 PRE-TV INSPECTION~~

~~Perform post cleaning Pre-TV video inspections of the pipelines.~~

~~PACP certified personnel are to perform the TV inspection.~~

~~Submit the Pre-TV videos on CD or DVD and corresponding written logs prior to installation of the liner and for later reference by the Contracting Officer.~~

3.5 LATERAL LOCATIONS

Confirm the locations of branch service connections prior to installing and curing the liner material. In the event the status of a service connection cannot be adequately defined, the Contracting Officer will make the final

decision, prior to installation and curing of the liner, as to the status.

Unless directed otherwise, only re-open service connections deemed active.

3.6 MIXING

The Contractor shall combine the manufactured dry mix with potable water to the ratio specified by the Manufacturer. Mixing shall be performed with a high-speed shear type mixer until the appropriate consistency is obtained. The Contractor shall continue to agitate the mortar to prevent thickening beyond the desired fluidity. If placement of the lining material is to exten~~t~~d past the working time specified by the Manufacturer for a mixed batch, the Contractor shall mix a new batch to continue placement of the lining material and shall repeat this process as many times as necessary until the work is complete.

3.7 APPLICATION

The Contractor shall position the high pressure bi-directional rotating casting applicator within the culvert pipe as required by the Manufacturer and commence pumping the mortar. As the mortar begins to be centrifugally cast evenly around the interior, the Contractor shall retrieve the applicator head at the speed determined to be most effective for applying the thickness that has been specified. The applicator must provide for a dense and uniform application of liner material. If the mortar flow is interrupted for any reason, the Contractor shall arrest the retrieval of the applicator head until the mortar flow is restored. Throughout the application process the Contractor shall verify the thickness using an appropriate tool. The liner material must be specifically designed for the centrifugally cast concrete pipe (CCCP) process and have self-bonding characteristics such that installation within an arch culvert using bilateral phasing would not produce seams or joints.

The submittal package of the CCCP lining system manufacturer shall show that the material design and method of application of the system have been integrated to ensure required material densities and thicknesses may be achieved. This material-application system must allow for adjustments during installation (e.g. speed of spinning applicator head, position of the applicator within the culvert) to account for variations in size and shape of the host structure as pertains to velocity and resulting densification of the liner material upon impact with the host structure. Placement of the liner shall be by centrifugally bi-directional casting to prevent voids in the liner's matrix which may be produced by a unidirectional spinning applicator head. The Contractor's Quality Control Plan shall include methods to ensure placement requirements are met per Manufacturer specifications and project requirements.

3.7.1 Hot Weather Application (Above 80°F)

The Contractor shall not apply the mortars when the ambient air or surface temperature of the culvert pipe is 100° F or higher. Shade the material and prepare the surface to keep it cool.

To extend the working time of the mortar when the ambient air temperature is 80°F or higher, but below 100°F, the Contractor is advised to combine the mortar mix material with cool or ice-cooled water. When working at these elevated temperatures, the Contractor shall make certain that the substrate is saturated surface-dry (SSD) before the mortar lining application begins.

3.7.2 Cold Weather Application (Below 45°F)

The Contractor shall not apply the mortars when ambient air temperatures are expected to fall below 45°F within 72 hours of placement. Both the ambient air and substrate temperatures must be no less than 45°F at the time of placement.

Low substrate and ambient air temperatures will slow down the rate of set and strength development. At temperatures below 65°F, the Contractor is advised to warm the material, water, and substrate. Adequate ventilation shall be provided to the area when heating. After installation, the new liner shall be protected from freezing.

3.8 CURING/FINISHING

The Contractor shall use an ASTM C309 conforming curing compound such as 1315 Sealer or other approved equal.

3.9 MATERIALS HANDLING

The bags of the mortar materials shall be stored in a cool, dry location until the Contractor is ready to use the material.

3.10 FIELD QUALITY CONTROL

All costs for the collection, transportation and testing of samples are the responsibility of the Contractor.

A minimum of two sets of test cubes shall be taken each day of the liner installation process. Generally one set should be taken in the morning hours and a second set taken in the afternoon hours. The cubes shall be used to verify the compressive strength at 7 and 28 days using the testing procedure in ASTM C109/C109M. The flexural Strength, or Modulus of Rupture testing per ASTM C293/C293M will be at a frequency of one set of beams per manufacturer's lot number to confirm the raw materials batching process.

The overall liner thickness verification may be done by the use of mass balance calculations, provided that the calculation properly accounts for valleys of corrugations, mortar lines, and other irregularities which accumulate material not considered to be part of the required lining thickness.

Non-Destructive Testing shall be performed throughout the length of the installed CCCP liner using techniques such as impact-echo (i.e. Schmidt Hammer) and pulse velocity (ultrasonic) as applicable. The purpose of said testing will be to establish the in-situ compressive strength of the lining and the void-free thickness of the finished composite. The number of testing sites shall be determined by the characteristics of the installed liner as defined during this testing.~~I~~ In no case shall there be less than one test made per ~~100~~40 linear feet of lining, or one test along each existing structure type (i.e. stone, CMP), whichever is greater. For long runs of culvert the testing shall vary around the circumference of the liner with each location advancing (or rotating) 30 degrees.

The measured compressed strength of the finished liner must exceed the stated minimum used in the design calculations and no area of the CCCP liner shall be less than 90% of the required finished thickness as per the above paragraphs.

~~3.11 RECONNECTIONS OF EXISTING SERVICES~~

~~Make reconnections of existing services as needed after the liner has been installed, fully cured, and cooled down.~~

~~Utilize a CCTV camera and remote cutting tool for internal reconnections. The machined opening must be at least 90 percent of the service connection opening and the bottom of both openings are required to match. The opening cannot be more than 100 percent of the service connection opening. Smooth the edges of the opening and remove pipe or liner fragments, which may obstruct flow or snag debris. Cut the invert of the branch connection flush with the invert entering the culvert.~~

~~In the event that service reinstatements result in openings that are greater than 100 percent of the service connection opening, install a repair, sufficient in size to completely cover the over cut service connection according to the manufacturer's specifications.~~

~~3.12 POST TV INSPECTION~~

~~Perform a detailed closed-circuit Post-TV inspection in the presence of the Contracting Officer after installation of the liner and reconnection of the side sewers. Utilize a radial view (pan and tilt) TV camera. A post-TV video inspection is to confirm that the finished liner is continuous over the entire length of the installation, free of significant visual defects, damage, deflection, holes, leaks and other defects. Submit unedited digital video documentation of the inspection (Post-TV video inspection) to the Contracting Officer within 10 working days of the liner installation.~~

~~Include the following data on the Post-TV video: Inspection date, manhole identification numbers, size of culvert, direction of flow, location of reconnected branch utilities, and debris, as well as defects in the liner, such as gouges, cracks, bumps, or bulges.~~

~~Clean the newly installed liner removing accumulated debris and build-up immediately prior to conducting the Post-TV inspection.~~

3.11 SITE CLEANUP

Clean and restore existing surface conditions and structures. Repair any of the FFP system determined to be defective.

Schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, and property occupants.

3.12 CLOSEOUT ACTIVITIES

3.12.1 Demonstration

~~Complete Post-TV inspections and repairs to the installed liner before acceptance.~~

~~Submit post installation inspection documentation within 10 working days of the liner installation. The Contracting Officer may, at his or her discretion, suspend any further installation of lining materials if post-installation documentation is not submitted within 10 working days. As a result of this suspension, no additional working days will be added to the Contract, nor will any adjustment be made for increase in cost.~~

Submit as-built drawings for the portions of the culvert that were rehabilitated, showing complete detail with dimensions.

Include the identification of the work completed on one set of Contract Drawings. Keep legible as-built drawings on the project site at all times and maintain them as the work progresses. Continuously update the as-built drawings with accurate dimensions and notations concerning locations, dimensions, observed site conditions, and specific material types. Include dimensions, locations, and types of point repairs on the as-built drawings.

-- End of Section --

SECTION TABLE OF CONTENTS

DIVISION 33 - UTILITIES

SECTION 33 40 00

STORM DRAINAGE UTILITIES

-- End of Section Table of Contents --

SECTION 33 40 00

STORM DRAINAGE UTILITIES

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 ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 167M/M 167	(2014) Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M 218	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized), for Corrugated Steel Pipe - Nineteenth Edition
AASHTO M 243	(1996; R 2012) Standard Specification for Field-Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches

ASTM INTERNATIONAL (ASTM)

ASTM A807	(2013) Standard Practice for Installing Corrugated Steel Structural Plate Pipe for Sewers and Other Applications
ASTM C231	(2014) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM D1751	(2004; E 2013; R 2013) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	(2004a; R 2013) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the

following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Installation Work Plan; G, DO, RE

SD-02 Shop Drawings

Pipe For Culverts; G, RE

SD-03 Product Data

Pipe For Culverts

SD-07 Certificates

Pipe For Culverts

Determination of Density; G, RE

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. 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 Contracting Officer.

1.3.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Structural plate shall be carried to the trench, not dragged.

1.4 QUALITY ASSURANCE

A headwall with wingwalls shall be installed as an end treatment for the arch culvert. The headwall and wingwalls shall be reinforced concrete unless otherwise approved. The headwall may be either cast-in-place or precast concrete. Concrete for these features shall have compressive strength of 4,500 PSI or greater. The shape and design of these features shall be as shown. The arch culvert shall also have footings of cast-in-place or pre-cast reinforced concrete as shown. During placement of embankment rock fill, heavy equipment shall not be permitted within 20 feet of the headwall or wingwalls. Small vibratory compaction equipment, as appropriate for the structure backfill material, shall be permitted within this zone.

PART 2 PRODUCTS

2.1 PIPE FOR CULVERTS

Pipe for culverts shall be of the sizes indicated and shall conform to the requirements specified.

Install structural plate arch to the dimensions and extents shown. Contractor shall field verify the dimensions and geometry of the existing

stone arch culvert. The radius of the structural plate arch between STA 3+30 and 3+50 shall be increased as needed to accommodate the new concrete footers and the existing concrete encased sanitary sewer.

~~2.1.1 Reinforced Arch Culvert~~

~~Manufactured in accordance with and conforming to ASTM C506, A-III or A-IV.~~

2.1.1 Structural Plate, Steel Pipe, Pipe Arches and Arches

Assembled with galvanized steel nuts and bolts, from galvanized corrugated steel plates conforming to AASHTO M 167M/M 167 or AASHTO M 218, as applicable. Pipe coating, when required, shall conform to the requirements of AASHTO M 243. Thickness of plates shall be as indicated. ~~Grout couplers shall be installed by the manufacturer and the locations indicated on the shop drawings. Five evenly spaced grout couplers per plate shall be provided, unless otherwise approved.~~

2.2 MISCELLANEOUS MATERIALS

2.2.1 Concrete

Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements as shown on the drawings and under Section 03 30 00 CAST-IN-PLACE CONCRETE. The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 1-1/2 inches. Air content shall be determined in accordance with ASTM C231. The concrete covering over steel reinforcing shall not be less than 1 inch thick for covers and not less than 1-1/2 inches thick for walls and flooring. Concrete covering deposited directly against the ground shall have a thickness of at least 3 inches between steel and ground. Expansion-joint filler material shall conform to ASTM D1751, or ASTM D1752, or shall be resin-impregnated fiberboard conforming to the physical requirements of ASTM D1752.

~~2.2.2 Mortar~~

~~Mortar for pipe joints, connections to other drainage structures, and brick or block construction shall conform to ASTM C270, Type M, except that the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable. Water shall be clean and free of harmful acids, alkalis, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.~~

PART 3 EXECUTION

~~3.1 EXCAVATION FOR CULVERT~~

~~Excavation of trenches, and for appurtenances and backfilling for culverts and storm drains, shall be in accordance with the applicable portions of Section 31 00 00 EARTHWORK and the requirements specified below.~~

~~3.1.1 Trenching~~

~~The width of trenches at any point below the top of the pipe shall be not~~

~~greater than the outside diameter as shown on the detail to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing, where required, shall be placed within the trench width as specified, without any overexcavation. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures will be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.~~

~~3.1.2 Removal of Rock~~

~~Rock in either ledge or boulder formation shall be replaced with suitable materials to provide a compacted earth cushion having a thickness between unremoved rock and the pipe of at least 8 inches or 1/2 inch for each foot of fill over the top of the pipe, whichever is greater, but not more than three fourths the nominal diameter of the pipe. Rock excavation shall be as specified and defined in Section 31 00 00 EARTHWORK.~~

~~3.1.3 Removal of Unstable Material~~

~~Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor while performing shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the Government.~~

3.1 PLACING ~~PIPE~~CULVERT COMPONENTS

3.1.1 Structural-Plate Steel

Structural plate shall be installed in accordance with ASTM A807. Structural plate shall be assembled in accordance with instructions furnished by the manufacturer. Instructions shall show the position of each plate and the order of assembly. Bolts shall be tightened progressively and uniformly, starting at one end of the structure after all plates are in place. The operation shall be repeated to ensure that all bolts are tightened to meet the torque requirements of 200 foot-pounds plus or minus 50 foot-pounds. Any power wrenches used shall be checked by the use of hand torque wrenches or long-handled socket or structural wrenches for amount of torque produced. Power wrenches shall be checked and adjusted frequently as needed, according to type or condition, to ensure proper adjustment to supply the required torque.

Multiple pipes may be encountered inside the culvert and headwall. The Contractor shall field locate these pipes and submit a Installation Work Plan to incorporate the pipes into the system or abandon as applicable. Any efforts to abandon pipes shall be approved by the Contracting Officer and coordinated with the appropriate authority/owner of the pipe. See Conduit Inspection Memorandum attachment for reference.

The structural plate shall be installed per the manufacturer's recommendations unless otherwise noted. Contractor may submit alternatives to the structural plate for approval.

3.2 DRAINAGE STRUCTURES

3.2.1 ~~Walls and~~ Headwalls and Wingwalls

~~Walls and h~~Headwall~~s~~ and wingwall construction shall be as indicated. See Section 03 30 00 CAST-IN-PLACE CONCRETE

3.3 BACKFILLING

~~3.3.1 Backfilling Pipe in Trenches~~

~~After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation equal to the midpoint (spring line) of HDPE or has reached an elevation of at least 12 inches above the top of the pipe for flexible pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 8 inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the Contracting Officer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.~~

~~3.3.2 Backfilling Pipe in Fill Sections~~

~~For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified below. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 8 inches. Use select granular material for this entire region of backfill for flexible pipe installations.~~

3.3.1 Movement of Construction Machinery

When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.

~~3.3.2 Compaction~~

~~3.3.2.1 General Requirements~~

~~Cohesionless materials include gravels, gravel sand mixtures, sands, and~~

~~gravelly sands. Cohesive materials include clayey and silty gravels, gravel silt mixtures, clayey and silty sands, sand clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse shaped moisture density curves, and cohesive soils will show normal moisture-density curves.~~

~~3.3.2.2 Minimum Density~~

~~Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.~~

~~a. Under airfield and heliport pavements, paved roads, streets, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.~~

~~b. Under unpaved or turfed traffic areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.~~

~~c. Under nontraffic areas, density shall be not less than that of the surrounding material.~~

~~3.3.3 Determination of Density~~

~~Testing is the responsibility of the Contractor and performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Tests shall be performed in sufficient number to ensure that specified density is being obtained. Laboratory tests for moisture density relations shall be made in accordance with ASTM D1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D2167 or ASTM D6938. When ASTM D6938 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. ASTM D6938 results in a wet unit weight of soil and ASTM D6938 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D6938. Test results shall be furnished the Contracting Officer. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.~~

-- End of Section --

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		01 32 01.00 10	SD-01 Preconstruction Submittals															
			Project Schedule - Bar Chart	3.3	G	RE												
		01 32 23.00 08	SD-01 Preconstruction Submittals															
			Qualifications	1.7	G	DO												
			Survey Procedures and	1.6	G	DO												
			Equipment															
			SD-07 Certificates															
			Survey Logs	1.5.1	G	DO												
			Post excavation and Post	3.3	G	DO												
			Construction Surveys															
			Metadata	3.6	G	DO												
		01 32 33	SD-03 Product Data															
			Digital Camera	2.1.1	G	RE												
			SD-11 Closeout Submittals															
			Thumbnail Hard Copy Prints of	3.1	G	RE												
			Progress Images															
			Glossy Prints of Selected Official	3.1	G	RE												
			Progress Images															
			Electronic Copy of Selected	3.1	G	RE												
			Official Progress Images															
			Electronic Copy of All Other	3.1	G	RE												
			Progress Images															
		01 33 00	SD-01 Preconstruction Submittals															
			Submittal Register	1.7	G	RE												
		01 35 00.00 08	SD-01 Preconstruction Submittals															
			Access Plan	1.14	G	RE												

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		01 35 00.00 08	Emergency Plan		G	RE													
			Traffic Control Plan	1.10	G	RE													
			ROV Survey Work Plan		G	DO													
			Utility Plan	1.13	G	RE													
			SD-11 Closeout Submittals																
			ROV Survey Reports		G	DO													
		01 35 26	SD-01 Preconstruction Submittals																
			Accident Prevention Plan (APP)	1.6	G	RE													
			Confined Space Entry Plan	1.6.1	G	RE													
			Activity Hazard Analysis (AHA)	1.7	G	RE													
			SD-06 Test Reports																
			Accident Reports	1.11.2															
			Monthly Exposure Reports	1.11.3															
		01 45 00.00 10	SD-01 Preconstruction Submittals																
			Contractor Quality Control (CQC)	3.2	G	RE													
			Plan																
			SD-07 Certificates																
			CQC Training	3.4.4															
		01 50 10	SD-02 Shop Drawings																
			Project Sign	3.1	G	RE													
		01 57 20.00 10	SD-01 Preconstruction Submittals																
			Environmental Protection Plan	1.7	G	RE													
		01 57 23.00 08	SD-01 Preconstruction Submittals																
			Erosion And Sediment Controls	1.5															
			SD-03 Product Data																
			Aggregates	2.1.1	G	RE													

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		01 57 23.00 08	Geotextile	2.1.2	G	RE												
			Pumped Water Filter Bag	2.1.3	G	RE												
			Compost Filter Sock	2.1.4	G	RE												
			Pipe Flume and Stream Crossing	2.1.5.1	G	RE												
			Corrugated Dual Wall Drainage															
			Pipe															
			Annular Corrugated Single Wall	2.1.5.2	G	RE												
			Heavy Duty (HDPE)															
			Precast Concrete Inlet	3.9.1	G	RE												
			Non-Shrink Grout	3.9.2	G	RE												
			Inlet Grate	3.10.1	G	RE												
			Filter Bag Inlet Protection	2.1.6	G	RE												
			SD-07 Certificates															
			Aggregates	2.1.1	G	RE												
			Geotextile	2.1.2	G	RE												
			Pumped Water Filter Bag	2.1.3	G	RE												
			Compost Filter Sock	2.1.4	G	RE												
			Pipe Flume and Stream Crossing	2.1.5.1	G	RE												
			Corrugated Dual Wall Drainage															
			Pipe															
			Annular Corrugated Single Wall	2.1.5.2	G	RE												
			Heavy Duty (HDPE)															
			Precast Concrete Inlet	3.9.1	G	RE												
			Non-Shrink Grout	3.9.2	G	RE												
			Inlet Grate	3.10.1	G	RE												
			Filter Bag Inlet Protection	2.1.6	G	RE												

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		01 78 02.00 15	SD-11 Closeout Submittals															
			Working As-Built Drawings	1.2.3	G	RE												
		02 41 00	SD-01 Preconstruction Submittals															
			Existing Condition Survey	1.8	G	RE												
			Demolition Plan	1.2.1	G	RE												
		02 42 00	SD-01 Preconstruction Submittals															
			Disposal Plan	1.7	G	RE												
			Waste Classification, Handling, and Disposal Plan	1.8	G	RE												
			Disposal Sites	1.6.1	G	RE												
			Salvaged Materials	3.1.7	G	RE												
		03 30 00	SD-01 Preconstruction Submittals															
			Concrete Curing Plan	1.5.4.1	G													
			Laboratory Accredidation	1.5.6	G	RE												
			Form Removal Schedule	1.5.3.1	G													
			SD-02 Shop Drawings															
			Formwork	1.5.3.1	G	RE												
			Reinforcing Steel	1.5.3.2	G	DO												
			SD-03 Product Data															
			Joint Sealants	2.4.1	G	RE												
			Joint Filler	2.4.7	G	RE												
			Materials for Forms	2.1	G	RE												
			Cementitious Materials	2.4.2	G	RE												
			Concrete Curing Materials	2.3.3	G	RE												
			Reinforcement	2.5	G	RE												
			Admixtures	2.4.6	G	RE												

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		03 30 00	Mechanical Reinforcing Bar	2.5.2	G	RE												
			Connectors															
			Biodegradable Form Release	2.4.8	G	RE												
			Agent															
			Pumping Concrete	1.5.4.2	G	RE												
			SD-05 Design Data															
			Mix Design	2.3.1	G	RE												
			Formwork Calculations	1.5.1	G													
			SD-06 Test Reports															
			Concrete Mix Design	1.5.2														
			Fly Ash	1.5.5.1														
			Pozzolan	1.5.5.1														
			Ground Granulated	1.5.5.2														
			Blast-Furnace Slag															
			Aggregates	2.4.4														
			Fiber-Reinforced Concrete	1.5.5.4														
			Tolerance Report	3.8.3.1														
			Compressive Strength Tests	3.11.2.3														
			Unit Weight of Structural	3.11.2.5														
			Concrete															
			Ion Concentration	3.11.2.6														
			Air Content	3.11.2.4														
			Slump Tests	3.11.2.1														
			Water	2.4.3														
			SD-07 Certificates															
			Reinforcing Bars	2.5.1														

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		03 30 00	Welder Qualifications															
			VOC Content for Form Release	1.5.4.3														
			Agents, Curing Compounds, and															
			Concrete Penetrating Sealers															
			Material Safety Data Sheets	1.5.4.4														
			Field Testing Technician and	1.5.7.1														
			Testing Agency															
			SD-08 Manufacturer's Instructions															
			Curing Compound	2.3.3														
		10 14 00.10	SD-02 Shop Drawings															
			Approved Detail Drawings	3.1	G	RE												
			SD-03 Product Data															
			Installation	3.1	G	RE												
			Exterior Signage	1.2	G	RE												
			Wind Load Requirements	1.2.1	G	RE												
			SD-07 Certificates															
			Exterior Signage	1.2	G	RE												
		31 00 00	SD-01 Preconstruction Submittals															
			Shoring	3.4	G	DO												
			Dewatering Work Plan	1.4.3	G	DO												
			Excavation Work Plan	3.12.1	G	DO												
			SD-03 Product Data															
			Utilization of Excavated Materials	3.9	G	RE												
			Proposed Source of Commercial	3.12.4	G	DO												
			Stone															
			SD-06 Test Reports															

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		31 00 00	Testing	3.17														
			Borrow Site Testing	2.1														
			SD-07 Certificates															
			Testing	3.17														
		31 05 19	SD-03 Product Data															
			Geotextiles	2.2.1	G	DO												
			SD-06 Test Reports															
			Geotextiles	2.2.1														
			DO															
			SD-07 Certificates															
			Geotextiles	2.2.1														
			DO															
			Needle Punched Geotextile	2.2.1.3														
		31 11 00	SD-01 Preconstruction Submittals															
			Work Plan	3.1	G	RE												
		31 32 11	SD-03 Product Data															
			Erosion Control Blankets	2.2	G	RE												
			SD-07 Certificates															
			Erosion Control Blankets	2.2	G	RE												
		31 37 16.00 08	SD-01 Preconstruction Submittals															
			Selection of Sources	1.3.1	G	DO												
			SD-06 Test Reports															
			Gradation Testing	2.2.4	G	DO												
			SD-07 Certificates															
			Stone	2.2.2	G	DO												
			Granular Fill	2.1	G	DO												

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		31 37 16.00 08	SD-11 Closeout Submittals															
			Waybills and Delivery Tickets	1.3.3														
		31 63 33	SD-01 Preconstruction Submittals															
			Fabrication and Installation	2.1.2	G	DO												
			Drawings															
			Equipment	3.1	G	DO												
			Fabricator Qualifications	1.5.1	G	RE												
			Installer Qualifications	1.5.2	G	RE												
			Installation Plan	1.3	G	DO												
			SD-06 Test Reports															
			Micropile Steel Casing	3.3.2	G	RE												
			Cement Grout Mixture	2.3.5	G	RE												
			Proportions															
			SD-07 Certificates															
			Deformed steel bars	2.1.1	G	RE												
			SD-11 Closeout Submittals															
			Driller Logs	3.2.5	G	DO												
			Micropile Records	3.4.3	G	DO												
		31 73 00.00 08	SD-01 Preconstruction Submittals															
			Pressure Washing and Pressure	3.3	G	DO												
			Testing Operations															
			Cement Grouting Operations	3.3	G	DO												
			SD-03 Product Data															
			Grouting Report	1.5														
		32 11 23	SD-07 Certificates															
			Aggregates	2.1														

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		32 11 23	SD-11 Closeout Submittals														
			Waybills and Delivery Tickets	1.6													
		32 31 13	SD-02 Shop Drawings														
			Fence Assembly	1.3	G RE												
			Location of Gate, Corner, End,	3.15.1	G RE												
			and Pull Posts														
			Gate Hardware and Accessories	2.10	G RE												
			Erection/Installation Drawings	1.3	G RE												
			SD-03 Product Data														
			Fence Assembly	1.3	G RE												
			Gate Hardware and Accessories	2.10	G RE												
			Zinc Coating	2.2	G RE												
			Fabric	2.3	G RE												
			Stretcher Bars	2.6	G RE												
			Concrete	2.13	G RE												
			SD-07 Certificates														
			Certificates of Compliance	1.5.2													
			SD-08 Manufacturer’s Instructions														
			Fence Assembly	1.3													
			Gate Assembly	1.3													
			Hardware Assembly	1.3													
			Accessories	1.3													
		32 92 19	SD-01 Preconstruction Submittals														
			Delivery Schedule	1.4.1	G RE												
			SD-03 Product Data														
			Seed	2.1	G RE												

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ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							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 REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		32 92 19	Fertilizer	2.2.1	G	RE												
			Mulch	2.3	G	RE												
			Lime	3.2.2	G	RE												
			Off-Site Topsoil	3.2.1	G	RE												
			SD-06 Test Reports															
			Equipment Calibration	3.1.3	G	RE												
			SD-07 Certificates															
			Quantity Check	3.4	G	RE												
			Seed Establishment Period	3.7	G	RE												
			Maintenance Record	3.7.3.3	G	RE												
			Seed	2.1	G	RE												
			Fertilizer	2.2.1	G	RE												
			Mulch	2.3	G	RE												
			Lime	3.2.2	G	RE												
			Off-Site Topsoil	3.2.1	G	RE												
		33 01 30.72 08	SD-01 Preconstruction Submittals															
			Contractor's Qualifications	1.4.1														
			Equipment	2.2.1	G	DO												
			Sequence Of Liner Installation	3.1.1	G	DO												
			Diversion Plan	3.4	G	DO												
			SD-03 Product Data															
			Manufacturer's Technology Data	2.2.3.1	G	RE												
			SD-05 Design Data															
			Engineering Design Calculations	2.1.1	G	DO												
			SD-07 Certificates															
			Contractor's Qualifications	1.4.1	G	DO												

SUBMITTAL REGISTER

CONTRACT NO.
W911WN-17-B-8007

TITLE AND LOCATION
Permanent Embankment and Culvert Repair at Blairsville

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		33 01 30.72 08	Certificate of QC Laboratory	1.4.3	G	DO												
			Accreditation															
			SD-11 Closeout Submittals															
			As-Built Drawings	3.12.1	G	RE												
		33 40 00	SD-01 Preconstruction Submittals															
			Installation Work Plan	3.1.1	G	DO												
			SD-02 Shop Drawings															
			Pipe For Culverts	2.1	G	RE												
			SD-03 Product Data															
			Pipe For Culverts	2.1														
			SD-07 Certificates															
			Pipe For Culverts	2.1														
			Determination of Density		G	RE												