Dobbins Airfield Storm Water Phase 2

Dobbins Air Reserve Base, GA

GEORGIA REGISTERED No. PE032950 PROFESSIONAL ENGINEER JAMES R. WARNER 5/15/19

SPECIFICATIONS

100% Certified Final Design Submittal

USACE Louisville District

Project #: FGWB-04-0014-P2A/B

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AE Project #:1180636

GEORGIA REGISTERED NO. 034223 PROFESSIONAL ENGINEER JAMES A. SWIFT 5-20-19

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SECTION 01 01 00

GENERAL REQUIREMENTS
01/19

PART 1 GENERAL

1.1 PROJECT INFORMATION

This project includes the all work necessary to maintain the stormwater drainage systems east of Taxiway 'J' on Dobbins ARB.

1.1.1 Contract Drawings and Specifications

a. Drawings for Dobbins Airfield Storm Water System Phase 2, Dated May 20, 2019.

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q.	32 12 15.13	ASPHALT PAVING FOR AIRFIELDS
r.	32 92 23	SODDING
s.	33 05 23	TRENCHLESS UTILITY INSTALLATION
t.	33 40 00	STORM DRAINAGE UTILITIES

1.2 SUBMITTALS

Submittals shall be submitted in accordance with Section 01 30 00, SUBMITTALS.

SD-01 Preconstruction Submittals

Submittal Register; G
Temporary Construction Authorization Form
Construction Phasing
Daily Progress Reports
Quality Control Plan
As Built Drawings

NOTE: The contractor shall obtain Government approval of all materials and equipment requiring submittals prior to bringing these materials and equipment onto Dobbins ARB for installation and incorporation into the work. The contractor shall follow section 01 30 00 of the basic contract in obtaining Government approval.

1.2.1 Administrative or Close-out Submittal

a. Construction Phasing (ref: paragraph 3.2.1)
b. Daily Progress Reports to Contracting Officer within 2 hours of shift completion
c. Quality Control Plan, (ref: paragraph 3.17.6)
d. As built drawings (After construction complete)

Contractor shall video inspection all piping systems that are covered under this scope of work. Provide three (3) copies on CD’s to COR. Contractor responsible for repairing any deficiencies discovered by the video inspection with the work they performed. Contractor shall also video inspect Phase I piping systems. The piping systems are a minimum of 12” diameter and the total feet is estimated at 5,303 LF (Contractor to account for 5,800 LF in bid to account for any field overruns). Contractor is not responsible for repairing any deficiencies discovered during the inspection of Phase I piping systems. Provide three (3) CD’s to COR for this work.

1.3 GENERAL DESCRIPTION

1.3.1 Location

The project is located at Dobbins Air Reserve Base, Georgia. Project site is located east of Taxiway J and includes the area to extending the Eastern most perimeter of the facility.

1.3.2 Project Description

This project encompasses the work necessary to maintain the stormwater drainage systems east of Taxiway 'J' on Dobbins ARB. Areas where the slopes have failed or where they have been disturbed from previous repair will be regraded and have sod applied to obtain stabilization and positive drainage. Work shall include all maintenance items identified in basin III, IV, and V on the airfield.

In addition to the work associated with correcting the grades around the airfield, the cleaning of existing flumes, pipes, and swales is required to reestablish proper drainage patterns. New concrete flumes will be installed at various locations throughout the airfield to reestablish positive drainage and prevent future erosion and standing water.

Repair and maintenance of the existing storm pipe system will be facilitated through the installation of additional access manholes throughout the drainage system. The corrections of the existing system will be attained via pipe cleaning and lining as outlined in the specifications. In areas where pipe lining is not feasible the system will be repaired through replacement of the existing system.

This project will also include the removal of trees on the south side of the runway to a distance established on the approved plans. This work will be completed in and around the State Water buffer and jurisdictional wetlands. No work will be allowed in jurisdictional areas until all permits have been received.

1.4 GOVERNMENT INSPECTOR

The Base Civil Engineer, or his authorized representative, is designated as the representative of the Contracting Officer for the purpose of technical surveillance of workmanship and inspection of materials for work being

performed under this contract. This clause does not authorize anyone other than the Contracting Officer to commit the Government to changes in the terms of the contract.

1.5 ORAL STATEMENTS

No oral statement by any government official shall in any manner or degrees modify or otherwise affect the terms of this contract.

1.6 NO GOVERNMENT WAVER

The failure of the Government in any one or more instances to insist upon strict performance to any of the terms of this contract or to exercise any option herein conferred will not be construed as a waiver or relinquishment to any extent of the right to assert or rely upon such terms or option on any future occasion.

1.7 AS-BUILT DRAWINGS

1.7.1 As-Built Drawings

Maintain at the jobsite 2 sets of full-size contract drawings. Any deviations from the contract drawings shall be marked legibly and accurately with a red pen. These drawings shall be available for review by the Contracting Officer at all times. Submit one marked set of prints to the Contracting Officer no later than 30 calendar days after work is deemed substantially performed or beneficial occupancy is taken.

Barricades must be placed per IAW UFC 3-260-04 Airfield and Heliport Marking. Solar powered lights are not authorized.

1.8 BASE POINT OF CONTACT

1.8.1 Airfield Management Point of Contact Shall Be:

Mr. T. Wesley Jones; 678-773-1191; 678-655-4905; 678-655-4903

1.8.2 Base Civil Engineering Point of Contact Shall Be:

Mr. Nigel Perry; 678-655-4808

1.9 FOD CHECKPOINTS

FOD checkpoints must be established in construction areas to access active airfield area. Checkpoint shall be kept clean at all times per the contract documents. If the area is not deemed clean by the Airfield Management POC or Base CE POC, the Contractor at no cost to the government shall have the site cleaned by a vacuum truck until accepted by either POC.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 BASE REGULATIONS

The Contractor and his employees and subcontractor shall become familiar with and obey all base regulations, including fire, traffic, airfield,

safety, environmental, and security regulations. Regulations are available upon request. All personnel employed on subject contract shall keep within the limits of the work and avenues of ingress and egress. Do not enter any restricted areas unless previously cleared for such entry. The Contractor's equipment shall be conspicuously marked for identification.

Contractor is required to obtain all security badges for their staff, subcontractors, and any other associated parties. For staff that must drive on base, a minimum one-day training course is required and provided by Dobbins ARB. Contractor shall coordinate with Base CE point of contact a minimum 14 days in advance.

3.2 WORK SCHEDULE

The Contractor shall schedule his work to cause the least amount of interference with base operations. Work schedules shall be subject to the approval of the Contracting Officer. Under no circumstances shall fire water system be out of service for more than 5 calendar days. Permission to interrupt any base roads and/or utility service shall be requested in writing a minimum of 10 calendar days prior to the desired date of interruption. Interruption shall not take place without specific approval from the Contracting Officer.

The contractor is to include up to ten (10) days of work stoppage in the schedule for unforeseen airfield activities that would prevent work within the airfield. This stoppage will be included at no additional cost to the government nor will it result in an increase in the allotted completion time unless so directed by the Contracting Officer.

The total expected time to complete this project shall not exceed 420 Days.

Any required outage of taxiways, runways, or aircraft operations shall be detailed in the schedule. These outages shall be requested in writing a minimum of 45 days in advance.

3.2.1 Construction Phasing

Thirty (30) days prior to commencing work, provide to the Contracting Officer, for approval, a plan, which indicates the Timeline of start to completion of each construction phase.

After completion of field work, Contractor shall video inspection all piping systems that are covered under this scope of work. Provide three (3) copies on CD’s to COR. Contractor responsible for repairing any deficiencies discovered by the video inspection with the work they performed. Contractor shall also video inspect Phase I piping systems. The piping systems are a minimum of 12” diameter and the total feet is estimated at 5,303 LF (Contractor to account for 5,800 LF in bid to account for any field overruns). Contractor is not responsible for repairing any deficiencies discovered during the inspection of Phase I piping systems. Provide three (3) CD’s to COR for this work.

3.3 WORK HOURS

The normal hours of work for the performance of this contract will be from 7:30 AM to 5:00 PM except as otherwise expressly provided in this contract. The workdays will be Monday through Friday, with Federal holidays excluded. Alternate work hours require written permission of the Contracting Officer. The contractor must submit a written request for

permission to work to the Contracting Officer at least 2 working days in advance of the date when the contractor desires to deviate from the normal hours and days. Permission to deviate will be predicated on complete justification for the request after due consideration to a larger work force and more equipment during normal hours, and providing the contractor defrays the additional costs to the Government including, but not limited to, inspection computed in accordance with existing Government regulations. If permission is granted by the Contracting Officer, written authority will be furnished to the contractor prior to the date the contractor desires to deviate from the normal hours or days. The Contracting Officer may also direct performance as authorized by the General Provisions by reference clause entitled "Schedule for Construction Contract."

3.4 TEMPORARY CONSTRUCTION AUTHORIZATION FORM

Airfield operations are a key function of the daily activity at Dobbins ARB. As such the contract will limit at all times the disruption to air traffic. This means that constant coordination will be required with base airfield personnel when working within the perimeter of the airfield. It is imperative that this be maintained for the safety of the contractor and those operating the aircraft and airfield operations. In order to aid the contractor in scheduling the work in the airfield the following items should be noted:

1. The normal airfield operating hours are from 6 AM to 11 PM, unless otherwise notified by Airfield Operations.

2. Unless otherwise notified by Airfield Operations the field has a scheduled closure the last Saturday of each month from 7 am to 4 pm.

3. A closure of no longer than four (4) consecutive days may be scheduled with Base Airfield operations when a 30 day notification and coordination are completed through the Contracting Officer.

While working in the clear zones shown on the plans, the contractor will be required to abandon the clear zone when notified by the Airfield Operations, personnel and equipment when practical for the safety of the construction workers and flight/field crews.

G/S ILS critical areas have been shown on the plans with locational coordinates and elevations. All of these checkpoints must be surveyed and verified prior to the start of construction. Following the completion of the construction all points are to be relocated in the precise location they are removed from. These points are critical to the calibration of the instruments landing system used at the airfield. Once disturbed only visual landings will be authorized. Therefore, it is critical that the airfield manager be aware of all work in these areas. As such the contractor is responsible for completing a Temporary Construction Authorization Form prior to the start of any construction. It will also be the contractor's responsibility to coordinate with the FAA for ILS calibration following the work. Due to the backlog of the FAA it is recommended this contact be completed not less than 120 days prior to the completion of work.

Barricades must be placed per IAW UFC 3-260-04 Airfield and Heliport Marking. Solar powered lights are not authorized.

3.5 EXISTING WORK

The removal or altering in any way of existing work shall be carried on in such a manner as to prevent personal injury or damage to any portions of the existing work that remains.

3.6 SANITATION

Adequate sanitary conveniences of a type approved for use by persons employed on the work shall be provided. Sanitary conveniences shall be properly secluded from public observation, and maintained by the Contractor in such a manner as required or approved by the Contracting Officer. Maintain these conveniences at all times without nuisance. Upon completion of the work, the contractor shall remove the conveniences from the premises, leaving the premises clean and free from nuisance.

3.7 UTILITIES

All reasonable quantities of government provided utilities shall be made available to the contractor without charge. Any temporary telephone service shall be requested by the contractor from the local Telephone Company providing service to Dobbins ARB. The contractor shall not tamper with, connect or access any Government communication facility, equipment or cable without express written consent from the Contracting Officer. Any temporary connections or lines that may be required shall be installed, maintained, and removed by the Contractor at his expense and in a manner satisfactory to the Contracting Officer. Contractor shall remove all temporary connections and lines prior to final acceptance of the construction.

3.8 UTILITY SERVICE INTERRUPTION

The Government shall not be held responsible for interruptions of utility services and shall not be liable for Contractor delays, damages, or increased costs occasioned by any such interruption of services.

3.9 OPTIONAL REQUIREMENTS

Where a choice of materials or methods, or both, is permitted in this contract, the Contractor will be given the right to exercise the option unless otherwise required by the specification or plans.

3.10 MATERIAL APPROVAL SUBMITTAL PREPARATION

"Material and Workmanship" shall be accomplished on and in accordance with the instructions to AF Form 3000, Material Approval Submittal. Material Approval Submittals shall contain complete information for the product proposed. The information shall be in enough detail to allow the Government to determine acceptability. Information to be provided includes, but is not limited to: a description of all salient features of the product, descriptive literature and manufacturer's cut sheet (if available), plus an explanation as to precisely why and how the material or item submitted meets or exceeds all required functions, performance and quality specifications.

3.11 MATERIAL DISPOSITION

3.11.1 Material/Equipment Title

Title to materials and equipment to be demolished, except Government

salvage and historical items, is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

3.11.2 Contractor Salvage

Contractor shall salvage items and materials to the maximum extent possible. Material salvaged for the Contractor shall be stored as approved by the Contracting Officer and removed from Government property before completion of the contract. The contractor shall not sell salvaged material on the site.

3.12 CLEAN-UP

Remove and transport debris in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply. The contractor shall maintain a clean and orderly work site.

Prior to Contractor completing work in one location and moving to another area shall require obtaining written approval by base operations point of contact. This shall require the Contractor to thoroughly clean their wok area and verify the area is free of any material that could be considered foreign objects that can cause damage to aircraft. For hard surfaces, a street sweeper vacuum track shall be used.

3.13 SAFETY REQUIREMENTS

The contractor shall initiate and maintain programs that comply with the provisions of 29 CFR parts 1926 and 1910 of the Occupational Safety and Health Standards. These programs shall include the education and training of employees and subcontractors' personnel in the recognition, avoidance, and prevention of unsafe conditions and practices.

3.14 FIRE PROTECTION

The contractor shall be responsible for furnishing adequate and proper fire protection during all phases of work on site. Contact the base Fire Department in the event of emergency.

3.15 FACILITIES AND SERVICES

The contractor is responsible for storage of all materials. Storage areas shall be shown on the site plan and approved by the Contracting Officer.

3.16 RESTRICTIONS

3.16.1 Radio Transmitter Restrictions

The contractor shall conform to the restrictions and procedures for the use of radio transmitting equipment, as directed. Two transmitters shall be provided by the government to the contractor for use during construction.

3.16.2 Materials Burning

Burning of trash, timber and any other debris on government property is not permitted.

3.17 REQUIRED CONTRACTOR ACTIONS

3.17.1 Base Permits

Obtain these pursuant to paragraph 3.1 of this specification. Permits are required for, but are not necessarily limited to, welding, and digging.

3.17.1.1 Government Digging Permits

The requirement for digging or excavation permits (AF Form 103) shall be applicable for Government-owned utilities such as water, gas, electrical, sewer, fiber optics, telephone cable and communication cables for radar, weather and navigational aids cable.

3.17.1.1.1 Procedures for Government Digging Permits

Contractor shall not dig anywhere on Dobbins ARB without a valid digging permit.

Contractor shall notify the Contracting Officer in writing to request a digging permit.

Contractor shall mark the area on site where digging is to occur. This shall be done the same day the dig permit is requested. Government has 14 days to issue an initial digging permit.

Contractor shall maintain all markings during construction performance period.

Contractor will provide (AFM) Airfield Manager completed and signed copy of AF Form 103,Dig Permit, prior to digging.

Once a digging permit is issued, the contractor must hand dig and locate all marked utilities within 5 feet of the area to be worked on. Contractor shall fill all holes prior to project completion.

If, during the life of the digging permit, utility markings are removed by the contractor or his subcontractor the contractor shall be responsible for replacing all markings.

3.17.1.2 UPC Digging Permits

The procedures set forth for Government-owned utilities shall not apply to utilities which are governed by the Utilities Protection Center (UPC) under the auspices of the State of Georgia. UPC utilities on Dobbins ARB include television cable, telephone cables, data cables, etc. Procedures for utilities governed by the UPC shall be followed in accordance with Georgia Utility Facility Protection Act (GUFPA). The contractor is required to obtain a UPC digging permit prior to digging on Dobbins ARB. The government is not responsible for issuing or monitoring UPC digging permits.

3.17.1.3 Utility Damage

The Contractor must immediately notify the Government technical representative and UPC in the event that utility damage occurs. If damage to utilities is due to contractor non-compliance with permit instructions or contract requirements, repairs required shall be at the contractor's expense. Fiber optic cables, which cannot be repaired to meet the minimum allowable decibels, will be replaced at the contractor's expense.

3.17.1.4 Welding Permits

Obtain welding permits on a daily basis from the Base Fire Department.

3.17.2 Severe Weather Protection

In the event of severe weather, the contractor shall take precautions to minimize any danger to persons, and protect the work and any nearby Government property. Precautions shall include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work.

3.17.3 Clean Tire Policy

Dobbins ARB has a clean tire policy at work sites. The purpose of this policy is to reduce or eliminate the transport of mud from the work area onto public rights of way by motor vehicles leaving the site or by runoff from the site. Clean and remove mud from the wheels of vehicles prior to entrance to public rights of way. The site exit shall be maintained in order to prevent tracking or flow of mud onto public rights of way. Immediately remove all materials spilled, dropped, washed or tracked from any vehicle or site onto any roadway or into any storm drain. Compliance with the clean tire policy, by Contractor and Sub-contractor personnel, shall be the sole responsibility of the Contractor.

3.17.4 Erosion and Sediment Control

Take positive steps to minimize siltation and erosion during the work. Comply with the requirements of Section 01 56 00, drawings and all other related specification sections.

3.17.5 Environmental Requirements

The Contractor and all work to be performed on Dobbins ARB shall comply with the requirements of Section 01 56 00.

3.17.6 Quality Control Plan

The contractor shall be required to institute a comprehensive Quality Control Program in order to assure himself and the Government that all materials and workmanship are in strict accordance with the provisions of the specifications. Within 10 calendar days after receipt of Notice to Proceed, the contractor shall submit his Quality Control Program Plan to the Contracting Officer for review and approval. The plan shall contain, at a minimum, identification of procedures for quality control, the type and model of major pieces of equipment to be used on-the-job, ordering procedures for materials, and procedures to ensure adequate progress.

3.17.7 Hazardous Spill Reporting

The contractor shall report any spill of oil or hazardous substances to the Fire Department service desk at Ext. 911 from a government phone, or (678) 655-4840 from a commercial phone (24 hours per day, 7 days per week). The contractor shall take every reasonable precaution to prevent the spillage of oil or other hazardous substances.

3.17.8 DD Form 1354

Completion of a DD1354 Package is required for this project. A draft version of the DD1354 included as an attachment to this specification. Electronic copies will be available from the COR. Follow the instructions given for executing the DD1354 and coordinate its submission with the COR.

3.17.9 Land Disturbance Permit

Contractor shall perform the following actions for receipt of land disturbance permit through Cobb County:

1. Submit a Notice of Intent (NOI) and required fee to the Georgia Environmental Protection Division (EPD).

2. Provide Cobb County Community Development Agency with a copy of the NOI.

3. Provide Cobb County Community Development Agency with a CD of the approved drawings stamped by Cobb County. CD to be provided by the Government.

4. Provide Cobb County Community Development Agency with a 24-hour contact person for erosion and sediment control.

3.18 SITE QUALIFICATIONS, DUTIES, AND MEETINGS

Personnel Qualifications

Site Safety and Health Officer (SSHO)

Provide an SSHO that meets the requirements of EM 385-1-1 Section 1. The SSHO must ensure that the requirements of 29 CFR 1926.16 are met for the project. Provide a Safety oversight team that includes a minimum of one (1) person at each project site to function as the Site Safety and Health Officer (SSHO). The SSHO or an equally-qualified Alternate SSHO must be at the work site at all times to implement and administer the Contractor's safety program and government-accepted Accident Prevention Plan. The SSHO and Alternate SSHO must have the required training, experience, and qualifications in accordance with EM 385-1-1 Section 01.A.17, and all associated sub-paragraphs.

If the SSHO is off-site for a period longer than 24 hours, an equally-qualified alternate SSHO must be provided and must fulfill the same roles and responsibilities as the primary SSHO. When the SSHO is temporarily (up to 24 hours) off-site, a Designated Representative (DR), as identified in the AHA may be used in lieu of an Alternate SSHO, and must be on the project site at all times when work is being performed. Note that the DR is a collateral duty safety position, with safety duties in addition to their full time occupation.

3.18.1 Additional Site Safety and Health Officer (SSHO) Requirements and Duties

The SSHO may also serve as the Quality Control Manager. The SSHO may not serve as the Superintendent.

The SSHO must have completed a 40 hour contract safety awareness course based on the content and principles of EM 385-1-1, and instructed in accordance with the guidelines of ASSE/SAFE Z490.1, by a trainer meeting

the qualifications of paragraph QUALIFIED TRAINER REQUIREMENTS. If the SSHO does not have a current certification, certification must be obtained within 60 days, maximum, of contract award.

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SECTION 01 30 00

SUBMITTALS
01/19

PART 1 GENERAL

1.1 DEFINITIONS

Submittal Definition, Shop drawings, product data, samples, administrative and closeout submittals, and additional data presented for review and approval by the Government.

1.2 SUBMITTAL TYPES

1.2.1 Material Submittals

Submittals for which review and approval will be made to ensure that the materials installed and processes used for installation are in compliance with the design concept and contract documents. These include, but are not limited to, those items shown in paragraph 1.7 of this section. The following are examples of material approval data items:

a. Shop Drawings: As used in this Section, drawings, schedules, diagrams, and other data prepared specifically for this Contract, by the Contractor or through the Contractor by way of a subcontractor, manufacturer, supplier, distributor, or other lower tier contractor, to illustrate a portion of the work. Types are as listed in the paragraph 1.7, entitled "Schedule of Submittal Descriptions (SD)."

b. Product Data: Preprinted materials such as illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, catalog data, and other data to illustrate a portion of the work, but not prepared exclusively for this Contract. Types are as listed in the paragraph 1.7, entitled "Schedule of Submittal Descriptions (SD)."

c. Samples: Physical examples of products, materials, equipment, assemblies, or workmanship, physically identical to a portion of the work, illustrating a portion of the work or establishing standards for evaluating the appearance of the finished work or both. Types are as listed in the paragraph 1.7, entitled "Schedule of Submittal Descriptions (SD)."

1.2.2 Administrative and Closeout Submittals

Submittals of data for which review and approval will be to ensure that the administrative requirements of the contract are adequately met but not to ensure directly that the work is in accordance with the design concept and in compliance with the Contract documents. Submittals of this type include, but are not limited to, those items shown in paragraph 1.7 of this section.

1.2.3 Approving Authority

The approving authority for all submittals shall be the Contracting Officer.

1.2.4 Work

As used in this Section, the construction required by the Contract documents, including labor necessary to produce the construction and materials, products, equipment, and systems incorporated or to be incorporated in such construction and including materials, products, equipment, and systems produced both on and off-site.

1.3 PROCEDURES FOR ADMINISTRATIVE AND CLOSEOUT SUBMITTALS

1.3.1 Dobbins ARB Requirement

Administrative and closeout submittals shall be provided as the work progresses in accordance with the time frames established within the contract for each item. Should a delivery date fall on a weekend or a holiday, the submittal shall be due the next working day thereafter.

1.3.2 Sequencing

Unless otherwise stated, the Government shall have fifteen (15) working days for review and acceptance of each administrative/closeout submittal.

1.3.3 Scheduling

All administrative/closeout submittals shall be submitted by letter to the Contracting Officer. The format shall be as specified for each item at the point in the contract which establishes the requirement. If a format and applicable forms are not specified, the submittal may be made on 8 1/2" by 11" plain bond paper, double-sided. The item shall be neatly and legibly handwritten or typed.

1.3.4 Dobbins ARB Requirement

Warranties and operating instructions are required at the completion of the contract work and shall be submitted no later than thirty (30) calendar days after work is deemed to be substantially performed or beneficial occupancy is taken. Four copies of all warranties and operating instructions shall be provided unless otherwise specified. The Government shall have thirty (30) calendar days for review and acceptance. Operation and maintenance manual data also shall include components required in the various technical sections of this specification.

1.3.5 With the exception of as-built drawings, drawings included in an administrative or closeout submittal shall conform to the requirements of paragraph 1.6.3 of this section.

1.3.6 Unless otherwise stated, administrative and closeout submittals shall be submitted in quantities of four, one original and three copies.

1.4 PROCEDURES FOR MATERIAL SUBMITTALS

1.4.1 Limits and Constraints Regarding Material Submittals

a. Submittals shall be complete for each portion of the work; components of the work interrelated as a system shall be submitted at the same time.

b. When submittal acceptability is dependent on conditions, items, or materials included in separate subsequent submittals, the submittal

will be returned without review.

c. Submittals of information not required as a submittal, or covering work for which the submittals have been returned as "approved" or "approved as noted," will be returned without review.

d. Approval of a separate material, product, or component does not imply approval of assembly in which the item functions.

e. The work shall conform to approved submittals as approved. In the event a previously approved submittal has an error or omission, the contractor shall revise the submittal and resubmit for approval. Government review, corrections or comments made on submittals do not relieve the contractor from compliance with the requirements of the drawings, specifications, addenda and contract documents. The government reserves the right to seek equitable compensation if submittals containing unnoted deviations are approved.

f. Approval of a submittal by the Contracting Officer shall not relieve the Contractor from the responsibility to provide materials which comply with project specifications.

g. All material submittals must be submitted on an AF Form 3000, entitled Material Approval's submittal.

Review of submittals by the government will not be construed as a complete check, but indicates only that the submittals are in general conformance with the design concept and with the information given in the Contract Documents. This approval shall not relieve the contractor from responsibility for errors and omissions.

1.4.2 Scheduling of Material Submittals - SUBMITTAL REGISTER

a. Material submittals requiring government review and/or approval are defined in each section of the specification and designated on the Submittal Register as "G". Material submittals requiring Architectural and Engineering review and/or approval are defined in each section of the specification and designated on the Submittal Register as "A/E". The Submittal Register contains a listing of items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The contractor shall complete and submit the forms to the Contracting Officer for approval within 15 calendar days after Notice-to-Proceed or at the direction of the Contracting Officer. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedule shall be coordinated. The Contractor shall carefully control his/her procurement operations to ensure that each individual submittal is made on or before the Contract scheduled submittal date shown on the approved "Submittal Register." Approval must be obtained from the Contracting Officer before the Contractor initiates any work for which material submittals are required. Submittals for critical items or long lead items shall be submitted individually to expedite processing.

b. The Contractor shall coordinate preparation and processing of submittals with performance of the work so that work will not be delayed by submittal processing. Also, coordinate and sequence different categories of submittals for same work and for interfacing

units of work, so that one will not be delayed by coordination with another.

c. Except as otherwise specified, the Government will have fifteen (15) working days, beginning with receipt by the Contracting Officer, for review and approval of each material submittal. The period of review is the same for both the submittal and resubmittal.

d. For submittals requiring approval by the Fire Protection Engineer, the Government shall have, beginning with receipt by the Contracting Officer, 30 calendar days for review and approval of the submittal. The period of review is the same for both the submittal and resubmittal.

e. Resubmittal's for disapproved items shall be made within the time specified on the AF Form 3000 by the Contracting Officer.

1.4.3 Contractor Responsibilities

a. Determine and verify field measurements, materials, field construction criteria; review each submittal; and check and coordinate each submittal with requirements of the work and Contract documents.

b. Ensure that material is clear and legible. Ensure required specialty stamps are affixed and signed.

c. Stamp each sheet of each submittal with the Contractor's certificating stamp, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only. Word the submittal stamp as follows:

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated into Project Number

_____,_____, is in compliance with the Contract drawings and specifications, can be installed in the allocated spaces, and is submitted for Government approval.
Certified by _____ Date _____"

Note that this certification shall be placed on data attached to the AF Form 3000, not the AF Form 3000 itself.

d. Sign the Contractor's certification. The person signing the certification shall be one designated in writing by the Contractor as having that authority. The signature shall be in original ink. Stamped signatures are not acceptable.

e. Transmit submittals to the Contracting Officer in orderly sequence, to prevent project delays and delays in work by the Government or separate contractors.

f. Proposed deviations from the contract requirements shall be clearly identified. Advise the Contracting Officer of submittals which include a proposed deviation requested by the Contractor, the reason for deviation shall be annotated on the submittal. The notification shall be inserted directly under the AF Form 3000 and shall clearly state that the submittal includes deviations from the specifications and drawings. Government review, corrections or comments made on submittals do not relieve the contractor from compliance with the

requirements of the drawings, specifications, addendums and contract documents. The government reserves the right to seek equitable compensation if submittals containing unnoted deviations are approved.

g. Correct and resubmit submittal as directed by the Contracting Officer. Direct specific attention, in writing or on resubmitted submittal, to revisions not requested by the Contracting Officer on previous submissions.

h. Retain a copy of approved submittals at the project site, including the Contractor's copy of approved samples.

i. Furnish additional copies of submittals if requested by Contracting Officer, limit of 5.

j. Ensure no work is begun until the submittals for that work have been returned as "approved" or "approved as noted," except to the extent that a portion of the work must be accomplished as a basis of the submittal.

k. If an "or equal" product is submitted for approval, the contractor shall identify in the submittal what features are the same as the brand name product and what differences exist between the equal product and the brand name product.

1.4.4 Approving Authority's Responsibilities

a. Submittals will be reviewed for approval with reasonable promptness and only for conformance with project design concepts and compliance with the Contract documents.

b. Submittals will be returned with one of the following notations:

(1) Submittals marked "approved" or "approved as submitted" authorize the Contractor to proceed with the work covered.

(2) Submittals marked "approved as noted" authorize the Contractor to proceed with the work as noted provided the Contractor takes no exception to the notations and complies with all notations.

(3) Submittals marked "disapproved" indicate the submittal does not comply with the design concept or the requirements of the Contract documents and shall be resubmitted with appropriate changes.

1.5 FORMAT AND QUANTITY OF MATERIAL SUBMITTALS

1.5.1 Transmittal Form

Use of Transmittal Form AF Form 3000 is required. Transmit each submittal, except sample installations and sample panels, to the office of the Contracting Officer.

1.5.2 Identifying Submittals

Identify submittals, except sample panel and sample installation, with the following information permanently adhered to or noted on each separate component of each submittal and noted on the transmittal form. Mark each copy of each submittal identically, with the following:

a. Project title and location.

b. Construction Contract number.

c. The Section and Paragraph number of the Specification Section in which the submittal is required.

d. Submittal number - Submittals shall be numbered sequentially by date submitted including re-submittals. Each submittal number shall be unique. A resubmittal shall be numbered in sequence as though an original submittal and shall include a reference to the submittal number for which the resubmittal is being made.

e. The name, address, and telephone number of the subcontractor, supplier, manufacturer and any other second tier contractor associated with the submittal.

f. Product identification and location in project.

1.5.3 Format and Quantity for Ship Drawings

a. For shop drawings presented on sheets larger than 8 1/2-inches by 14 inches, submit one reproducible and three prints of each required shop drawing prepared for this project.

(1) Transmit re-producibles rolled in mailing tubes.

(2) Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to the information "Identifying Submittals."

(3) After review, the approving authority will retain the prints and return only the reproducible with notation resulting from the review.

b. For shop drawings presented on sheets 8 1/2-inches by 14 inches or less, conform to the format and quantity requirements for product data, and present as a part of the bound volume for the submittals required by the Section.

c. Dimension drawings, except diagrams and schematic drawings; prepare dimensioned drawings to scale. Identify materials and products for work shown.

d. Shop drawings shall be not less than 8 1/2 by 11 inches nor more than 30 by 42 inches.

1.5.4 Format and Quantity for Product Data

a. Submit 2 full sized and 1 half sized copies of submittals of product data.

b. Present product data submittals for each Section as a complete, bound volume. Include a table of contents listing page and catalog item numbers for product data.

c. Indicate, by prominent notation, each product which is being submitted; indicate the Section and paragraph numbers to which it pertains.

d. Supplement product data with material prepared for the project to satisfy submittal requirements for which product data does not exist. Note that the material is developed specifically for the project.

1.5.5 Format and Quantity of Samples

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

(1) Sample of equipment or device: Full size.

(2) Sample of materials less than 2 by 3 inches: Built up to 8 1/2 by 11 inches.

(3) Sample of materials exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.

(4) Sample of linear devices or materials, such as, conduit and handrails: 10-inch length or length to be supplied, if less than 10 inches.

(5) Sample of non-solid materials, such as, sand and paint.

(6) Color selection samples: 2 inches by 4 inches.

(7) Sample panel: 4 feet by 4 feet.

(8) Sample Installation: 100 square feet.

b. Samples showing range of variation: Where variations are unavoidable due to the nature of the materials, submit sets of samples of not less than three units showing the extremes and middle of the range.

c. Quantity, unless otherwise specified:

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

(2) Submit one sample panel. Include components listed in technical section, as required by specifications.

(3) Submit one sample installation, as required by specifications.

(4) Submit one sample of non-solid materials, as required by specifications.

d. Recording of sample installation: Note and preserve the notation of the area constituting the sample installation but remove the notation at the final clean up of the project.

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

1.6 SCHEDULE OF SUBMITTAL DESCRIPTIONS

SD-AA, Progress Schedule

Schedule for performance of work for the project, Contract Progress Schedule. (A type of administrative or closeout submittal.)

SD-BB, Progress Reports

Bi-weekly progress reports on work completed, Progress Report. (A type of administrative or closeout submittal.)

SD-01 Data

Submittals which provide calculations, descriptions, or documentation regarding the work.

SD-02 Manufacturer's Catalog Data

Data composed of catalog cuts, brochures, circulars, specifications and product data, and printed information in sufficient detail and scope to verify compliance with requirements of the contract documents. (A type of Material Submittal.)

SD-03 Manufacturer's Standard Color Charts

Preprinted brochures of illustrations showing the color range of a material. Color selection samples may be submitted in lieu of color charts. (A type of Material Submittal.)

SD-04 Drawings

Scaled drawings, diagrams, schematic drawings, or other drawings, primarily graphic in nature, illustrating details, configuration, components, physical or functional relationship, and connections of a part of the work and the relationship of one part of the work to others or illustrating relationships among various parts of the work. (A type of Material Submittal.)

SD-05 Design Data

Design calculations, mix designs, analyses, or other data, written nature and pertaining to a part of the work. (A type of Material Submittal.)

SD-06 Instructions

Preprinted material describing the installation of a product, system, or material, including special notices and Material Safety Data Sheets, if any, concerning impedances, hazards, and safety precautions. (A type of Material Submittal.)

SD-07 Schedules

A tabular listing of information pertaining to the work or a tabular listing including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work. (A type of Material Submittal.)

SD-08 Statements

A document, required of the Contractor, or through the Contractor by way of a supplier, installer, manufacturer, or other lower tier contractor, the purpose of which is to further the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications, or other verification of quality. (A type of administrative or closeout submittal.)

SD-09 Reports

Reports of inspections or tests, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used shall be identified and test results shall be recorded.

SD-10 Test Reports

A report signed by an authorized official of a testing laboratory that a material, product, or system identical to the material product or system to be provided has been tested in accordance with requirements specified by naming the test method and material. The test report must state the test was performed in accordance with the test requirements; state the test results; and indicate whether the material, product, or system has passed or failed the test. Testing must have been within three years of the date of award of this Contract. (A type of Material Submittal.)

SD-11 Factory Test Reports

A written report which includes the findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for this project before it is shipped to the job site. The report must be signed by an authorized official of a testing laboratory and must state the test was performed in accordance with the test requirements; state the test results; and indicate whether the material, product, or system has passed or failed the test. (A type of Material Submittal.)

SD-12 Field Test Reports

A written report which includes the findings of a test made at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation. The report must be signed by an authorized official of a testing laboratory or agency and must state the test was performed in accordance with the test requirements; state the test results; and indicate whether the material, product, or system has passed or failed the test. (A type of Material Submittal.)

SD-13 Certificates

A written statement, signed by an authorized official of the manufacturer of a product, system, or material attesting that the product, system, or material conforms to the requirements of the Contract documents. The certificate of compliance must be dated after the award of this contract, name the project, and list the specific requirements which it is intended to address. Except for test reports and factory test reports required as separate submissions, the

certificate of compliance shall be submitted with substantiating test reports and other supporting data. (A type of Material Submittal.)

SD-14 Samples

Physical examples of products, materials, equipment, and assemblies to illustrate quality, finish, or workmanship and referred to in the technical sections as "samples." (A type of Material Submittal.)

SD-15 Color Selection Samples

Samples of the available choice of colors, textures, and finishes of a product or material. (A type of Material Submittal.)

SD-16 Sample Panels

An assembly constructed at the project site in a location acceptable to the Contracting Officer and using materials and methods to be employed in the work; completely finished; maintained during construction; and removed at the conclusion of the work or when authorized by the Contracting Officer. (A type of Material Submittal.)

SD-17 Sample Installations

A portion of an assembly or material constructed where directed and, if approved, retained as a part of the work. (A type of Material Submittal.)

SD-18 Records

Letters of record expressing Contractor and Contracting Officer communication and records of historical field data. (A type of administrative or closeout submittal.)

SD-19 Operation and Maintenance Manuals

Data intended to be incorporated in an Operations and Maintenance Manual. A type of administrative and closeout submittal. Submit data packages in accordance with Section 01300, paragraph 1.4.4. (A type of administrative or closeout submittal.)

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

-- End of Section --

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Dobbins Airfield Storm Water System Phase 2

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	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)
		01 01 00	SD-01 Preconstruction Submittals																
			Submittal Register		G														
			Temporary Construction	3.4															
			Authorization Form																
			Construction Phasing	1.2.1															
			Construction Phasing	3.2.1															
			Daily Progress Reports	1.2.1															
			Quality Control Plan	1.2.1															
			As Built Drawings	1.2.1															
		01 56 00	SD-03 Product Data																
			Facility Info	3.2.2.1															
			Weight Receipts	3.2.2.2															
			Hazardous Material Information	1.5.1															
			National Pollutant Discharge																
			Elimination Standard NOI																
			Environmental Permits and																
			Certifications																
			Storm Water Erosion,	3.4.2.1															
			Sedimentation, and Pollution																
			Control Plan																
		01 57 19	SD-01 Preconstruction Submittals																
			Preconstruction Survey	1.5.1															
			Solid Waste Management Permit	1.9	G														
			Regulatory Notifications	1.5.2	G														
			Environmental Protection Plan	1.6	G														
			Stormwater Notice of Intent	3.2.1.2	G														

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		01 57 19	Dirt and Dust Control Plan	1.6.9.1	G													
			Employee Training Records	1.5.4	G													
			Environmental Manager		G													
			Qualifications															
			SD-06 Test Reports															
			Laboratory Analysis															
			Inspection Reports	3.2.1.3														
			Solid Waste Management Report	3.7.2.1	G													
			SD-07 Certificates															
			Employee Training Records	1.5.4	G													
			Erosion and Sediment Control	1.5.4														
			Inspector															
			SD-11 Closeout Submittals															
			Stormwater Pollution Prevention	3.2.1.4	G													
			Plan Compliance Notebook															
			Stormwater Notice of Termination	3.2.1.5	G													
			Waste Determination	3.7.1	G													
			Documentation															
			Disposal Documentation for	3.7.3.5	G													
			Hazardous and Regulated Waste															
			Assembled Employee Training	1.5.4	G													
			Records															
			Solid Waste Management Permit	1.9	G													
			Solid Waste Management Report	3.7.2.1	G													
			Hazardous Waste/Debris	3.7.3.1	G													
			Management															

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		01 57 19	Regulatory Notifications	1.5.2	G													
			Sales Documentation	3.7.2.1	G													
			Contractor Certification															
			As-Built Topographic Survey															
		02 41 00	SD-01 Preconstruction Submittals															
			Existing Conditions	1.10	G													
			SD-07 Certificates															
			Demolition Plan	1.2.1	G													
			Notification	1.6	G													
		02 66 00	SD-03 Product Data															
			Materials Handling Plan	2.3														
			SD-04 Samples															
			Select Fill	2.1														
			Topsoil	2.2														
			SD-06 Test Reports															
			Borrow Source Assessment	3.1	G													
			Report															
			Select Fill and Topsoil Material	3.4.1														
			Tests															
			Moisture Content and Density	3.4.2														
			Tests of In-Place Select Fill															
		03 62 15.00 06	SD-01 Preconstruction Submittals															
			Flowable Fill Mix Design	Part 2	G	AE												
			3 years of experience for the	3.7	G													
			Admixture Supplier															

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		03 62 15.00 06	1 year of experience for the	3.7	G														
			manufactured ready mix concrete																
			producer with similar products																
			SD-06 Test Reports																
			Compressive Strength Testing	3.5.1.1															
			Flowability	3.5.1.2															
			Permeability	3.5.1.4															
			Expansion	3.5.1.5															
			Shrinkage	3.5.1.6															
			Unit Weight/Air Content	3.5.1.3															
			Batch Records	3.6															
			SD-07 Certificates																
			Portland Cement	2.1															
			Aggregates	2.2															
		31 00 00.00 06	SD-01 Preconstruction Submittals																
			Shoring	3.5	G	AE													
			Dewatering Work Plan	1.6	G	AE													
			Blasting	1.4.3	G	AE													
			SD-03 Product Data																
			Utilization of Excavated Materials	3.9	G	AE													
			Rock Excavation	1.4.2															
			Opening of any Excavation or	3.4															
			Borrow Pit																
			Shoulder Construction	3.14															
			SD-06 Test Reports																
			Testing	1.2.3															

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		31 00 00.00 06	Testing	3.17														
			SD-07 Certificates															
			Testing	1.2.3	G													
			Testing	3.17	G													
		31 11 00	SD-03 Product Data															
			Nonsaleable Materials	3.3.1	G													
		31 16 00	SD-01 Preconstruction Submittals															
			Dewatering Work Plan	3.1	G													
			Flow Bypass Work Plan	3.1	G													
			SD-03 Product Data															
			Mortar Material Design	2.1.3	G	AE												
			Repair Mortar Material	2.1	G	AE												
			Lining Mortar Material	2.1	G	AE												
			SD-05 Design Data															
			Wall Thickness Design	2.2	G	AE												
			SD-06 Test Reports															
			Sampling And Testing	1.3.4	G													
		32 01 13.63	SD-03 Product Data															
			Contractor Qualifications	1.4	G													
			Manufacturer Representative's	1.4.1														
			Experience															
			Material Performance	2.2.1														
			Equipment List	1.2.1	G	AE												
			Friction Test	3.4	G	AE												
			Inspection Reports	3.1	G	AE												
			SD-04 Samples															

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		32 01 13.63	Gilsonite Modified Asphalt	1.4.2														
			Emulsion															
			Aggregates	1.4.3														
			SD-06 Test Reports															
			Manufacturer's Certificate of	1.4														
			Compliance															
			Manufacturer's Certificate of	1.4														
			Compliance															
			Manufacturer's Certificate of	2.1														
			Compliance															
			Manufacturer's Certificate of	2.1														
			Compliance															
			Bituminous Material	2.1														
			Aggregates	1.4.3														
			Bituminous Materials	1.4.4	G	AE												
		32 01 19	SD-03 Product Data															
			Equipment	3.1														
			SD-04 Samples															
			Materials	1.3.1	G													
		32 11 23	SD-03 Product Data															
			Plant, Equipment, and Tools	1.4	G													
			SD-06 Test Reports															
			Initial Tests	2.3.1	G													
			In-Place Tests	3.13.1	G													
		32 12 11	SD-03 Product Data															
			Cutback Asphalt	2.2.2.1														

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		32 12 11	Asphalt Cement	2.2.2.3														
			SD-06 Test Reports															
			Tests	1.3.2														
		32 12 13	SD-06 Test Reports															
			Sampling and Testing	3.7														
		32 12 15.13	SD-02 Shop Drawings															
			Placement Plan	2.1	G													
			SD-03 Product Data															
			Diamond Grinding Plan	2.1.6	G													
			Mix Design	2.5	G													
			Contractor Quality Control	3.1	G													
			SD-04 Samples															
			Aggregates	2.2														
			Asphalt Cement Binder	2.3														
			Warm-mix Additive	2.5.1														
			SD-06 Test Reports															
			Aggregates	2.2	G													
			QC Monitoring	3.1.3.10														
			SD-07 Certificates															
			Asphalt Cement Binder	2.3	G													
			Testing Laboratory	3.7														
			Warm-mix Additive	2.5.1														
		32 13 13.06	SD-03 Product Data															
			Curing Materials	2.1.5	G													
			Admixtures	2.1.4	G													
			SD-05 Design Data															

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		32 13 13.06	Mix Design	2.3	G													
			SD-06 Test Reports															
			Aggregate	2.1.3	G													
			Concrete Slump Tests	3.6.2	G													
			Air Content Tests	3.6.4	G													
			Flexural Strength Tests	3.6.3	G													
			SD-07 Certificates															
			Ready-mixed Concrete Plant	1.5.1	G													
			Batch Tickets	1.5.4	G													
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			Surface Preparation Equipment List	2.1.1.2	G													
			Application Equipment List	2.1.2	G													
			Exterior Surface Preparation	3.2														
			Safety Data Sheets	1.3.1	G													
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			Solventborne Paint	2.2.1	G													
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SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Dobbins Airfield Storm Water System Phase 2

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	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 31 13.53	SD-02 Shop Drawings																
			Fence Installation	3.1															
			Installation Drawings	1.3.2															
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			Zinc Coating	1.3.1															
			aluminum alloy coating	1.3.1															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Dobbins Airfield Storm Water System Phase 2

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	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 31 13.53	Fence Fabric															
			Barbed Wire	2.4.2														
			Stretcher Bars	2.1.1														
			Concrete	2.5														
			SD-08 Manufacturer’s Instructions															
			Fence Installation	3.1														
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			Fertilizer	2.4														
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SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Dobbins Airfield Storm Water System Phase 2

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAG # RAPH	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)
		33 05 23	Access Shaft Construction Plan	1.4	G													
			Access Shaft Construction Plan	3.1.1	G													
			SD-06 Test Reports															
			Monitoring Survey	3.5.1.1	G													
			SD-08 Manufacturer's Instructions															
			Installation	3.3	G													
			Safety Data Sheets	1.8.1.2	G													
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			Determination of Density	3.6.4														
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SECTION 01 56 00

DOBBINS ARB ENVIRONMENTAL REQUIREMENTS
02/19

PART 1 GENERAL

This Section describes the requirements placed upon the Contractor necessary for the prevention of environmental pollution or damage on Dobbins Air Reserve Base (DARB), and to enable DARB to meet environmental compliance, reporting and tracking requirements set forth in local, State, and Federal laws, rules, and guidance documents due to work performed by the Contractor during the execution of this project.

1.1 COMPLIANCE WITH ENVIRONMENTAL REGULATIONS

The Contractor and his subcontractors shall comply with all applicable Federal, State, and local laws and regulations concerning environmental permitting, tracking, pollution control and protection, as well as the specific requirements stated elsewhere in the contract specifications.

1.2 SUBMITTALS

Submittal requirement details for each project are listed in a submittal matrix identified for this specification section 01 56 00, as well as in each respective subsection. The following submittals are always required:

SD-03 Product Data

1.2.1 Facility Info 3.2.2.1
1.2.2 Weight Receipts 3.2.2.2
1.2.3 Hazardous Material Information 3.3.2
1.2.4 National Pollutant Discharge Elimination Standard NOI 3.4
1.2.5 Environmental Permits and Certifications

Storm Water Erosion, Sedimentation, and Pollution Control Plan

The Contractor is responsible for verifying all permits have been obtained and are active prior to accomplish all work. Requirements for specific permits and certifications are included in subsequent subsections below as outline in the following Matrix:

1.3 ENVIRONMENTAL FINES AND PENALTIES

The Contractor agrees to indemnify the Government, its officers, agents, and employees against liability and costs associated with the intentional or negligent noncompliance of environmental laws, regulations, or requirements by the Contractor, its officers, agents, employees, or subcontractors to the extent such noncompliance arises out of the manufacture or delivery of supplies, services or construction by or for the account of the Government. The Contractor shall reimburse the Government for any fines and monetary penalties assessed by State or Government agencies against Dobbins Air Reserve Base due to intentional or negligent noncompliance with environmental laws, regulations, or requirements by the Contractor. The Contractor shall be responsible for making corrections necessary to comply with any environmental laws, regulations or requirements.

1.4 REGULATORY INSPECTIONS

The Contractor shall immediately notify the Contracting Officer when contacted by a Federal, state or local environmental regulatory inspector(s). The Contractor cannot represent the Government during an inspection. The Contracting Officer, or designated government representative, will be responsible for meeting and escorting the inspector(s) at the job site.

1.5 DEFINITIONS

1.5.1 Hazardous Material Information (Hazmat)

Any substance defined by OSHA as a hazardous substance requiring a Material Safety Data Sheet (MSDS), including, but not limited to any chemicals, curing agents, joint sealers, ready-mix concrete, grout, paints, adhesives, sealing compounds, strippers, glues, petroleum products, natural or synthetic gases, pesticides, all aerosols, and all materials containing hazardous substances.

1.5.2 Solid Waste

Any material, liquid, gaseous or solid, that is deemed as waste by the generator because it is no longer needed, is excess, has exceeded its shelf life, is spill residue, has been abandoned, or is no longer usable for its intended purpose. Solid waste includes, but is not limited to: used or spilled chemicals; contaminated clothing and personal protective equipment (e.g. mask filters, gloves, coveralls); contaminated wipes, rags and other equipment; empty containers; garbage; packaging; construction and demolition debris; refuse; recyclable materials; and all other discarded materials that are generated during construction, residential, and commercial activities.

1.5.3 Hazardous Waste

Any solid waste that meets the Title 40 Code of Federal Regulations (CFR) Part 261 criteria for characterization as hazardous waste (reference 40 CFR 261). Solid waste which is expected to exhibit any hazardous waste characteristics, or is a listed hazardous waste, based upon the information provided on the Material Safety Data Sheets (MSDS) by the contractor per Section 3.2 of this specification for the original materials, is hazardous waste. Flashpoint, corrosivity, and constituents on the MSDS are used by the government to determine potential for solid wastes to be hazardous wastes.

1.5.4 Universal Waste

Any hazardous waste that are subject to the universal waste requirements found in Title 40 Code of Federal Regulations (CFR) Part 273 to include used batteries, pesticides, mercury-containing equipment, and lamps.

1.5.5 Empty Containers

Empty containers of hazmat must meet the 40 CFR regulatory definition of "empty" to be considered empty (reference 40 CFR 261.7(b) and allowed to be disposed of in a rolloff as non-hazardous solid waste).

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 GENERAL ENVIRONMENTAL REQUIREMENTS

3.1.1 Prohibition Against Open Burning

The Contractor is prohibited from open burning on Dobbins Air Reserve Base.

3.1.2 Historical and Archeological Findings

If the Contractor believes he or she has discovered any item or area of historical or archaeological interest not specified in the contract during the completing of work, the Contractor shall leave the area undisturbed and immediately report the finding to the Contracting Officer.

3.1.3 Diversion of Construction and Demolition Debris From Landfill

At least 50% of all construction and demolition debris (C&D) shall be recycled either onsite (within the project) or at an appropriate off base recycling facility. Recyclable C&D debris is prohibited from being landfilled. Recyclable C&D includes, but is not limited to: asphalt, concrete, scrap metal, metal piping, metal fixtures, lumber, ceiling tiles, gypsum, carpeting, fluorescent lamps, batteries, cardboard, paper, and fiberboard. Requirements are detailed in Sections 3.2 and 3.10 of this specification.

3.1.4 Protection Against Sediment Runoff

Any project that disturbs the soil will require protection of the surrounding land against sediment runoff. Requirements are detailed in Section 3.4 of this specification. Any excavated soils must be disposed of at an off base state permitted landfill. Disposal or reuse on base is prohibited, unless otherwise provided in writing by the Contracting Officer.

3.1.5 Unanticipated Materials of Concern

3.1.5.1 Asbestos Containing Material (ACM)

If the Contractor discovers ACM not specified in the contract during the execution of work, the Contractor shall stop work on the site immediately and notify the Contracting Officer. The Contractor shall not be permitted to install or use any ACM on Dobbins ARB.

3.1.5.2 Lead-Based Paint (LBP)

If the Contractor discovers LBP not specified in the contract during the execution of work, the Contractor shall stop work on the site immediately and notify the Contracting Officer. The Contractor shall not be permitted to install or use lead-based paint for any work on Dobbins ARB.

3.1.5.3 Polychlorinated Biphenyls (PCBs)

If the Contractor discovers a PCB containing item not specified in the contract during the execution of work, the Contractor shall stop work on the site immediately and notify the Contracting Officer. The Contractor

shall not use nor install any equipment containing PCBs on Dobbins ARB.

3.2 SOLID WASTE MANAGEMENT

The Contractor is authorized to generate or dispose of solid waste under the scope of this contract in accordance with the requirements of this section. Solid waste, in this section, refers to any non-hazardous waste, any municipal waste, any construction and demolition debris, and any recyclable materials generated by the Contractor while performing the work under this contract. Excess clean soil free of solid waste, and routine personal waste (food and drink containers that are carried off-base at the end of the work day), are excluded from this definition.

3.2.1 References

Georgia Department of Natural Resources Environmental Protection Division, Chapter 391-3-4, Solid Waste Management

3.2.2 Submittals

3.2.2.1 Landfill and Recycling Facility Information

The Contractor shall submit a document which lists the name(s), address(es), phone number(s) and point(s) of contact for each landfill or recycling facility intended to be used for the disposal and/or recycling of solid wastes generated by the Contractor during the course of this contract. This document must be approved by the Contracting Officer prior to beginning any work resulting in the generation of any solid waste or recyclables.

3.2.2.2 Weight Receipts

Weight receipts for solid waste disposed and materials recycled. These are legible documents provided to the Contractor by the recycling and/or disposal facility which indicate: the date of service (drop off); the type of the waste dropped off, and the weight of the waste (in pounds or tons). Weight Receipts shall be submitted for approval within 5 days of the service date.

3.2.3 The Contractor shall only use state-permitted solid waste landfills and recycling facilities for all solid waste generated on Dobbins ARB.

3.2.4 Construction and Demolition Debris

3.2.4.1 Dobbins ARB Requirement

All recyclable construction and demolition debris (C&D) shall be recycled either onsite or at a C&D recycling facility. Recyclable C&D debris is prohibited from being landfilled. Recyclable C&D includes, but is not limited to: asphalt, concrete, scrap metal, metal piping, metal fixtures, lumber, ceiling tiles, gypsum, carpeting, cardboard, paper and fiberboard.

3.2.4.2 Non-recyclable C&D shall be disposed of at a state permitted landfill that is permitted for, and is currently accepting, C&D waste.

3.2.4.3 Dobbins ARB Requirement

The Contractor shall segregate recyclable C&D from non-recyclable C&D, in accordance with the recycling facility requirements. Small quantities of

some scrap metals may be recycled at the base Recycling Center, Building 560, upon Contractor request and approval from the Contracting Officer.

3.2.4.4 The Contractor shall collect all cardboard, fiberboard and standard wooden pallets generated by any Contractor shipping and packaging activities (e.g. receipt of furniture, receipt of shipments of hazmats, etc.) in order to recycle them.

3.2.4.5 Any materials approved by the Contracting Officer to be recycled at the base Recycling Center which are taken to this facility do not require weight receipts to be submitted (ref. submittal 3.2.2.2).

Any materials approved by the Contracting Officer to be recycled at the base Recycling Center which are taken to this facility do not require weight receipts to be submitted (ref. submittal 3.2.2.2).

3.2.5 Collection And Storage Of Recyclable C&D and Solid Wastes

3.2.5.1 Dobbins ARB Requirement

The Contractor shall provide all appropriate containers, bags, liners, trays, rolloffs and other equipment required for the proper collection of solid wastes and recyclable C&D. The Contractor shall not use any base dumpster's or other base trash receptacles for collecting or storing solid waste.

3.2.5.2 All solid wastes shall be reclaimed, recycled or disposed of prior to completion of work under this project.

3.2.5.3 The Contractor shall not generate any waste as a result of cleaning Contractor tools, vehicles, containers or other equipment on base. Cleaning of Contractor tools, vehicles, containers or other equipment on base is prohibited.

3.2.6 Excavated Soils

Any excavated soils must be disposed of at an off base state permitted landfill.

3.3 HAZARDOUS MATERIALS (Hazmat) MANAGEMENT

The Contractor is authorized to use hazardous materials under the scope of this contract in accordance with this section. Hazardous Material (Hazmat) is any hazardous substance required by the Occupation Safety and Health Administration (OSHA) to have a manufacturer's Material Safety Data Sheet (this does not include OSHA "articles" such as tape, fabric, batteries, mesh, mechanical fasteners, etc.).

3.3.1 References

3.3.1.1 Air Force Instruction 32-7086, Hazardous Materials Management, 1 Nov 2005

3.3.1.2 Base Instruction 94I32-7086, February 2014

3.3.2 Submittals

3.3.2.1 Contractor's Hazmat Storage Location Sketch

3.3.2.2 Material Information Sheet (MIS)

3.3.2.3 Material Safety Data Sheets (MSDSs)/ Safety Data Sheets (SDSs)

3.3.2.4 Substantiating Documentation for Use of Prohibited Hazmat

3.3.2.5 Product Data Sheets (PDSs)

3.3.3 EPCRA Compliance

Reference FAR 52.223-5: The Contractor needs to provide all information needed by Dobbins ARB to comply with EPCRA. Contractor shall provide the following submittals for government approval:

3.3.3.1 Contractor's Hazmat Storage Location Sketch (ref. submittal 3.3.2.1)

A document which identifies exactly where Hazmats are intended to be stored on base when not in use;

3.3.3.2 Material Information Sheet (MIS) (ref. submittal 3.3.2.2)

Document completed and submitted by the Contractor which lists individual specific Hazmat, intended to be used by the Contractor under the scope of the project, detailing data needed, including: container type, container size, estimated quantity to be used, and application method. No Hazmat material reviews will be completed by the government without this document and accompanying MSDSs/MDSs.

3.3.3.3 Material Safety Data Sheet (MSDS)/ Material Data Sheets (MDSs) (ref. submittal 3.3.2.3)

A manufacturer's material document which describes the physical and chemical characteristics of a hazmat, to be submitted by the Contractor for each and every different Hazmat listed on the MIS, submitted concurrently with the MIS. MSDSs/MDSs shall be obtained directly from the manufacturer and shall be current.

3.3.3.4 Substantiating documentation (ref. submittal 3.3.2.4)

Includes documents which justify the use of prohibited Hazmats and/or prohibited chemicals constituents. Substantiating documentation shall be submitted concurrently with the MIS and MSDSs when a prohibited Hazmat or chemical constituent is requested for use by the Contractor on Dobbins ARB. Documents must identify which specific engineering criteria or specification will NOT be met unless the prohibited Hazmat or chemical constituent is used, and shall contain the statement that alternate commercially available products are not available which will meet the specific engineering criteria or specification. Prohibited Hazmats or

chemical constituents will not be authorized for use on Dobbins without substantiating documentation. Prohibited hazmats and chemical constituents prohibited from use on Dobbins include, but are not limited to: EPA-17 listed chemicals (i.e. methyl ethyl ketone, xylene, toluene, methylene chloride, et al); Class I Ozone Depleting Substances (i.e. Freon 12, 1,1,1-trichloroethane, et al) ; heavy metals (i.e. lead, barium, silver, nickel, chromium, cadmium, et al); carcinogenic constituents; cyanide and cyanide compounds, phosphate compounds, SARA Title III Extremely Hazardous Substances, and SARA Title III 313 Hazardous Substances.

3.3.3.4.1 No prohibited Hazmat or chemical constituent will be approved for use in excess of 3000 pounds cumulatively over the entire contract period.

3.3.3.4.2 No prohibited Hazmat or chemical constituent will be approved for use that will generate hazardous waste by nature of its use, unless the Contractor is authorized to generate hazardous waste in accordance with paragraph 3.7 of this section 01 56 00.

3.3.3.4.3 Dobbins ARB Requirement

No Class I Ozone Depleting Substance will be authorized for purchase or reimbursement under any circumstances. All Class I Ozone Depleting Substances identified as necessary by engineering to meet an engineering criteria or specification must be obtained through the Defense Reserve with SAF authorization and approval.

3.3.3.5 Product Data Sheet (PDS) (ref. submittal 3.3.2.5)

A document provided by the manufacturer of a hazmat that provides detailed usage information about the hazmat including usage conditions and proper application methods. The Contractor shall submit a PDS for each Hazmat listed on the MIS concurrently with the MIS.

3.3.4 Limited overnight storage of any single Hazmat on base (less than 5,000 pounds) will be authorized in accordance with any storage conditions provided by the Government during hazmat approval review.

3.3.5 Dobbins ARB Requirement

Use of approved and authorized Hazmats are restricted to the methods of application and quantities identified on the corresponding MIS; if quantities needed exceed the estimates provided on the MIS, the Contractor must identify the additional quantity needed to the project inspector as soon as the need is identified. Additional quantities are authorized as long as no cumulative quantity limitations (reference 3.3.3.4.1 and 3.3.4 above) are exceeded.

3.3.6 Dobbins ARB Requirement

The Contractor will implement the following Best Management Practices (BMPs) to prevent spills and other releases to the environment, and to meet NFPA, OSHA, and RCRA requirements, including but not limited to: providing covered storage of Hazmats, providing appropriate storage for flammable materials, providing impervious underlayment (e.g. tarps) where Hazmats are being used on grassed areas, keeping lids of containers closed at all times, etc.:

3.3.6.1 The Contractor shall store all Hazmat only in the designated Hazmat storage area approved by the Contracting Officer, per submittal 3.3.2.1.

3.3.6.2 Dobbins ARB Requirement

The Contractor shall provide secondary containment for all Hazmat being stored on base. Secondary containment shall be chemically inert to the Hazmat being stored and impervious to absorption of the Hazmat (spilled, dripped or leaked). The secondary containment volume shall not be less than 10% of the total quantity being stored or the equal quantity of the largest container being stored, whichever is greater in volume. Separate secondary containment shall be provided for incompatible Hazmats, such as acids and bases, flammables and corrosives, flammables and oxidizers, etc.

3.3.6.3 The preservation of the landscape shall be an imperative consideration in the selection of all sites. No activity shall be conducted or storage permitted within the dripline of any tree without being depicted on the drawings and being approved by the Contracting Officer.

3.3.6.4 The Contractor shall be responsible for the cleanup and disposal of all spilled Hazmats, including any spilled, leaking or dripping hydraulic fluid and other fluids from equipment and vehicles.

3.3.6.4.1 Dobbins ARB Requirement

Spills have no size limit; any amount spilled shall be cleaned up by the Contractor. The Contractor shall provide all materials use to contain and absorb any spill, and shall provide appropriate and proper containers into which the spill debris shall be placed. Spill absorbents used shall be picked up immediately and placed in the disposal container.

3.3.6.4.2 Disposal of spilled wastes generated from spill cleanup shall be the Contractor's responsibility and shall meet all federal, state and other regulations regarding storage, shipment and disposal.

3.3.6.5 The Contractor shall use NFPA and OSHA required or specified flammable material and corrosive material storage lockers for the storage of all Hazmats.

The Contractor shall use NFPA and OSHA required or specified flammable material and corrosive material storage lockers for the storage of all Hazmats.

3.3.6.6 The Contractor shall segregate incompatible materials at all times in his or her field office, storage, staging and work areas.

3.3.6.7 The Contractor shall use protective measures, such as drop cloths and tarpaulins, when using Hazmats, in order to keep the work and storage areas free from drips and spills and to protect unimproved surfaces from environmental contamination.

3.3.6.8 The Contractor shall keep all containers closed at all times when not in use. At any time when a hazmat is finished being used for the day, the hazmat container shall be returned to the designated storage area.

3.3.6.9 The Contractor shall not store Hazmat outdoors where it may be exposed to sun, rain, wind or other elements and precipitation. The Contractor shall follow all manufacturers' recommendations for storage of Hazmat, according to the PDS.

3.3.6.10 The Contractor shall ensure that Hazmats are never poured out onto grass or soil, and are never drained to or dispose of on the ground, in a water way or via the storm sewer system. Mixtures of water and/or Hazmats shall never be dumped onto the ground.

3.3.6.11 The Contractor shall ensure that all employees are given proper training in the use and storage of the Hazmats onsite, and in the use of any personal protective equipment necessary for the proper use of Hazmat on Dobbins ARB.

3.3.7 Dobbins ARB Requirement

The Contractor shall not generate any waste as a result of cleaning any Contractor tools, vehicles, containers or other equipment on base; cleaning of Contractor equipment on base is prohibited unless otherwise permitted by the Contracting Officer. The Contractor shall plan for this in determining which Hazmats to use for specific tasks.

3.4 STORMWATER POLLUTION PREVENTION

The Contractor is authorized to perform land disturbing activities under the scope of this project. The project does require coverage under Georgia National Pollutant Discharge Elimination Standard (NOS) NPDES general permit for construction activity GAR100001. The contractor will be required to file a Notice of Intent and pay any associated fees to the Georgia EPD. The contractor must also file a Notice of termination at the completion of the project.

3.4.1 References

3.4.1.1 GA Rule 391-3-03k: Water Quality Standards

3.4.1.2 GA Rule 391-3-7: Erosion and Sedimentation Control

3.4.1.3 Cobb County, Article VIII: Soil Erosion and Sedimentation Control

3.4.1.4 Erosion Control Manual: Manual for Erosion and Sediment Control in Georgia (4th Edition 1996, or Current)

3.4.1.5 Storm Water P2 Plan: Dobbins ARB Storm Water Pollution Prevention Plan (September 2005 or Current)

3.4.2 Submittals

3.4.2.1 Storm Water Erosion, Sedimentation, and Pollution Control Plan

3.4.3 Erosion, Sedimentation, And Pollution Control Plan Requirements

3.4.3.1 Dobbins ARB Requirement

The Contractor shall review the site specific Erosion, Sedimentation, and Pollution Control Plan (ESPCP) and file a Notice of Intent with the Georgia Environmental Protection Division pay any associated fees. Proof of filing shall be provided (Submittal 3.4.2.1) for government review and approval prior to the start of work. The Contractor is prohibited from beginning land disturbing activities until the ESPCP has been approved by the Contracting Officer.

3.4.3.2 The Project Specific ESPCP shall include the following:

3.4.3.2.1 Base Project Information (Project Name, Project Number, Contact Information, Project Engineer, Project Inspector)

3.4.3.2.2 Contractor Information (Contractor Name, Contact Information, Supervisor Name, Supervisor Contact Info.)

3.4.3.2.3 Project Disturbed Area (acres)

3.4.3.2.4 Erosion & Sedimentation Control Plan (1/2 Scale Project Drawings). If the project drawings do not include Erosion and Sedimentation Control Plans, the Contractor is responsible for generating a plan in accordance with Cobb County and State of Georgia Requirements

3.4.3.2.5 Erosion and Sedimentation Control Maintenance Procedures

3.4.3.2.6 Best Management Practices for Storm Water Pollution Prevention

3.4.4 Dobbins Storm Water Protection Requirements

3.4.4.1 No fuels, oils, acids, wastes, or other materials shall be permitted to enter these water resources directly or through storm drain inlets in accordance with Georgia Rule 391-3-03k Water Quality Standards.

3.4.4.2 The Contractor is prohibited from pouring ANY material down a storm drain. Exceptions to this requirement may be granted by the Contracting Officer after a written request for the discharge is approved by the government and is consistent with permit requirements.

3.4.4.3 If the Contractor believes he/she has encountered federally protected floodplain's or wetlands not specified in the contract during the execution of work, the Contractor shall stop work on the site immediately and notify the Contracting Officer.

3.4.4.4 Dobbins ARB Requirement

The government has applied for all necessary and appropriate waivers and/or permits (with the exception of the NPDES NOI as outlined in 3.4 above) for land disturbing activities occurring within seventy-five (75) feet of designated Waters of the State of Georgia and/or Waters of the United States or that involve stream bed or bank disturbance. The contractor may not begin work in these areas until verification of approval of these permits is received. Designated Waters of the State and/or United States present on Dobbins ARB include Rottenwood Creek, Poorhouse Creek, and their respective tributaries.

3.5 PETROLEUM OIL AND LUBRICANT (POL) USE AND MANAGEMENT

The Contractor is permitted to: fill vehicles or equipment on Dobbins with fuel; add oil or lubricant to vehicles or equipment; and to store and use gasoline, diesel, oil or hydraulic fluid under the scope of this project.

3.5.1 References

3.5.1.1 Dobbins Hazmat Plan

Dobbins Air Reserve Base Hazardous Materials Emergency Response (HAZMAT) Plan (December 2003 or Current).

3.5.2 Hazardous Material Requirements

The Contractor is required to follow hazardous material requirements outlined in Paragraph 3.3 in addition to POL requirements outlined in this subsection for the following POL products:

3.5.2.1 Gasoline

3.5.2.2 Diesel

3.5.3 Storage

3.5.3.1 The Contractor shall not store any quantity of fuel or other petroleum products in tanks or bladders larger than 5 gallons without government approval.

3.5.3.2 Dobbins ARB Requirement

The Contractor shall provide and use secondary containment for storage of fuel and other petroleum products. Material used in the establishment of secondary containment shall be inert and impervious to the material being stored. Secondary containment shall be able to contain at least the contents of the largest container for which it is employed plus ten percent. Separate containment shall be provided for incompatible materials. If the tank and secondary containment are exposed to rainfall, the following additional requirements apply:

3.5.3.2.1 Sufficient freeboard shall be incorporated to ensure the containment will hold the complete contents of the tank plus ten percent plus 6" of rainfall.

3.5.3.2.2 Storm water drained off the secondary containment must be inspected and monitored before draining out of the containment. If POL is present, the water must be disposed of as petroleum contact water and cannot be discharged to the environment.

3.5.3.2.3 Inspection and draining of any accumulated water shall be conducted at least once a week or after rain fall events.

3.5.4 Transfer Operations

In all transfer activities, the Contractor shall maintain segregation of incompatible materials.

3.5.5 Vehicle Capacity

The Contractor is prohibited from using any vehicle for the transportation of fuel or other POL products on Dobbins ARB with a total tank capacity of greater than 2,000 gallons per storage compartment.

3.5.6 Spill Control and Cleanup

The Contractor shall be responsible for the cleanup and disposal of all spilled POL products, including all materials used to contain and absorb the spill. The Contractor shall maintain a stock of spill cleanup material, e.g. absorbent material, on hand at all locations where fuel or petroleum products are stored and transferred. The Contractor's stock of

spill cleanup materials shall be adequate to clean up the total amount of products being stored by the Contractor or the total amount being transferred by the Contractor. Spills of POL products shall be managed in accordance with the current HAZMAT Plan for Dobbins ARB. Disposal of wastes generated from spill cleanup shall be the Contractor's responsibility and be in accordance with this section.

3.6 LANDSCAPE PROTECTION

The Contractor is prohibited from performing exterior work that can harm or threaten trees, shrubs, grass, and landscaping on Dobbins outside of the areas specifically outlined in the provided plans. The Contractor is prohibited from driving on any surface other than paved or graveled roads on Dobbins ARB unless required to complete the work outlined. If the project requires exterior work outside of those areas shown on these plans, the Contractor shall immediately notify the Contracting Officer.

3.7 HAZARDOUS WASTE MANAGEMENT

The Contractor is prohibited from generating or disposing of any Hazardous Waste under the scope of this contract. If the Contractor generates hazardous waste not authorized under the scope of this contract, the Contracting Officer shall be notified immediately. The Contractor is responsible for management and disposal of such waste in accordance with federal, state, local, and base requirements.

3.8 PESTICIDES

Use of pesticides under the scope of this project is authorized provided the Contractor complies with requirements outlined within this paragraph.

3.8.1 References

3.8.1.1 Armed Forces Pest Management Board (AFPMB) Standard Pesticides List (11 February 2015)

3.8.2 Submittals

3.8.2.1 Pesticide Applicator Certification

3.8.2.2 Pesticide Usage Report

3.8.3 Approval

All pesticides, herbicides, insecticides, and rodenticides are hazardous materials. Therefore all requirements concerning Hazardous Material (HAZMAT) review and approval outlined in Paragraph 3.3 of this section apply to pesticides to be used on this project in addition to requirements of Paragraph 3.8. Additionally, a copy of pesticide labels to be used under the scope of this project shall be included with HAZMAT Submittals 3.3.2.2, 3.3.2.3 and 3.3.2.5.

3.8.4 Application Certification

Application of all pesticides shall be accomplished by certified pest control personnel or under the supervision of a State of Georgia certified pest control operator. The Contractor shall submit personnel certification (Submittal 3.8.2.1) with HAZMAT Submittals 3.3.2.1 and 3.3.2.2. Applicator Certifications shall be valid, as a minimum, through to the completion of

any applications to be accomplished under this contract.

3.8.5 Usage Report

The Contractor shall submit a usage report (Submittal 3.8.2.2) no later than seven (7) days after pest control applications are completed for the project. The usage report shall include, as a minimum:

3.8.5.1 Name, address, and phone number of Contractor

3.8.5.2 Name of the applicator

3.8.5.3 Building, facility, or area treated

3.8.5.4 Target pest(s) to be controlled

3.8.5.5 Pesticide Name and EPA Number

3.8.5.6 Active Ingredient Applied in pounds

3.8.5.7 Date of the application

3.8.6 Disposal

The Contractor is prohibited from disposing of excess pesticides on Dobbins ARB in base dumpster's or down sanitary, industrial, or storm drains. The Contractor is responsible for disposing of pesticides and pesticide waste in accordance with paragraphs 3.2 and 3.7 of this section. Excess pesticides may be applied on Dobbins ARB if a written request is submitted by the Contractor and is approved by the Contracting Officer.

3.9 RADIOACTIVE MATERIAL (RAM)

The Contractor is prohibited from disturbing any radioactive materials or using equipment or tools containing radioactive sources. This includes, but is not limited to: ionizing radiation emitters, non-ionizing radiation emitters, and lasers. Permission and instruction for use of such equipment must be obtained prior to beginning work from the Radiation Officer located in the Bioenvironmental Engineering office, Building 550.

3.10 UNIVERSAL WASTES

The disturbing, removing, replacing, and/or disposal of fluorescent or High Intensity Discharge (HID) lamps, ballasts, mercury-containing materials (e.g. thermostats, switches, etc.) or batteries of any kind is authorized under the scope of this project provided the Contractor complies with all requirements outlined within this section. No Universal Waste shall be generated.

3.10.1 References

3.10.1.1 Georgia Environmental Protection Division Rule 391-3-11-18

Standards for Universal Waste Management

3.10.1.2 Title 40 Code of Federal Regulations (CFR) Part 273 (40 CR 273)

3.10.2 Submittals

3.10.2.1 Universal Waste Tracking Log

3.10.2.2 Recycler and Transporter Information

3.10.2.3 Universal Waste Shipping Manifest

3.10.3 Mercury Containing Materials

Any mercury-containing materials (e.g. mercury switches, thermostats with mercury, etc.) removed during demolition work, or replaced in the course of construction, shall be collected intact by the Contractor and turned in to the base Hazardous Waste Storage Facility, Bldg 748, in coordination with the Environmental Office, on the same day they are collected. Mercury-containing items shall be identified in the plans and on drawings if they are known to exist.

-- End of Section --

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SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS
11/15

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. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
40 CFR 112	Oil Pollution Prevention
40 CFR 122.26	Storm Water Discharges (Applicable to State NPDES Programs, see section 123.25)
40 CFR 241	Guidelines for Disposal of Solid Waste
40 CFR 243	Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste
40 CFR 258	Subtitle D Landfill Requirements
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 261.7	Residues of Hazardous Waste in Empty Containers
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 262.34	Standards Applicable to Generators of Hazardous Waste-Accumulation Time
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of

	Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 273	Standards For Universal Waste Management
40 CFR 273.2	Standards for Universal Waste Management - Batteries
40 CFR 273.4	Standards for Universal Waste Management - Mercury Containing Equipment
40 CFR 273.5	Standards for Universal Waste Management - Lamps
40 CFR 279	Standards for the Management of Used Oil
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 300.125	National Oil and Hazardous Substances Pollution Contingency Plan - Notification and Communications
40 CFR 355	Emergency Planning and Notification
40 CFR 403	General Pretreatment Regulations for Existing and New Sources of Pollution
40 CFR 50	National Primary and Secondary Ambient Air Quality Standards
40 CFR 60	Standards of Performance for New Stationary Sources
40 CFR 63	National Emission Standards for Hazardous Air Pollutants for Source Categories
40 CFR 64	Compliance Assurance Monitoring
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

1.2 DEFINITIONS

1.2.1 Class I and II Ozone Depleting Substance (ODS)

Class I ODS is defined in Section 602(a) of The Clean Air Act. A list of Class I ODS can be found on the EPA website at the following weblink.

https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances.

Class II ODS is defined in Section 602(s) of The Clean Air Act. A list of Class II ODS can be found on the EPA website at the following weblink. https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances.

1.2.2 Contractor Generated Hazardous Waste

Contractor generated hazardous waste is 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), waste thinners, excess paints, excess solvents, waste solvents, excess pesticides, and contaminated pesticide equipment rinse water.

1.2.3 Electronics Waste

Electronics waste is discarded electronic devices intended for salvage, recycling, or disposal.

1.2.4 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 or historically.

1.2.5 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.

1.2.6 Hazardous Debris

As defined in paragraph SOLID WASTE, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) in accordance with 40 CFR 261. Hazardous debris also includes debris that exhibits a characteristic of hazardous waste in accordance with 40 CFR 261.

1.2.7 Hazardous Materials

Hazardous materials as defined in 49 CFR 171 and listed in 49 CFR 172.

Hazardous material is any material that: Is regulated as a hazardous material in accordance with 49 CFR 173; or requires a Safety Data Sheet (SDS) in accordance with 29 CFR 1910.120; or during end use, treatment, handling, packaging, storage, transportation, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D. Designation of a material by this definition, when separately regulated or

controlled by other sections or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this section for "control" purposes. Such material includes ammunition, weapons, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, radioactive materials, and other materials such as asbestos, mercury, and polychlorinated biphenyls (PCBs).

1.2.8 Hazardous Waste

Hazardous Waste is any material that meets the definition of a solid waste and exhibit a hazardous characteristic (ignitability, corrosivity, reactivity, or toxicity) as specified in 40 CFR 261, Subpart C, or contains a listed hazardous waste as identified in 40 CFR 261, Subpart D.

1.2.9 Land Application

Land Application means spreading or spraying discharge water at a rate that 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. Comply with federal, state, and local laws and regulations.

1.2.10 Municipal Separate Storm Sewer System (MS4) Permit

MS4 permits are those held by installations to obtain NPDES permit coverage for their stormwater discharges.

1.2.11 National Pollutant Discharge Elimination System (NPDES)

The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

1.2.12 Oily Waste

Oily waste are those materials that are, or were, mixed with Petroleum, Oils, and Lubricants (POLs) and have become separated from that POLs. Oily wastes also mean materials, including wastewaters, centrifuge solids, filter residues or sludges, bottom sediments, tank bottoms, and sorbents which have come into contact with and have been contaminated by, POLs and may be appropriately tested and discarded in a manner which is in compliance with other state and local requirements.

This definition includes materials such as oily rags, "kitty litter" sorbent clay and organic sorbent material. These materials may be land filled provided that: It is not prohibited in other state regulations or local ordinances; the amount generated is "de minimis" (a small amount); it is the result of minor leaks or spills resulting from normal process operations; and free-flowing oil has been removed to the practicable extent possible. Large quantities of this material, generated as a result of a major spill or in lieu of proper maintenance of the processing equipment, are a solid waste. As a solid waste, perform a hazardous waste determination prior to disposal. As this can be an expensive process, it is recommended that this type of waste be minimized through good housekeeping practices and employee education.

1.2.13 Regulated Waste

Regulated waste are solid wastes that have specific additional federal, state, or local controls for handling, storage, or disposal.

1.2.14 Sediment

Sediment is soil and other debris that have eroded and have been transported by runoff water or wind.

1.2.15 Solid Waste

Solid waste is a solid, liquid, semi-solid or contained gaseous waste. A solid waste can be a hazardous waste, non-hazardous waste, or non-Resource Conservation and Recovery Act (RCRA) regulated waste. Types of solid waste typically generated at construction sites may include:

1.2.15.1 Debris

Debris is non-hazardous solid material generated during the construction, demolition, or renovation of a structure that exceeds 2.5-inch particle size that is: a manufactured object; plant or animal matter; or natural geologic material (for example, cobbles and boulders), broken or removed concrete, masonry, and rock asphalt paving; ceramics; roofing paper and shingles. Inert materials may be reinforced with or contain ferrous wire, rods, accessories and weldments. A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection.

1.2.15.2 Green Waste

Green waste is the vegetative matter from landscaping, land clearing and grubbing, including, but not limited to, grass, bushes, scrubs, small trees and saplings, tree stumps and plant roots. Marketable trees, grasses and plants that are indicated to remain, be re-located, or be re-used are not included.

1.2.15.3 Material not regulated as solid waste

Material not regulated as solid waste is nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

1.2.15.4 Non-Hazardous Waste

Non-hazardous waste is waste that is excluded from, or does not meet, hazardous waste criteria in accordance with 40 CFR 263.

1.2.15.5 Recyclables

Recyclables are materials, equipment and assemblies such as doors, windows, door and window frames, plumbing fixtures, glazing and mirrors that are recovered and sold as recyclable, insulated/non-insulated copper wire cable, and structural components. It also includes commercial-grade refrigeration equipment with Freon removed, household appliances where the

basic material content is metal, clean polyethylene terephthalate bottles, cooking oil, used fuel oil, textiles, high-grade paper products and corrugated cardboard, stackable pallets in good condition, clean crating material, and clean rubber/vehicle tires. Metal meeting the definition of lead contaminated or lead based paint contaminated may be included as recyclable if sold to a scrap metal company. Paint cans that meet the definition of empty containers in accordance with 40 CFR 261.7 may be included as recyclable if sold to a scrap metal company.

1.2.15.6 Surplus Soil

Surplus soil is existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars, and paving. Contaminated soil meeting the definition of hazardous material or hazardous waste is not included and must be managed in accordance with paragraph HAZARDOUS MATERIAL MANAGEMENT.

1.2.15.7 Scrap Metal

This includes scrap and excess ferrous and non-ferrous metals such as reinforcing steel, structural shapes, pipe, and wire that are recovered or collected and disposed of as scrap. Scrap metal meeting the definition of hazardous material or hazardous waste is not included.

1.2.15.8 Wood

Wood is dimension and non-dimension lumber, plywood, chipboard, hardboard. Treated or painted wood that meets the definition of lead contaminated or lead based contaminated paint is not included. Treated wood includes, but is not limited to, lumber, utility poles, crossties, and other wood products with chemical treatment.

1.2.16 Surface Discharge

Surface discharge means discharge of water into drainage ditches, storm sewers, creeks or "waters of the United States". Surface discharges are discrete, identifiable sources and require a permit from the governing agency. Comply with federal, state, and local laws and regulations.

1.2.17 Wastewater

Wastewater is the used water and solids from a community that flow to a treatment plant.

1.2.17.1 Stormwater

Stormwater is any precipitation in an urban or suburban area that does not evaporate or soak into the ground, but instead collects and flows into storm drains, rivers, and streams.

1.2.18 Waters of the United States

Waters of the United States means Federally jurisdictional waters, including wetlands, that are subject to regulation under Section 404 of the Clean Water Act or navigable waters, as defined under the Rivers and Harbors Act.

1.2.19 Wetlands

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

1.2.20 Universal Waste

The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: batteries, pesticides, mercury-containing equipment (for example, thermostats), and lamps (for example, fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal. These regulations can be found at 40 CFR 273.

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 30 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preconstruction Survey

Solid Waste Management Permit; G

Regulatory Notifications; G

Environmental Protection Plan; G

Stormwater Notice of Intent (for NPDES coverage under the general permit for construction activities); G

Dirt and Dust Control Plan; G

Employee Training Records; G

Environmental Manager Qualifications; G

SD-06 Test Reports

Laboratory Analysis

Inspection Reports

Solid Waste Management Report; G

SD-07 Certificates

Employee Training Records; G

Erosion and Sediment Control Inspector Qualifications

SD-11 Closeout Submittals

Stormwater Pollution Prevention Plan Compliance Notebook; G

Stormwater Notice of Termination (for NPDES coverage under the general permit for construction activities); G

Waste Determination Documentation; G

Disposal Documentation for Hazardous and Regulated Waste; G

Assembled Employee Training Records; G

Solid Waste Management Permit; G

Solid Waste Management Report; G

Hazardous Waste/Debris Management; G

Regulatory Notifications; G

Sales Documentation; G

Contractor Certification

As-Built Topographic Survey

1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this Contract. Comply with federal, state, and local regulations pertaining to the environment, including water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

Tests and procedures assessing whether construction operations comply with Applicable Environmental Laws may be required. Analytical work must be performed by qualified laboratories; and where required by law, the laboratories must be certified.

1.4.1 Conformance with the Environmental Management System

Perform work under this contract consistent with the policy and objectives identified in the installation's Environmental Management System (EMS). Perform work in a manner that conforms to objectives and targets of the environmental programs and operational controls identified by the EMS. Support Government personnel when environmental compliance and EMS audits are conducted by escorting auditors at the Project site, answering questions, and providing proof of records being maintained. Provide monitoring and measurement information as necessary to address environmental performance relative to environmental, energy, and transportation management goals. In the event an EMS nonconformance or environmental noncompliance associated with the contracted services, tasks,

or actions occurs, take corrective and preventative actions. In addition, employees must be aware of their roles and responsibilities under the installation EMS and of how these EMS roles and responsibilities affect work performed under the contract.

Coordinate with the installation's EMS coordinator to identify training needs associated with environmental aspects and the EMS, and arrange training or take other action to meet these needs. Provide training documentation to the Contracting Officer. The Installation Environmental Office will retain associated environmental compliance records. Make EMS Awareness training completion certificates available to Government auditors during EMS audits and include the certificates in the Employee Training Records. See paragraph EMPLOYEE TRAINING RECORDS.

1.5 QUALITY ASSURANCE

1.5.1 Preconstruction Survey and Protection of Features

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, perform a Preconstruction Survey of the project site with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site. Submit a report for the record. Include in the report 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. The Contractor and the Contracting Officer will sign this survey report upon mutual agreement regarding its accuracy and completeness. Protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference that their preservation may cause to the work under the Contract.

1.5.2 Regulatory Notifications

Provide regulatory notification requirements in accordance with federal, state and local regulations. In cases where the Government will also provide public notification (such as stormwater permitting), coordinate with the Contracting Officer. Submit copies of regulatory notifications to the Contracting Officer at least 30 days prior to commencement of work activities. Typically, regulatory notifications must be provided for the following (this listing is not all-inclusive): demolition, renovation, NPDES defined site work, construction, removal or use of a permitted air emissions source, and remediation of controlled substances (asbestos, hazardous waste, lead paint).

1.5.3 Environmental Brief

Attend an environmental brief to be included in the preconstruction meeting. Provide the following information: types, quantities, and use of hazardous materials that will be brought onto the installation; and types and quantities of wastes/wastewater that may be generated during the Contract. Discuss the results of the Preconstruction Survey at this time.

Prior to initiating any work on site, meet with the Contracting Officer and installation Environmental Office to discuss the proposed Environmental Protection Plan (EPP). Develop a mutual understanding relative to the

details of environmental protection, including measures for protecting natural and cultural resources, required reports, required permits, permit requirements (such as mitigation measures), and other measures to be taken.

1.5.4 Employee Training Records

Prepare and maintain Employee Training Records throughout the term of the contract meeting applicable 40 CFR requirements. Provide Employee Training Records in the Environmental Records Binder. Ensure every employee completes a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures compliance with federal, state and local regulatory requirements for RCRA Large Quantity Generator. Provide a Position Description for each employee, by subcontractor, based on the Davis-Bacon Wage Rate designation or other equivalent method, evaluating the employee's association with hazardous and regulated wastes. This Position Description will include training requirements as defined in 40 CFR 265 for a Large Quantity Generator facility. Submit these Assembled Employee Training Records to the Contracting Officer at the conclusion of the project, unless otherwise directed.

Train personnel to meet state of Georgia requirements. Conduct environmental protection/pollution control meetings for personnel prior to commencing construction activities. Contact additional meetings 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, waters of the United States, and endangered species and their habitat that are known to be in the area. Provide copy of the Erosion and Sediment Control Inspector Certification as required by State of Georgia.

1.5.5 Non-Compliance Notifications

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 EPP. After receipt of such notice, 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.

1.6 ENVIRONMENTAL PROTECTION PLAN

The purpose of the EPP is to present an overview of known or potential environmental issues that must be considered and addressed during construction. Incorporate construction related objectives and targets from the installation's EMS into the EPP. Include in the EPP measures for protecting natural and cultural resources, required reports, and other measures to be taken. Meet with the Contracting Officer or Contracting Officer Representative to discuss the EPP and develop a mutual

understanding relative to the details for environmental protection including measures for protecting natural resources, required reports, and other measures to be taken. Submit the EPP within 15 days after Contract award and not less than 10 days before the preconstruction meeting. Revise the EPP throughout the project to include any reporting requirements, changes in site conditions, or contract modifications that change the project scope of work in a way that could have an environmental impact. No requirement in this section will relieve the Contractor of any applicable federal, state, and local environmental protection laws and regulations. During Construction, identify, implement, and submit for approval any additional requirements to be included in the EPP. Maintain the current version onsite.

The EPP includes, but is not limited to, the following elements:

1.6.1 General Overview and Purpose

1.6.1.1 Descriptions

A brief description of each specific plan required by environmental permit or elsewhere in this Contract such as stormwater pollution prevention plan, spill control plan, solid waste management plan, traffic control plan Non-Hazardous Solid Waste Disposal Plan and borrowing material plan.

1.6.1.2 Duties

The duties and level of authority assigned to the person(s) on the job site who oversee environmental compliance, such as who is responsible for adherence to the EPP, who is responsible for spill cleanup and training personnel on spill response procedures, who is responsible for manifesting hazardous waste to be removed from the site (if applicable), and who is responsible for training the Contractor's environmental protection personnel.

1.6.1.3 Procedures

A copy of any standard or project-specific operating procedures that will be used to effectively manage and protect the environment on the project site.

1.6.1.4 Communications

Communication and training procedures that will be used to convey environmental management requirements to Contractor employees and subcontractors.

1.6.1.5 Contact Information

Emergency contact information contact information (office phone number, cell phone number, and e-mail address).

1.6.2 General Site Information

1.6.2.1 Drawings

Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, jurisdictional wetlands, material storage areas, structures, sanitary facilities, storm drains and conveyances, and stockpiles of excess soil.

1.6.2.2 Work Area

Work area plan showing the proposed activity in each portion of the area and identify the areas of limited use or nonuse. Include measures for marking the limits of use areas, including methods for protection of features to be preserved within authorized work areas and methods to control runoff and to contain materials on site, and a traffic control plan.

1.6.2.3 Documentation

A letter signed by an officer of the firm appointing the Environmental Manager and stating that person is responsible for managing and implementing the Environmental Program as described in this contract. Include in this letter the Environmental Manager's authority to direct the removal and replacement of non-conforming work.

1.6.3 Management of Natural Resources

a. Land resources

b. Tree protection

c. Replacement of damaged landscape features

d. Temporary construction

e. Stream crossings

f. Fish and wildlife resources

g. Wetland areas

1.6.4 Protection of Historical and Archaeological Resources

a. Objectives

b. Methods

1.6.5 Stormwater Management and Control

a. Ground cover

b. Erodible soils

c. Temporary measures

(1) Structural Practices

(2) Temporary and permanent stabilization

d. Effective selection, implementation and maintenance of Best Management Practices (BMPs).

1.6.6 Protection of the Environment from Waste Derived from Contractor Operations

Control and disposal of solid and sanitary waste. Control and disposal of hazardous waste.

This item consists of the management procedures for hazardous waste to be generated. The elements of those procedures will coincide with the Installation Hazardous Waste Management Plan. The Contracting Officer will provide a copy of the Installation Hazardous Waste Management Plan. As a minimum, include the following:

a. List of the types of hazardous wastes expected to be generated

b. Procedures to ensure a written waste determination is made for appropriate wastes that are to be generated

c. Sampling/analysis plan, including laboratory method(s) that will be used for waste determinations and copies of relevant laboratory certifications

d. Methods and proposed locations for hazardous waste accumulation/storage (that is, in tanks or containers)

e. Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted)

f. Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions (40 CFR 268)

g. Management procedures for recyclable hazardous materials such as lead-acid batteries, used oil, and similar

h. Used oil management procedures in accordance with 40 CFR 279; Hazardous waste minimization procedures

i. Plans for the disposal of hazardous waste by permitted facilities; and Procedures to be employed to ensure required employee training records are maintained.

1.6.7 Prevention of Releases to the Environment

Procedures to prevent releases to the environment

Notifications in the event of a release to the environment

1.6.8 Regulatory Notification and Permits

List what notifications and permit applications must be made. Some permits require up to 180 days to obtain. Demonstrate that those permits have been obtained or applied for by including copies of applicable environmental permits. The EPP will not be approved until the permits have been obtained.

1.6.9 Clean Air Act Compliance

1.6.9.1 Haul Route

Submit truck and material haul routes along with a Dirt and Dust Control Plan for controlling dirt, debris, and dust on Installation roadways. As a minimum, identify in the plan the subcontractor and equipment for cleaning along the haul route and measures to reduce dirt, dust, and debris from roadways.

1.6.9.2 Pollution Generating Equipment

Identify air pollution generating equipment or processes that may require federal, state, or local permits under the Clean Air Act. Determine requirements based on any current installation permits and the impacts of the project. Provide a list of all fixed or mobile equipment, machinery or operations that could generate air emissions during the project to the Installation Environmental Office (Air Program Manager).

1.6.9.3 Stationary Internal Combustion Engines

Identify portable and stationary internal combustion engines that will be supplied, used or serviced. Comply with 40 CFR 60 Subpart IIII, 40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ, and local regulations as applicable. At minimum, include the make, model, serial number, manufacture date, size (engine brake horsepower), and EPA emission certification status of each engine. Maintain applicable records and log hours of operation and fuel use. Logs must include reasons for operation and delineate between emergency and non-emergency operation.

1.6.9.4 Air Pollution-engineering Processes

Identify planned air pollution-generating processes and management control measures (including, but not limited to, spray painting, abrasive blasting, demolition, material handling, fugitive dust, and fugitive emissions). Log hours of operations and track quantities of materials used.

1.6.9.5 Compliant Materials

Provide the Government a list of and SDSs for all hazardous materials proposed for use on site. Materials must be compliant with all Clean Air Act regulations for emissions including solvent and volatile organic compound contents, and applicable National Emission Standards for Hazardous Air Pollutants requirements. The Government may alter or limit use of specific materials as needed to meet installation permit requirements for emissions.

1.7 LICENSES AND PERMITS

Obtain licenses and permits required for the construction of the project and in accordance with FAR 52.236-7 Permits and Responsibilities. Notify the Government of all general use permitted equipment the Contractor plans to use on site. This paragraph supplements the Contractor's responsibility under FAR 52.236-7 Permits and Responsibilities.

a. The following permits have been obtained by the Government:

(1) GSWCC Permit

1.8 ENVIRONMENTAL RECORDS BINDER

Maintain on-site a separate three-ring Environmental Records Binder and submit at the completion of the project. Make separate parts within the binder that correspond to each submittal listed under paragraph CLOSEOUT SUBMITTALS in this section.

1.9 SOLID WASTE MANAGEMENT PERMIT

Provide the Contracting Officer with written notification of the quantity of anticipated solid waste or debris that is anticipated or estimated to be generated by construction. Include in the report the locations where various types of waste will be disposed or recycled. Include letters of acceptance from the receiving location or as applicable; submit one copy of the receiving location state and local Solid Waste Management Permit or license showing such agency's approval of the disposal plan before transporting wastes off Government property.

1.9.1 Solid Waste Management Report

Monthly, submit a solid waste disposal report to the Contracting Officer. For each waste, the report will state the classification (using the definitions provided in this section), amount, location, and name of the business receiving the solid waste.

1.10 FACILITY HAZARDOUS WASTE GENERATOR STATUS

Dobbins ARB is designated as a Small Quantity Generator. Meet the regulatory requirements of this generator designation for any work conducted within the boundaries of this Installation. Comply with provisions of federal, state, and local regulatory requirements applicable to this generator status regarding training and storage, handling, and disposal of construction derived wastes.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitats. Prior to the commencement of activities, consult with the Installation Environmental Office, regarding rare species or sensitive habitats that need to be protected. The protection of rare, threatened, and endangered animal and plant species identified, including their habitats, is the Contractor's responsibility.

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work that is consistent with the requirements of the Installation Environmental Office or as otherwise specified. Confine construction activities to within the limits of the work indicated or specified.

3.1.1 Flow Ways

Do not alter water flows or otherwise significantly disturb the native habitat adjacent to the project and critical to the survival of fish and wildlife, except as specified and permitted.

3.1.2 Vegetation

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without the Contracting Officer's permission. Do

not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Contracting Officer. Where such use of attached ropes, cables, or guys is authorized, the Contractor is responsible for any resultant damage.

Protect existing trees that are to remain to ensure they are not injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. Coordinate with the Contracting Officer and Installation Environmental Office to determine appropriate action for trees and other landscape features scarred or damaged by equipment operations.

3.1.3 Streams

Stream crossings must allow movement of materials or equipment without violating water pollution control standards of the federal, state, and local governments. Construction of stream crossing structures must be in compliance with any required permits including, but not limited to, Clean Water Act Section 404, and Section 401 Water Quality.

The Contracting Officer's approval and appropriate permits are required before any equipment will be permitted to ford live streams. In areas where frequent crossings are required, install temporary culverts or bridges. Obtain Contracting Officer's approval prior to installation. Remove temporary culverts or bridges upon completion of work, and repair the area to its original condition unless otherwise required by the Contracting Officer.

3.2 STORMWATER

Do not discharge stormwater from construction sites to the sanitary sewer. If the water is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization in advance from the Installation Environmental Office for any release of contaminated water.

3.2.1 Construction General Permit

Provide a Construction General Permit as required by 40 CFR 122.26 or the State of Georgia (GSWCC) General Permit. Under the terms and conditions of the permit, install, inspect, maintain BMPs, prepare stormwater erosion and sediment control inspection reports, and submit SWPPP inspection reports. Maintain construction operations and management in compliance with the terms and conditions of the general permit for stormwater discharges from construction activities.

3.2.1.1 Stormwater Pollution Prevention Plan

Submit a project-specific Stormwater Pollution Prevention Plan (SWPPP) to the Contracting Officer for approval, prior to the commencement of work. The SWPPP must meet the requirements of 40 CFR 122.26 and the Georgia State General Permit for stormwater discharges from construction sites.

Include the following:

a. Comply with terms of the state general permit for stormwater discharges from construction activities. Prepare SWPPP in accordance with state requirements. Use Georgia Soil and water Conservation Commission.

b. Select applicable BMPs from EPA Fact Sheets located at http://water.epa.gov/polwaste/npdes/swbmp/Construction-Site-StormWater-Run-Off-Control.cfm or in accordance with applicable state or local requirements.

c. Include a completed copy of the Notice of Intent, BMP Inspection Report Template, and Stormwater Notice of Termination, except for the effective date.

3.2.1.2 Stormwater Notice of Intent for Construction Activities

Prepare and submit a Notice of Intent as a co-permittee to the Contracting Officer, for review and approval.

Submit the approved NOI and appropriate permit fees onto the appropriate federal or state agency for approval. No land disturbing activities may commence without permit coverage. Maintain an approved copy of the SWPPP at the onsite construction office, and continually update as regulations require, reflecting current site conditions.

3.2.1.3 Inspection Reports

Submit "Inspection Reports" to the Contracting Officer in accordance with the State of Georgia Construction General Permit.

3.2.1.4 Stormwater Pollution Prevention Plan Compliance Notebook

Create and maintain a three ring binder of documents that demonstrate compliance with the Construction General Permit. Include a copy of the permit Notice of Intent, proof of permit fee payment, SWPPP and SWPPP update amendments, inspection reports and related corrective action records, copies of correspondence with the Georgia State Permitting Agency, and a copy of the permit Notice of Termination in the binder. At project completion, the notebook becomes property of the Government. Provide the compliance notebook to the Contracting Officer.

3.2.1.5 Stormwater Notice of Termination for Construction Activities

Submit a Notice of Termination to the Contracting Officer for approval once construction is complete and final stabilization has been achieved on all portions of the site for which the permittee is responsible. Once approved, submit the Notice of Termination to the appropriate state or federal agency.

3.2.2 Erosion and Sediment Control Measures

Provide erosion and sediment control measures in accordance with state and local laws and regulations. Preserve vegetation to the maximum extent practicable.

Erosion control inspection reports may be compiled as part of a stormwater pollution prevention plan inspection reports.

3.2.2.1 Erosion Control

Prevent erosion by mulching, Compost Blankets, Geotextiles, temporary slope drains. Stabilize slopes by sodding, seeding, or such combination of these methods necessary for effective erosion control. Use of hay bales is prohibited.

3.2.2.2 Sediment Control Practices

Implement sediment control 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 sediment control practices prior to soil disturbance and prior to creating areas with concentrated flow, during the construction process to minimize erosion and sediment laden runoff. Include the following devices: silt fence, storm drain inlet protection, Location and details of installation and construction are indicated on the drawings.

3.2.3 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 that 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. Personnel must be knowledgeable of the purpose for marking and protecting particular objects.

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. Move or relocate the Contractor facilities only when approved by the Government. Provide erosion and sediment controls for onsite borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant or work areas to protect adjacent areas.

3.2.5 Municipal Separate Storm Sewer System (MS4) Management

Comply with the Installation's MS4 permit requirements.

3.3 SURFACE AND GROUNDWATER

3.3.1 Cofferdams, Diversions, and Dewatering

Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure must be constantly controlled to maintain compliance with existing state water quality standards and designated uses of the surface water body. Comply with the State of Georgia water quality standards and anti-degradation provisions . Do not discharge excavation ground water to the sanitary sewer, storm drains, or to surface waters without prior specific authorization in writing from the Installation Environmental Office. Discharge of hazardous substances will not be permitted under any circumstances. Use sediment control BMPs to prevent construction site runoff from directly entering any storm drain or surface waters.

If the construction dewatering is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization for any contaminated groundwater release in advance from the Installation Environmental Officer and the federal or state authority, as applicable. Discharge of hazardous substances will not be permitted under any circumstances.

3.3.2 Waters of the United States

Do not enter, disturb, destroy, or allow discharge of contaminants into waters of the United States except as authorized herein. The protection of waters of the United States shown on the drawings in accordance with paragraph LICENSES AND PERMITS is the Contractor's responsibility. Authorization to enter specific waters of the United States identified does not relieve the Contractor from any obligation to protect other waters of the United States within, adjacent to, or in the vicinity of the construction site and associated boundaries.

3.4 PROTECTION OF CULTURAL RESOURCES

3.4.1 Archaeological Resources

If, during excavation or other construction activities, any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, activities that may damage or alter such resources will be 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. The Government retains ownership and control over archaeological resources.

3.5 AIR RESOURCES

Equipment operation, activities, or processes will be in accordance with 40 CFR 64 and state air emission and performance laws and standards.

3.5.1 Preconstruction Air Permits

Notify the Air Program Manager, through the Contracting Officer, at least 6 months prior to bringing equipment, assembled or unassembled, onto the Installation, so that air permits can be secured. Necessary permitting time must be considered in regard to construction activities. Clean Air Act (CAA) permits must be obtained prior to bringing equipment, assembled or unassembled, onto the Installation.

Confirm that these permits have been obtained.

3.5.2 Burning

Burning is prohibited on the Government premises.

3.5.3 Class I ODS Prohibition

Class I ODS are Government property and must be returned to the Government for appropriate management. Coordinate with the Installation Environmental Office to determine the appropriate location for turn in of all reclaimed refrigerant.

3.5.4 Accidental Venting of Refrigerant

Accidental venting of a refrigerant is a release and must be reported immediately to the Contracting Officer.

3.5.5 EPA Certification Requirements

Heating and air conditioning technicians must be certified through an EPA-approved program. Maintain copies of certifications at the employees' places of business; technicians must carry certification wallet cards, as provided by environmental law.

3.5.6 Dust Control

Keep dust down at all times, including during nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster.

3.5.6.1 Particulates

Dust particles, aerosols and gaseous by-products from construction activities, and processing and preparation of materials (such as from asphaltic batch plants) 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, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates that would exceed 40 CFR 50, state, and local air pollution standards or that 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. 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 state and local visibility regulations.

3.5.7 Odors

Control odors from construction activities. The odors must be in compliance with state regulations and local ordinances and may not constitute a health hazard.

3.6 WASTE MINIMIZATION

Minimize the use of hazardous materials and the generation of waste. Include procedures for pollution prevention/ hazardous waste minimization in the Hazardous Waste Management Section of the EPP. Obtain a copy of the installation's Pollution Prevention/Hazardous Waste Minimization Plan for reference material when preparing this part of the EPP. If no written plan exists, obtain information by contacting the Contracting Officer. Describe the anticipated types of the hazardous materials to be used in the construction when requesting information.

3.6.1 Salvage, Reuse and Recycle

Identify anticipated materials and waste for salvage, reuse, and recycling. Describe actions to promote material reuse, resale or recycling. To the extent practicable, all scrap metal must be sent for reuse or recycling and will not be disposed of in a landfill.

Include the name, physical address, and telephone number of the hauler, if transported by a franchised solid waste hauler. Include the destination and, unless exempted, provide a copy of the state or local permit (cover) or license for recycling.

3.6.2 Nonhazardous Solid Waste Diversion Report

Maintain an inventory of nonhazardous solid waste diversion and disposal of construction and demolition debris. Submit a report to the Contracting Officer on the first working day after each fiscal year quarter, starting the first quarter that nonhazardous solid waste has been generated. Include the following in the report:

Construction and Demolition (C&D) Debris Disposed	cubic yards, as appropriate
C&D Debris Recycled	cubic yards, as appropriate
Total C&D Debris Generated	cubic yards, as appropriate
Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount)	cubic yards, as appropriate

3.7 WASTE MANAGEMENT AND DISPOSAL

3.7.1 Waste Determination Documentation

Complete a Waste Determination form (provided at the pre-construction conference) for Contractor-derived wastes to be generated. All potentially hazardous solid waste streams that are not subject to a specific exclusion or exemption from the hazardous waste regulations (e.g. scrap metal, domestic sewage) or subject to special rules, (lead-acid batteries and precious metals) must be characterized in accordance with the requirements of 40 CFR 261 or corresponding applicable state or local regulations. Base waste determination on user knowledge of the processes and materials used, and analytical data when necessary. Consult with the Installation environmental staff for guidance on specific requirements. Attach support documentation to the Waste Determination form. As a minimum, provide a Waste Determination form for the following waste (this listing is not inclusive): oil- and latex -based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and containers of the original materials.

3.7.2 Solid Waste Management

3.7.2.1 Solid Waste Management Report

Provide copies of the waste handling facilities' weight tickets, receipts, bills of sale, and other sales documentation. In lieu of sales documentation, a statement indicating the disposal location for the solid waste that is signed by an employee authorized to legally obligate or bind the firm may be submitted. The sales documentation must include the receiver's tax identification number and business, EPA or state registration number, along with the receiver's delivery and business addresses and telephone numbers. For each solid waste retained for the Contractor's own use, submit the information previously described in this paragraph on the solid waste disposal report. Prices paid or received do not have to be reported to the Contracting Officer unless required by other provisions or specifications of this Contract or public law.

3.7.2.2 Control and Management of Solid Wastes

Pick up solid wastes, and place in covered containers that are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with non-hazardous solid waste. Transport solid waste off Government property and dispose of it in compliance with 40 CFR 260, state, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill is the minimum acceptable offsite solid waste disposal option. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. Solid waste disposal offsite must comply with most stringent local, state, and federal requirements, including 40 CFR 241, 40 CFR 243, and 40 CFR 258.

Manage hazardous material used in construction, including but not limited to, aerosol cans, waste paint, cleaning solvents, contaminated brushes, and used rags, in accordance with 49 CFR 173.

3.7.3 Control and Management of Hazardous Waste

Do not dispose of hazardous waste on Government property. Do not discharge any waste to a sanitary sewer, storm drain, or to surface waters or conduct waste treatment or disposal on Government property without written approval of the Contracting Officer.

3.7.3.1 Hazardous Waste/Debris Management

Identify construction activities that will generate hazardous waste or debris. Provide a documented waste determination for resultant waste streams. Identify, label, handle, store, and dispose of hazardous waste or debris in accordance with federal, state, and local regulations, including 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, and 40 CFR 268.

Manage hazardous waste in accordance with the approved Hazardous Waste Management Section of the EPP. Store hazardous wastes in approved containers in accordance with 49 CFR 173 and 49 CFR 178. Hazardous waste generated within the confines of Government facilities is identified as being generated by the Government. Prior to removal of any hazardous waste from Government property, hazardous waste manifests must be signed by

personnel from the Installation Environmental Office. Do not bring hazardous waste onto Government property. Provide the Contracting Officer with a copy of waste determination documentation for any solid waste streams that have any potential to be hazardous waste or contain any chemical constituents listed in 40 CFR 372-SUBPART D.

3.7.3.2 Waste Storage/Satellite Accumulation/90 Day Storage Areas

Accumulate hazardous waste at satellite accumulation points and in compliance with 40 CFR 262.34 and applicable state or local regulations. Individual waste streams will be limited to 55 gallons of accumulation (or 1 quart for acutely hazardous wastes). If the Contractor expects to generate hazardous waste at a rate and quantity that makes satellite accumulation impractical, the Contractor may request a temporary 90 day accumulation point be established. Submit a request in writing to the Contracting Officer and provide the following information (Attach Site Plan to the Request):

Contract Number	
Contractor	
Haz/Waste or Regulated Waste POC	
Phone Number	
Type of Waste	
Source of Waste	
Emergency POC	
Phone Number	
Location of the Site	

Attach a Waste Determination form for the expected waste streams. Allow 10 working days for processing this request. Additional compliance requirements (e.g. training and contingency planning) that may be required are the responsibility of the Contractor. Barricade the designated area where waste is being stored and post a sign identifying as follows:

"DANGER - UNAUTHORIZED PERSONNEL KEEP OUT"

3.7.3.3 Universal Waste Management

Manage the following categories of universal waste in accordance with federal, state, and local requirements and installation instructions:

a. Batteries as described in 40 CFR 273.2

b. Lamps as described in 40 CFR 273.5

c. Mercury-containing equipment as described in 40 CFR 273.4

Mercury is prohibited in the construction of this facility, unless specified otherwise, and with the exception of mercury vapor lamps and fluorescent lamps. Dumping of mercury-containing materials and devices

such as mercury vapor lamps, fluorescent lamps, and mercury switches, in rubbish containers is prohibited. Remove without breaking, pack to prevent breakage, and transport out of the activity in an unbroken condition for disposal as directed.

3.7.3.4 Electronics End-of-Life Management

Recycle or dispose of electronics waste, including, but not limited to, used electronic devices such computers, monitors, hard-copy devices, televisions, mobile devices, in accordance with 40 CFR 260-262, state, and local requirements, and installation instructions.

3.7.3.5 Disposal Documentation for Hazardous and Regulated Waste

Contact the Contracting Officer for the facility RCRA identification number that is to be used on each manifest.

3.7.4 Releases/Spills of Oil and Hazardous Substances

3.7.4.1 Response and Notifications

Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated in accordance with 40 CFR 300. Maintain spill cleanup equipment and materials at the work site. In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. In the event of any releases of oil and hazardous substances, chemicals, or gases; immediately (within 15 minutes) notify the Installation Fire Department, the Installation Command Duty Officer, the Installation Environmental Office, the Contracting Officer.

Submit verbal and written notifications as required by the federal (40 CFR 300.125 and 40 CFR 355), state, local regulations and instructions. Provide copies of the written notification and documentation that a verbal notification was made within 20 days. Spill response must be in accordance with 40 CFR 300 and applicable state and local regulations. Contain and clean up these spills without cost to the Government.

3.7.4.2 Clean Up

Clean up hazardous and non-hazardous waste spills. Reimburse the Government for costs incurred including sample analysis materials, clothing, equipment, and labor if the Government will initiate its own spill cleanup procedures, for Contractor- responsible spills, when: Spill cleanup procedures have not begun within one hour of spill discovery/occurrence; or, in the Government's judgment, spill cleanup is inadequate and the spill remains a threat to human health or the environment.

3.7.5 Mercury Materials

Immediately report to the Environmental Office and the Contracting Officer instances of breakage or mercury spillage. Clean mercury spill area to the satisfaction of the Contracting Officer.

Do not recycle a mercury spill cleanup; manage it as a hazardous waste for disposal.

3.7.6 Wastewater

3.7.6.1 Disposal of wastewater must be as specified below.

3.7.6.1.1 Treatment

Do not allow wastewater from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, and forms to enter water ways or to be discharged prior to being treated to remove pollutants. Dispose of the construction- related waste water off-Government property in accordance with 40 CFR 403, state, regional, and local laws and regulations.

3.7.6.1.2 Surface Discharge

For discharge of ground water, Surface discharge in accordance with federal, state, and local laws and regulations.

3.8 HAZARDOUS MATERIAL MANAGEMENT

Include hazardous material control procedures in the Safety Plan. Address procedures and proper handling of hazardous materials, including the appropriate transportation requirements. Do not bring hazardous material onto Government property that does not directly relate to requirements for the performance of this contract. Submit an SDS and estimated quantities to be used for each hazardous material to the Contracting Officer prior to bringing the material on the installation. Typical materials requiring SDS and quantity reporting include, but are not limited to, oil and latex based painting and caulking products, solvents, adhesives, aerosol, and petroleum products. Use hazardous materials in a manner that minimizes the amount of hazardous waste generated. Containers of hazardous materials must have National Fire Protection Association labels or their equivalent. Certify that hazardous materials removed from the site are hazardous materials and do not meet the definition of hazardous waste, in accordance with 40 CFR 261.

3.9 PREVIOUSLY USED EQUIPMENT

Clean previously used construction equipment prior to bringing it onto the project site. Equipment must be free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the U.S. Department of Agriculture jurisdictional office for additional cleaning requirements.

3.10 PETROLEUM, OIL, LUBRICANT (POL) STORAGE AND FUELING

POL products include flammable or combustible liquids, such as gasoline, diesel, lubricating oil, used engine oil, hydraulic oil, mineral oil, and cooking oil. Store POL products and fuel equipment and motor vehicles in a manner that affords the maximum protection against spills into the environment. Manage and store POL products in accordance with EPA 40 CFR 112, and other federal, state, regional, and local laws and regulations. Use secondary containments, dikes, curbs, and other barriers, to prevent POL products from spilling and entering the ground, storm or sewer drains, stormwater ditches or canals, or navigable waters of the United States. Describe in the EPP (see paragraph ENVIRONMENTAL PROTECTION PLAN) how POL tanks and containers must be stored, managed, and inspected and what protections must be provided. Storage of fuel on the project site must be in accordance with EPA, state, and local laws and regulations and

paragraph OIL STORAGE INCLUDING FUEL TANKS.

3.10.1 Used Oil Management

Manage used oil generated on site in accordance with 40 CFR 279. Determine if any used oil generated while onsite exhibits a characteristic of hazardous waste. Used oil containing 1,000 parts per million of solvents is considered a hazardous waste and disposed of at the Contractor's expense. Used oil mixed with a hazardous waste is also considered a hazardous waste. Dispose in accordance with paragraph HAZARDOUS WASTE DISPOSAL.

3.10.2 Oil Storage Including Fuel Tanks

Provide secondary containment and overfill protection for oil storage tanks. A berm used to provide secondary containment must be of sufficient size and strength to contain the contents of the tanks plus 5 inches freeboard for precipitation. Construct the berm to be impervious to oil for 72 hours that no discharge will permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Use drip pans during oil transfer operations; adequate absorbent material must be onsite to clean up any spills and prevent releases to the environment. Cover tanks and drip pans during inclement weather. Provide procedures and equipment to prevent overfilling of tanks. If tanks and containers with an aggregate aboveground capacity greater than 1320 gallons will be used onsite (only containers with a capacity of 55 gallons or greater are counted), provide and implement a SPCC plan meeting the requirements of 40 CFR 112. Do not bring underground storage tanks to the installation for Contractor use during a project. Submit the SPCC plan to the Contracting Officer for approval.

Monitor and remove any rainwater that accumulates in open containment dikes or berms. Inspect the accumulated rainwater prior to draining from a containment dike to the environment, to determine there is no oil sheen present.

3.11 INADVERTENT DISCOVERY OF PETROLEUM-CONTAMINATED SOIL OR HAZARDOUS WASTES

If petroleum-contaminated soil, or suspected hazardous waste is found during construction that was not identified in the Contract documents, immediately notify the Contracting Officer. Do not disturb this material until authorized by the Contracting Officer.

3.12 CHLORDANE

Evaluate excess soils and concrete foundation debris generated during the demolition of housing units or other wooden structures for the presence of chlordane or other pesticides prior to reuse or final disposal.

3.13 SOUND INTRUSION

Make the maximum use of low-noise emission products, as certified by the EPA. Blasting or use of explosives are not permitted without written permission from the Contracting Officer, and then only during the designated times. Confine pile-driving operations to the period between 8 a.m. and 4 p.m., Monday through Friday, exclusive of holidays, unless otherwise specified.

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

3.14 POST CONSTRUCTION CLEANUP

Clean up areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing by the Contracting Officer, remove traces of temporary construction facilities such as haul roads, 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. Grade parking area and similar temporarily used areas to conform with surrounding contours.

-- End of Section --

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SECTION 02 41 00

DEMOLITION
05/10

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

U.S. DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25	(June 2000) Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M	(2006) MILSTRIP - Military Standard Requisitioning and Issue Procedures
MIL-STD-129	(2014; Rev R) Military Marking for Shipment and Storage

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1	(2007; Rev K) Obstruction Marking and Lighting

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

40 CFR 61	National Emission Standards for Hazardous Air Pollutants
49 CFR 173.301	Shipment of Compressed Gases in Cylinders and Spherical Pressure Vessels

1.2 PROJECT DESCRIPTION

1.2.1 Demolition/Deconstruction Plan

Prepare a Demolition Plan and submit proposed salvage, demolition, and 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, airfield lighting, 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. Soil around Big Lake is known to be contaminated with PFAS. If excavated soil is not reused in place, disposal characterization must include analytical data provided by the Restoration Project manager.

1.2.2 General Requirements

Do not begin demolition until authorization is received from the Contracting Officer. Remove rubbish and debris from the project site; do not allow accumulations on airfield. Daily removal and inspection for Foreign Object Damage (FOD) shall be provided before the contractor has left the site. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily. Store materials that cannot be removed daily in areas specified by the Contracting Officer away from the Airfield. 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. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

1.3.1 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent necessary for installation of new construction. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.

1.3.2 Weather Protection

For portions of the facilities to remain, protect facilities from the weather and erosion at all times.

1.3.3 Utility Service

Maintain existing utilities service and protect against damage during demolition operations.

1.3.4 Facilities

Protect electrical services and utilities. Where removal of existing

utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.4 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted . Where burning is permitted, adhere to federal, state, and local regulations.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 30 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Existing Conditions; G

SD-07 Certificates

Demolition Plan; G
Notification; G

1.6 QUALITY ASSURANCE

Submit timely notification of demolition projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the local air pollution control district/agency and the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61, Subpart M. 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 on airfield pavements and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Sweep pavements as often as necessary to control the spread of debris that may result in FOD potential to aircraft.

1.7 PROTECTION

1.7.1 Traffic Control Signs

a. Where aircraft safety is endangered in the area of removal work, use low profile weighted traffic barricades with battery powered flashing lights. Anchor barricades in a manner to prevent displacement by wind, jet or prop blast. Notify the Contracting Officer prior to beginning such work.

Provide a minimum of 2 FAA type L-810 steady burning red obstruction lights on temporary structures (including cranes) over 100 feet, but less than 100 ft, above ground level. The use of LED based obstruction lights are not permitted. For temporary structures (including cranes) over 200 ft above ground level provide obstruction lighting in accordance with FAA AC 70/7460-1. Light construction and installation shall comply with FAA AC 70/7460-1. Lights shall be operational during periods of reduced visibility, darkness, and as directed by the Contracting Officer. Maintain the temporary services during the period of construction and remove only after permanent services have been installed and tested and are in operation.

1.7.2 Protection of Personnel

Before, during and after the demolition work continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.8 FOREIGN OBJECT DAMAGE (FOD)

Aircraft and aircraft engines are subject to FOD from debris and waste material lying on airfield pavements. Remove all such materials that may appear on operational aircraft pavements due to the Contractor's operations. If necessary, the Contracting Officer may require the Contractor to install a temporary barricade at the Contractor's expense to control the spread of FOD potential debris. The barricade shall include a fence covered with a fabric designed to stop the spread of debris. Anchor the fence and fabric to prevent displacement by winds or jet/prop blasts. Remove barricade when no longer required.

1.9 RELOCATIONS

Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Contracting Officer.

1.10 EXISTING CONDITIONS

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 sized 4 inch will be acceptable as a record of existing conditions. Include in the record the elevation of the top of foundation walls, finish floor elevations, possible conflicting electrical conduits, plumbing lines, alarms systems, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to before 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. Soil around Big Lake is known to be contaminated with PFAS. If excavated soil is not reused in place, disposal characterization must include analytical data provided by the Restoration Project manager.

PART 2 PRODUCTS

2.1 FILL MATERIAL

a. Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill voids, depressions or excavations resulting from demolition or deconstruction of structures.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing structures onsite for reuse. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Materials shall be designated for reuse onsite whenever possible.

3.1.1 Utilities and Related Equipment

3.1.1.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer.

3.1.1.2 Disconnecting Existing Utilities

Remove existing utilities , as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered but are not indicated on the drawings, notify the Contracting Officer prior to further work in that area.

3.1.2 Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs as indicated. Provide neat sawcuts at limits of pavement removal as indicated. Pavement and slabs designated to be recycled and utilized in this project shall be moved, ground and stored as directed by the Contracting Officer. Pavement and slabs not to be used in this project shall be removed from the Installation at Contractor's expense.

3.1.3 Concrete

Saw concrete along straight lines to a depth of a minimum 2 inch. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or sawcut entirely through the concrete. Where appropriate utilize existing sawcut joints. Do not cut new sawcuts that will create odd shaped panels to the next joint on taxiway.

3.1.4 Airfield Lighting

Remove existing airfield lighting as indicated and terminate in a manner satisfactory to the Contracting Officer.

3.2 CONCURRENT EARTH-MOVING OPERATIONS

Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition or deconstruction work in areas occupied by structures to be demolished or deconstructed until all demolition and deconstruction in the area has been completed and debris removed. Fill holes, open basements and other hazardous openings.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

Except for salvaged items specified in related Sections, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition and deconstruction, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition, deconstruction, and removal procedures, and authorization by the Contracting Officer to begin demolition and deconstruction. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.

3.3.2 Reuse of Materials and Equipment

Remove and store materials and equipment to be reused or relocated to prevent damage, and reinstall as the work progresses.

3.3.3 Salvaged Materials and Equipment

Remove materials and equipment that are indicated and specified to be removed by the Contractor and that are to remain the property of the Government, and deliver to a storage site.

a. Salvage items and material to the maximum extent possible.

b. Store all materials salvaged for the Contractor as approved by the Contracting Officer and remove from Government property before completion of the contract. On site sales of salvaged material is prohibited.

c. Remove salvaged items to remain the property of the Government in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage must be repaired or replaced to match existing items. Properly identify the contents of containers.

3.3.4 Transportation Guidance

Ship all ODS containers in accordance with MIL-STD-129, DLA 4145.25 (also referenced one of the following: Army Regulation 700-68, Naval Supply Instruction 4440.128C, Marine Corps Order 10330.2C, and Air Force Regulation 67-12), 49 CFR 173.301, and DOD 4000.25-1-M.

3.3.5 Unsalvageable and Non-Recyclable Material

Dispose of unsalvageable and non-recyclable combustible material off the

site.

3.4 CLEANUP

Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.5 DISPOSAL OF REMOVED MATERIALS

3.5.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations with all applicable federal, state and local regulations as contractually specified. Storage of removed materials on the project site is prohibited.

3.5.2 Burning on Government Property

Burning of materials removed from demolished structures will not be permitted on Government property.

3.5.3 Removal from Government Property

Transport waste materials removed from demolished and deconstructed structures, except waste soil, from Government property for legal disposal. Dispose of waste soil as directed.

3.6 REUSE OF SALVAGED ITEMS

Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

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SECTION 02 66 00

SELECT FILL AND TOPSOIL FOR LANDFILL COVER
02/10

PART 1 GENERAL

1.1 UNIT PRICES

Measurement and payment for "select fill" and "topsoil" shall be based on the respective unit prices for each cubic yard of "select fill" and "topsoil" in place. This unit price shall include the cost for development of borrow sources, cost of materials, excavation, hauling, equipment, placement, testing, and other work required to construct the "select fill" or "topsoil" layers.

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 D1556/D1556M	(2015; E 2016) Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D2167	(2015) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2216	(2010) Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D2487	(2017) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D2974	(2014) Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
ASTM D422	(1963; R 2007; E 2014; E 2014) Particle-Size Analysis of Soils
ASTM D4318	(2017; E 2018) Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4972	(2018) Standard Test Methods for pH of Soils
ASTM D6938	(2017a) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

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.))

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. Submit the following in accordance with Section 01 30 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Materials Handling Plan

SD-04 Samples

Select Fill
Topsoil

SD-06 Test Reports

Borrow Source Assessment Report; G
Select Fill and Topsoil Material Tests
Moisture Content and Density Tests of In-Place Select Fill

PART 2 PRODUCTS

2.1 Select Fill

Select fill shall comply with the criteria listed in Table 1 and shall be free of debris, frozen materials, angular rocks, roots, and organics. Submit a minimum of 50 pounds of select fill from each proposed borrow source to the Government's designated laboratory at least 15 days prior to placement.

2.2 TOPSOIL

Topsoil shall consist of natural, friable soil that is representative of soils in the vicinity which produce heavy growths of crops, grass, or other vegetation and is reasonably free from underlying subsoil, clay lumps, objectionable weeds, litter, brush, matted roots, toxic substances, or any material that might be harmful to plant growth or be a hindrance to grading, planting, or maintenance operations. Submit a minimum of 5 pounds of topsoil from each proposed borrow source to the Government's designated laboratory at least 15 days prior to placement. Topsoil shall also comply with the criteria listed in Table 1.

TABLE 1
REQUIRED PHYSICAL PROPERTIES OF SELECT FILL AND TOPSOIL

Property	Test Value	Test Method
Select Fill		

TABLE 1
REQUIRED PHYSICAL PROPERTIES OF SELECT FILL AND TOPSOIL

Property	Test Value	Test Method
Soil classification	Lean clay (CL) Clayey sand (SC) Clayey gravel (GC)	ASTM D2487
Max. particle size (inches)	1.0	ASTM D422
Max. particle size (inches)	1	ASTM D422
pH	5-7	ASTM D4972
Organic content (percent)	5-20	ASTM D2974

2.3 EQUIPMENT

Equipment used to place the select fill and topsoil layers shall be as described in the approved Materials Handling Plan, including ground pressures. Equipment shall not accelerate or brake suddenly, turn sharply, or be operated at speeds exceeding 5.0 miles per hour.

PART 3 EXECUTION

3.1 BORROW SOURCE ASSESSMENT REPORT

Submit a Borrow Source Assessment Report at least 15 days prior to select fill and topsoil placement. No select fill or topsoil may be placed until the Borrow Source Assessment Report is approved. Include the following in the report: location of each borrow source; estimated quantity of borrow available; logs of subsurface explorations; and laboratory test results.

3.1.1 Select Fill

3.1.1.1 Classification Testing

Borrow source assessment tests shall be performed on each principal type or combination of materials proposed for use in the select fill layer to ensure compliance with specified requirements. At least one set of borrow assessment tests shall be performed on each borrow source proposed for use. A set of borrow source assessment tests shall consist of Atterberg limits (ASTM D4318), particle size analysis (ASTM D422), and moisture content (ASTM D2216). Based on borrow source assessment testing, soils shall be classified in accordance with ASTM D2487.

3.1.1.2 Moisture-Density (Compaction) Testing

A representative sample from each principal type or combination of borrow materials shall be tested to establish compaction curves using ASTM D698. At least one compaction test shall be performed on each borrow source proposed. A minimum of 5 points shall be used to develop each compaction curve. During construction, placement of select fill shall conform to the

following requirements:

a. The minimum allowable dry density shall be no less than 90 percent of maximum dry density.

b. The allowable moisture content range shall be +/- 3 percent of optimum.

3.1.2 Topsoil

Testing shall be performed on representative samples of each principal type or combination of topsoil materials. At least one set of tests shall be performed on each borrow source proposed. Testing shall consist of the determination of maximum particle size in accordance with ASTM D422, pH in accordance with ASTM D4972, and organic content in accordance with ASTM D2974.

3.1.3 Chemical Contamination Testing

Borrow used for the select fill and topsoil layers shall be free of contamination. Each proposed borrow source shall be sampled and analyzed for chemical contamination.

3.2 INSTALLATION

3.2.1 Select Fill Placement

No equipment shall be operated directly on the top surface of geosynthetics without permission from the Contracting Officer. Select fill shall be pushed out over geosynthetics in an upward tumbling motion so that wrinkles in geosynthetics do not fold over. Soil shall not be dropped directly onto geosynthetics from a height greater than 3 feet. On slopes, select fill shall be placed from the bottom of the slope upward.

3.2.1.1 Initial Lift of Select Fill Placed Over Geosynthetics

The first lift of soil placed over geosynthetics shall be a minimum of 12 inches in loose thickness. Equipment with ground pressures less than 7 psi shall be used to place and traffic compact the first lift of select fill. Traffic compaction shall consist of a minimum of 2 passes over all areas.

3.2.1.2 Subsequent Lifts of Select Fill

The loose lift thickness of each subsequent lift shall be no greater than 8 inches. Full scale placement and compaction equipment shall be allowed on areas underlain by geosynthetics after the second loose lift of soil has been placed. Compaction shall consist of a minimum of 2 passes over all areas.

3.2.2 Topsoil Placement

Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading. Topsoil shall be placed in one lift and shall be evenly spread to a final compacted thickness of 6 inches. Topsoil shall be traffic compacted using approved placement equipment. On slopes, topsoil shall be placed from the bottom of the slope upward.

3.3 CONSTRUCTION TOLERANCES

Finished surfaces shall be uniformly graded and shall be free from depressions, mounds, or windrows. The top surface of the select fill layer and topsoil layer shall be no greater than 3 inches above the lines and grades shown on the drawings. No minus tolerance will be permitted. Rigid grade stakes shall not be driven into the select fill layer to control placement.

3.4 CONSTRUCTION TESTS

3.4.1 Select Fill and Topsoil Material Tests

No select fill or topsoil shall be placed until the Borrow Source Assessment Report is approved. During construction of the select fill layer, representative samples shall be taken for testing at the frequencies listed in Table 2 from the borrow source prior to placement. Test results must comply with the requirements listed in Part 2 Products or the material will be rejected for use. Submit test results as specified.

TABLE 2
SELECT FILL AND TOPSOIL MATERIAL TESTING FREQUENCIES

Property	Frequency	Test Method
Select Fill		
Grain size analysis	2,000 cubic yards	ASTM D422
Atterberg limits	2,000 cubic yards	ASTM D4318
Compaction (Note 1)	5,200 cubic yards	ASTM D698
Topsoil		
Grain size analysis for maximum particle size	2,000 cubic yards	ASTM D422
pH	2,000 cubic yards	ASTM D4972
Organic content	2,000 cubic yards	ASTM D2974

Note 1: Compaction test results shall be compared with the results obtained during the borrow source assessment. When there are significant differences, adjustments to the acceptable moisture content or density ranges shall be proposed by the Contractor for approval.

3.4.2 Moisture Content and Density Tests of In-Place Select Fill

Moisture content and density tests shall be performed in accordance with Table 3. Density requirements will not be enforced for the first lift of the select fill layer. Submit test results as specified.

TABLE 3
MOISTURE CONTENT AND DENSITY TESTS OF IN-PLACE SELECT FILL

Property	Frequency per Lift	Test Method
Nuclear moisture content	10,000 square feet	ASTM D6938
Standard moisture content	1 for every 20 nuclear tests	ASTM D2216
Nuclear density	10,000 square feet	ASTM D6938
Standard density	1 for every 20 nuclear tests	ASTM D1556/D1556M or ASTM D2167

3.4.2.1 Test Frequencies and Locations

Each day that select fill is placed, a minimum of one set of standard moisture content and density tests shall be performed. Nuclear density and moisture content tests shall be checked at the frequencies shown in Table 3. Standard tests shall be performed at locations which are as close as possible to the locations of the nuclear tests being checked.

3.4.2.2 Nuclear Density and Moisture Content Tests

Nuclear density readings shall be taken in the direct transmission mode. When ASTM D6938 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D1556/D1556M. ASTM D6938 results in a wet unit weight of soil and when using this method ASTM D6938 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D6938; 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 by the Contracting Officer.

3.4.2.3 Test Results

Field moisture content and density test results shall be compared to the compaction curve for the appropriate material type being tested. If test results are not within the acceptable range for moisture content or density, as described in subparagraph Moisture-Density (Compaction) Testing, 3 additional tests shall be performed near the location of the failed parameter. If all retests pass, no additional action shall be taken. If any of the retests fail, the lift of soil shall be repaired out to the limits defined by passing tests for that parameter. The area shall then be retested as directed.

3.5 PROTECTION

3.5.1 Damage

Erosion rills or other damage that occurs shall be repaired and grades re-established. Repairs to the select fill layer or topsoil layer shall be

documented including location and volume of soil affected, corrective action taken, and results of retests.

3.5.2 Stockpiles

Storage or stockpiling of material on the completed surface of the select fill or topsoil layers will not be permitted.

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SECTION 03 62 15.00 06

FLOWABLE FILL
07/16

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 SP-227-05	(2005) Shrinkage and Creep of Concrete

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 194	Standard Specification for Chemical Admixtures for Concrete

ASTM INTERNATIONAL (ASTM)

ASTM C33/C33M	(2016) Standard Specification for Concrete 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 C940	(2010a) Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory
ASTM D4832	(2010) Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders
ASTM D5084	(2010) Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D5971	(2007) Sampling Freshly Mixed Controlled Low Strength Material
ASTM D6023	(2007) Unit Weight, Yield, Cement Content and Air Content () of Controlled Low Strength Material (CLSM)
ASTM D6103	(2004) Standard Test Method for Flow Consistency of Controlled Low Strength

Material (CLSM)

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 LRL Section 01 30 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Flowable Fill Mix Design; G, AE
3 years of experience for the Admixture Supplier; G
1 year of experience for the manufactured ready mix concrete producer with similar products; G

The flowable fill mix design shall contain a mixture of cement, water, granulated bentonite with the use of admixtures. Curing methodology shall be addressed as part of this mix design.

SD-06 Test Reports

Provide test reports for the following:

Compressive Strength Testing
Flowability
Permeability
Expansion
Shrinkage
Unit Weight/Air Content
Batch Records

SD-07 Certificates

Provide certificates for the following items:

Portland Cement
Aggregates

1.3 Definitions

1.3.1 Flowable Fill

Flowable Fill is a ready-mix Controlled Low Strength Material (CLSM) used as an alternative to compacted soil, and is also known as controlled density fill, grout slurry, and many other names. Flowable fill shall be designed as a permanent material unless specifically approved otherwise by the Contracting Officer's Representative. Flowable fill (CLSM) differs from portland cement concrete as it contains a low cementitious content to reduce strength development if future removal is required.

1.3.2 Granulated Bentonite

Granulated Bentonite is a commercially available clay consisting mainly of the clay mineral Montmorillonite produced as granular particles.

1.3.3 Flowability

Material property which relates to the rheology of the material.

1.3.4 Flowable Fill Mixture

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

1.4 System Descriptions

Flowable fill materials shall be used as a structural fill replacement in accordance with LRL Section 31 00 00.00 06 EARTHWORK, unless otherwise noted. The Contractor shall provide all materials and equipment in suitable and adequate quantity and quality as necessary to accomplish the work specified herein. Flowable fill shall consist of a mixture of portland cement, fly ash, granulated bentonite, water, and other admixtures proportioned to provide an excavatable, non-segregating, free-flowing, self-consolidating material that will result in a hardened, dense backfill. The materials and mix design for the flowable fill should be designed to produce a comparable compressive strength and permeability to the surrounding soil after hardening. The minimum allowable compressive strength for flowable fill is 300 psi, and the minimum allowable permeability of the flowable fill is 1X10^-5 cm/s. The unit weight shall be no less than 100 pcf. Granulated bentonite and chemical admixtures may also be used in flowable fill to modify performance properties of strength, flow, and permeability.

1.5 Delivery, Storage, and Handling

Deliver and handle all products and equipment required, in strict compliance with manufacturer's recommendations. Protect from damage due to weather, excessive temperatures, and construction operations.

1.6 Project Conditions

Perform installation of flowable fill when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

PART 2 PRODUCTS

Provide a Flowable Fill Mix Design containing at a minimum cementitious materials, water, and granulated bentonite. Cementitious materials shall be portland cement, fly ash class F, with various admixtures at the contractor's option pending approval from the Contracting Officer's Representative. The flowable fill mix design may also contain, fine aggregate or filler, and/or chemical admixtures in any proportions such that the final product meets the strength, flow consistency and shrinkage requirements included in this specification, as approved by the Contracting Officer's Representative.

2.1 PORTLAND CEMENT

Conform to ASTM C150/C150M for Cement, Type I or Type II.

2.2 AGGREGATES

Conform to ASTM C33/C33M for aggregates and the gradation as directed.

2.3 WATER

Provide potable water in accordance with AASHTO M 194.

2.4 MINERAL ADMIXTURES

2.4.1 Granulated Bentonite

Sodium Based Granulated Bentonite shall be added to the mix design at a rate of 50-100 pounds per cubic yard.

2.4.2 Fly Ash Class F

Fly ash shall be Class F conforming to the requirements of ASTM C618.

2.5 CHEMICAL ADMIXTURES
Chemical Admixtures shall conform to the requirements of ASTM C494/C494M.

2.5.1 Superplasticizers

The use of Superplasticizer, High Range Water Reducer, or equivalent is recommended to increase flowability rather than adding excessive amounts of water to achieve the desired flowability.

2.5.2 Water Reducing Admixtures

If superplasticizer is not used, then the Contractor shall use other water reducing admixtures to achieve flowability at lower water/cement ratios.

2.5.3 Inhibiting Admixtures

The use of inhibitors shall not be permitted unless approved by the Contracting Officer's Representative.

2.5.4 Accelerating Admixtures

The use of accelerators shall not be permitted. No Calcium Chloride shall be used with flowable fill.

2.5.5 Expansive Agents

The use of expansive agents shall not be permitted.

2.5.6 Shrinkage Reducing Admixtures

Shrinkage Reducing Admixtures (SRA) shall be utilized to prevent excessive drying shrinkage and cracking.

2.5.7 Air-Entraining Admixture

The use of air entraining admixtures is acceptable if required in accordance with ASTM C150/C150M. The minimal accepted air void percentage is 4%. Maximum air void percentages shall be established through by Permeability Testing.

2.6 EQUIPMENT

Provide equipment as recommended by the Manufacturer and comply with manufacturer's recommendations for the addition of additives, whether at the production plant or prior to placement at the site. Protect from damage due to weather, excessive temperatures, and construction operations.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Pre-Approval Procedures

During the submittal process, the contractor shall prepare and submit a flowable fill mix design corresponding to required conditions and requirements. No flowable shall be placed before acceptance by the Contracting Officer. The use of flowable fill during any part of the project shall be restricted to those incidences where due to field conditions, the Contractor has made the Contracting Officer's Representative aware of the conditions in advance for which he recommends the use of the flowable fill, and the Contracting Officer's Representative has confirmed those conditions and approved the use of the flowable fill. Prior to commencement of field operations, the contractor shall establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

3.1.2 Site Preparation

Prepare areas for grouting by cleaning away foreign matter, laitance, dirt, grease or oil. Clean all contact surfaces of concrete and masonry no less than 24 hours before grout application. Examine conditions of substrates and other conditions under which work is to be performed and notify the Contracting Officer's Representative in writing of circumstances detrimental to the proper completion of the work. The Contractor shall not proceed until unsatisfactory conditions are corrected.

3.1.3 Test Strip

Before flowable fill is placed the Contractor shall place a Test Strip to demonstrate the mix design performs adequately and satisfies the requirements of this specification. All required testing shall be completed on the Test Strip. If the mix design fails a new mix design shall be submitted by the Contractor. A passing mix design for the test strip based on testing criteria shall satisfy testing requirements for Flowable Fill, unless directed otherwise by the COR.

3.2 MIXING

Mix flowable fill per the approved flowable fill mix design. For the Test Strip of flowable fill the water/cement ratio shall not be batched above 0.6 at the mixing plant. Water content may be field adjusted pending Quality Control Testing results. Once the Flowable Fill Mix Design is approved the water/cement ratio shall not be altered. Mix grout materials in proper mechanical mixers as close to work area as possible.

3.3 PLACING FLOWABLE FILL

Place Flowable Fill in accordance with the manufacturer's written installation instructions and recommendations. Do not use Flowable Fill

which has begun to set or if more than one hour has elapsed after initial mixing. Flowable Fill shall only be placed when the weather conditions are favorable and when the ambient temperature is above 35 degrees F and rising, providing the ground is sufficiently thawed, as determined by the Contracting Officer's Representative. Placement activities shall cease when the ambient air temperature is 36 degrees F and falling. At the time of placement flowable fill shall have a temperature of at least 50 degrees F. Placement of flowable fill shall cease when the ambient air temperature exceeds 95 degrees F.

3.4 PROTECTION AND CURING

Protect freshly placed flowable fill from premature drying, wash by rain or running water, wind, mechanical injury, and excessive cold or hot temperatures. Flowable fill shall be cured at a minimum temperature of 40 degrees F for at least 24 hours after placement. Curing methods shall be included as part of the submittal for the mix design.

3.5 QUALITY CONTROL

The following testing shall be performed on a test section for the acceptable flowable fill mix design. Acceptable results shall satisfy testing requirements for the remainder of the project, unless directed by the Contracting Officer's Representative that additional testing is required.

3.5.1 Sampling

Sampling shall be in accordance with ASTM D5971.

3.5.1.1 Compressive Strength Testing

Compressive Testing shall be in accordance with ASTM D4832.

3.5.1.2 Flowability

Flowability testing shall be in accordance with ASTM D6103. Acceptable results shall be at least 8 inches in diameter.

3.5.1.3 Unit Weight/Air Content

The unit weight and air content of the flowable fill shall be tested in accordance with ASTM D6023.

3.5.1.4 Permeability

The Permeability of the flowable fill shall be in accordance with ASTM D5084.

3.5.1.5 Expansion

The Expansion of the flowable fill shall be in accordance with ASTM C940, and shall not exceed 2% of the total volume.

3.5.1.6 Shrinkage

The Shrinkage of the flowable fill shall be in accordance with ACI SP-227-05 and shall not exceed 2% of the total volume.

3.6 Batch Records

Batch records and mix proportions shall be provided to the COR within 24 hours for approval and comparison with the approved mix design.

3.7 Qualifications

3 years of experience for the Admixture Supplier

1 year of experience for the manufactured ready mix concrete producer with similar products

-- End of Section --

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SECTION 31 00 00.00 06

EARTHWORK
06/15

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 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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136	(2001) Sieve Analysis of Fine and Coarse Aggregates

AMERICAN WATER WORKS ASSOCIATION(AWWA)

AWWA C600	(2010) Installation of Ductile-Iron Water Mains and Their Appurtenances

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C2	(2003) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes
AWPA P5	(2007) Standard for Waterborne Preservatives

ASTM INTERNATIONAL (ASTM)

ASTM A 139	(2000) Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
ASTM A 252	(1998; R 2002) Welded and Seamless Steel Pipe Piles

ASTM D 1140	(2000) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(2000) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(2002) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 1883	(1999) CBR (California Bearing Ratio) of Laboratory-Compacted Soils
ASTM D 2434	(1968; R 2000) Permeability of Granular Soils (Constant Head)
ASTM D 2487	(2000) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(2001) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 422	(1963; R 2002) Particle-Size Analysis of Soils
ASTM D 4318	(2000) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 698	(2000a) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))

1.2 DEFINITIONS

1.2.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, CL, ML, CL-ML, CH, MH. Satisfactory materials for grading shall be comprised of stones less than 8 inches, except for fill material for pavements and railroads which shall be comprised of stones less than 3 inches in any dimension.

1.2.2 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. The Contracting Officer shall be notified of any contaminated materials.

1.2.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified

as cohesionless only when the fines are nonplastic. Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

1.2.4 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 D 1557 abbreviated as a percent of laboratory maximum density. Since ASTM D 1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve shall be expressed as a percentage of the maximum density in accordance with AASHTO T 180 Method D and corrected with AASHTO T 224. To maintain the same percentage of coarse material, the "remove and replace" procedure as described in the NOTE 8 in Paragraph 7.2 of AASHTO T 180 shall be used.

1.2.5 Overhaul

Overhaul is the authorized transportation of satisfactory excavation or borrow materials in excess of the free-haul limit of 30 stations. Overhaul is the product of the quantity of materials hauled beyond the free-haul limit, and the distance such materials are hauled beyond the free-haul limit, expressed in station yards.

1.2.6 Topsoil

Material suitable for topsoils obtained from offsite areas is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

1.2.7 Hard/Unyielding Materials

Weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" with stones greater than 30 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller. These materials usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.2.8 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.

1.2.9 Unstable Material

Unstable material shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenant structure.

1.2.10 Select Granular Material

1.2.10.1 General Requirements

Select granular material shall consist of materials classified as GW, GP, SW, SP, or by ASTM D 2487 where indicated. Coefficient of permeability shall be a minimum of 0.002 feet per minute when tested in accordance with ASTM D 2434.

1.2.10.2 California Bearing Ratio Values

Bearing Ratio: At 0.1 inch penetration, the bearing ratio shall be 80 percent at 95 percent ASTM D 1557 maximum density as determined in accordance with ASTM D 1883 for a laboratory soaking period of not less than 4 days. The combined material shall conform to the following sieve analysis:

Sieve Size	Percent Passing by Weight
2 1/2 inches	100
No. 4	40 - 85
No. 10	20 - 80
No. 40	10 - 60
No. 200	5 - 25

1.2.11 Initial Backfill Material

Initial backfill shall consist of select granular material or satisfactory materials free from rocks 2 inches or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller. When the pipe is coated or wrapped for corrosion protection, the initial backfill material shall be free of stones larger than 2 inches in any dimension or as recommended by the pipe manufacturer, whichever is smaller.

1.2.12 Expansive Soils

Expansive soils are defined as soils that have a plasticity index equal to or greater than 7.5 when tested in accordance with ASTM D 4318.

1.2.13 Nonfrost Susceptible (NFS) Material

Nonfrost susceptible material shall be a uniformly graded washed sand with a maximum particle size of 1 inch and less than 5 percent passing the No. 200 size sieve, and with not more than 3 percent by weight finer than 0.02 mm grain size.

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. The following shall be submitted in accordance with LRL Section 01 30 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals
Shoring; G, AE
Dewatering Work Plan; G, AE
Blasting; G, AE

Submit 15 days prior to starting work.

SD-03 Product Data

Utilization of Excavated Materials; G, AE
Rock Excavation
Opening of any Excavation or Borrow Pit
Shoulder Construction

Procedure and location for disposal of unused satisfactory material. Proposed source of borrow material. Notification of encountering rock in the project. Advance notice on the opening of excavation or borrow areas. Advance notice on shoulder construction for rigid pavements.

SD-06 Test Reports

Testing

Within 24 hours of conclusion of physical tests, 2 copies of test results, including calibration curves and results of calibration tests. Results of testing at the borrow site.

SD-07 Certificates

Testing; G

Qualifications of the Corps' validated commercial testing laboratory or the Contractor's validated testing facilities.

1.4 CLASSIFICATION OF EXCAVATION

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

1.4.1 Common Excavation

Common excavation shall include the satisfactory removal and disposal of all materials not classified as rock excavation.

1.4.2 Rock Excavation

Rock excavation shall include blasting, excavating, grading, and disposing of material classified as rock and shall include the satisfactory removal and disposal of boulders 1/2 cubic yard or more in volume; solid rock; rock material that is in ledges, bedded deposits, and unstratified masses, which cannot be removed without systematic drilling and blasting; firmly cemented conglomerate deposits possessing the characteristics of solid rock impossible to remove without systematic drilling and blasting; and hard materials (see Definitions). The removal of any concrete or masonry structures, except pavements, exceeding 1/2 cubic yard in volume that may be encountered in the work shall be included in this classification. If at any time during excavation, including excavation from borrow areas, the Contractor encounters material that may be classified as rock excavation, such material shall be uncovered and the Contracting Officer notified by the Contractor. The Contractor shall not proceed with the excavation of this material until the Contracting Officer has classified the materials as common excavation or rock excavation and has taken cross sections as

required. Failure on the part of the Contractor to uncover such material, notify the Contracting Officer, and allow ample time for classification and cross sectioning of the undisturbed surface of such material will cause the forfeiture of the Contractor's right of claim to any classification or volume of material to be paid for other than that allowed by the Contracting Officer for the areas of work in which such deposits occur.

1.4.3 BLASTING

Blasting will not be permitted.

1.5 CRITERIA FOR BIDDING

Base bids on the following criteria:

a. Surface elevations are as indicated.

b. Pipes or other artificial obstructions, except those indicated, will not be encountered.

c. Ground water elevations indicated by the boring log were those existing at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.

d. Material character is indicated by the boring logs.

1.6 DEWATERING WORK PLAN

Submit procedures for accomplishing dewatering work.

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR BORROW SOILS

The Specification preparer shall choose one of the following:

"It is the responsibility of the Contractor to have any off site fill material designated as clean by an environmental engineering firm approved by the COR. This confirmation shall include obtaining and testing representative samples from the proposed borrow source. The engineering firm will submit a certification of clean material signed by a licensed professional engineer. This certification along with all proposed borrow sources, borrow materials, sampling and analysis plans and reports shall be approved by the COR prior to transportation of borrow material to the site."

If borrow material is required and borrow is not available from the project site or the Government installation, the Contractor shall obtain borrow material from an off-site borrow source that has been approved by the Government. The action of acquiring borrow and transporting that material to the project shall have had the appropriate level of National Environmental Policy Act (NEPA) compliance activity performed and deemed acceptable. If the NEPA assessment has not evaluated the acquisition of borrow, then compliance with NEPA will need to be demonstrated through the preparation of a Record of Environmental Consideration (REC) or a Supplemental Environmental Assessment (EA). NEPA documents shall be prepared using an inter-disciplinary approach which will ensure the integrated use of the natural and social sciences and the environmental design arts (section 102(2)(A) of the Act). The disciplines of the preparers shall be appropriate

to the scope and issues identified in the scoping process.

The following choice can only be chosen if a borrow site has been approved by the Government and identified in the RFP package:

Offsite soils shall be obtained from borrow site as designated by onsite Installation personnel/as directed by the COR

PLEASE NOTE: The changes above can only be made on a task order basis and cannot be made to the base contract specifications that were part of a MATOC award. If the specification preparer cannot make the revision in LRL Specification 31 00 00. 00 06, the specifications preparer will determine the appropriate place in the specifications package for the intended language.

2.2 MATERIAL FOR RIP-RAP

Provide Bedding material Filter fabric and rock conforming to DOT for construction indicated.

2.2.1 Bedding Material

Consisting of sand, gravel, or crushed rock, well graded, with a maximum particle size of 2 inches. Material shall be composed of tough, durable particles. Fines passing the No. 200 standard sieve shall have a plasticity index less than six.

2.2.2 Grout

Composed of cement, water, an air-entraining admixture, and sand mixed in proportions of one part portland cement to two parts of sand, sufficient water to produce a workable mixture, and an amount of admixture which will entrain sufficient air to produce durable grout, as determined by the Contracting Officer. Mix grout in a concrete mixer. Mixing time shall be sufficient to produce a mixture having a consistency permitting gravity flow into the interstices of the rip-rap with limited spading and brooming.

2.2.3 Rock

Rock fragments sufficiently durable to ensure permanence in the structure and the environment in which it is to be used. Rock fragments shall be free from cracks, seams, and other defects that would increase the risk of deterioration from natural causes. The size of the fragments shall be such that no individual fragment exceeds a weight of 150 pounds and that no more than 10 percent of the mixture, by weight, consists of fragments weighing 2 pounds or less each. Specific gravity of the rock shall be a minimum of 2.50 . The inclusion of more than trace 1 percent quantities of dirt, sand, clay, and rock fines will not be permitted.

2.3 CAPILLARY WATER BARRIER

Provide capillary water barrier of clean, poorly graded crushed rock, crushed gravel, or uncrushed gravel placed beneath a building slab with or without a vapor barrier to cut off the capillary flow of pore water to the area immediately below. Aggregate shall conform to ASTM C33 Size Number 57 or 67 with a maximum of 2 percent by weight passing the No. 4 sieve.

2.4 PIPE CASING

2.4.1 Casing Pipe

ASTM A 139, Grade B, or ASTM A 252, Grade 2, smooth wall pipe. Casing size shall be of the outside diameter and wall thickness as indicated. Protective coating is not required on casing pipe.

2.4.2 Wood Supports

Treated Yellow Pine or Douglas Fir, rough, structural grade. Provide wood with nonleaching water-borne pressure preservative (ACA or CCA) and treatment conforming to AWPA P5 and AWPA C2, respectively. Secure wood supports to carrier pipe with stainless steel or zinc-coated steel bands.

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Where indicated or directed, topsoil shall be stripped to a depth of 4 inches. Topsoil shall be spread 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. Topsoil shall be kept 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. Any surplus of topsoil from excavations and grading shall be stockpiled in locations indicated .

3.2 GENERAL EXCAVATION

The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph FINISHING. Satisfactory excavated materials shall be transported to and placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be disposed of in areas approved for surplus material storage or designated waste areas. Unsatisfactory excavated material shall be disposed of in designated waste or spoil areas. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or embankment in excess of that produced by excavation within the grading limits shall be excavated from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

3.2.1 Ditches, Gutters, and Channel Changes

Excavation of ditches, gutters, and channel changes shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Ditches and gutters shall not be excavated below grades shown. Excessive open ditch or gutter excavation shall be backfilled with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Material excavated shall be disposed of as shown or as directed,

except that in no case shall material be deposited less than 4 feet from the edge of a ditch. The Contractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.2.2 Drainage Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm, level, stepped, or serrated surface. Loose disintegrated rock and thin strata shall be removed. When concrete or masonry is to be placed in an excavated area, the bottom of the excavation shall not be disturbed. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed. Where pile foundations are to be used, the excavation of each pit shall be stopped at an elevation 1 foot above the base of the footing, as specified, before piles are driven. After the pile driving has been completed, loose and displaced material shall be removed and excavation completed, leaving a smooth, solid, undisturbed surface to receive the concrete or masonry.

3.2.3 Drainage

Provide for the 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. The Contractor shall establish/construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed.

3.2.4 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 2 feet below the working level.

3.2.5 Trench Excavation Requirements

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the

manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. Trench walls more than 5 feet high shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in. Vertical trench walls more than 3 feet high shall be shored. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter and shall not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to the Government.

3.2.5.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

3.2.5.2 Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, such material shall be removed 12 inches below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

3.2.5.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Government.

3.2.5.4 Excavation for Appurtenances

Excavation for manholes, catch-basins, inlets, or similar structures shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members Rock shall be cleaned of loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Loose disintegrated rock and thin strata shall be removed. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.2.5.5 Jacking, Boring, and Tunneling

Unless otherwise indicated, excavation shall be by open cut except that sections of a trench may be jacked, bored, or tunneled if, in the opinion

of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly compacted in such sections.

3.2.6 Underground Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Excavation made with power-driven equipment is not permitted within two feet of known Government-owned 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 or subsurface construction immediately to the Contracting Officer.

3.3 SELECTION OF BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from the borrow areas from approved private sources. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation.

3.4 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

The Contractor shall notify the Contracting Officer sufficiently in advance of the opening of any excavation or borrow pit to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, borrow pits and other excavation areas shall be excavated providing adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of as directed. Borrow pits shall be neatly trimmed and drained after the excavation is completed. The Contractor shall ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

3.5 SHORING

3.5.1 General Requirements

The Contractor shall submit a Shoring and Sheeting plan for approval 15 days prior to starting work. Submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheeting of excavations. Shoring, including sheet piling, shall be furnished and installed as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Shoring, bracing, and sheeting shall be removed as excavations are backfilled, in a manner to prevent caving.

3.5.2 Geotechnical Engineer

The Contractor is required to hire a Professional Geotechnical Engineer to provide inspection of excavations and soil/groundwater conditions throughout construction. The Geotechnical Engineer shall be responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. The Geotechnical Engineer shall update the excavation, sheeting and dewatering plans as construction progresses to reflect changing conditions and shall submit an updated plan if necessary. A written report shall be submitted, at least monthly, 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 Geotechnical Engineer shall be available to meet with the Contracting Officer at any time throughout the contract duration.

3.6 GRADING AREAS

Where indicated, work will be divided into grading areas within which satisfactory excavated material shall be placed in embankments, fills, and required backfills. The Contractor shall not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing. Stockpiles of satisfactory shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment, excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected 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, such material shall be removed and replaced with satisfactory material from approved sources.

3.7 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

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

3.8 GROUND SURFACE PREPARATION

3.8.1 General Requirements

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Contracting Officer. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.

3.8.2 Frozen Material

Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Minimum subgrade density shall be as specified in paragraph TESTING.

3.9 UTILIZATION OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be disposed of in designated waste disposal or spoil areas. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. No satisfactory excavated material shall be wasted without specific written authorization. Satisfactory material authorized to be wasted shall be disposed of in designated areas approved for surplus material storage or designated waste areas as directed. Newly designated waste areas on Government-controlled land shall be cleared and grubbed before disposal of waste material thereon. Coarse rock from excavations shall be stockpiled and used for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. No excavated material shall be disposed of 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 BACKFILLING AND COMPACTION

Backfill adjacent to any and all types of structures shall be placed and compacted between 85 and 90 percent laboratory maximum density for cohesionless materials to prevent wedging action or eccentric loading upon or against the structure. Ground surface on which backfill is to be placed shall be prepared as specified in paragraph PREPARATION OF GROUND SURFACE FOR EMBANKMENTS. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs PREPARATION OF GROUND SURFACE FOR EMBANKMENTS, EMBANKMENTS, and SUBGRADE PREPARATION, and UFGS Section 33 40 00 STORM DRAINAGE UTILITIES; and LRL Section 31 00 00.00 06 EARTHWORK. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.10.1 Trench Backfill

Trenches shall be backfilled to the grade shown. The trench shall not be backfilled until all specified tests are performed.

3.10.1.1 Replacement of Unyielding Material

Unyielding material removed from the bottom of the trench shall be replaced with select granular material or initial backfill material.

3.10.1.2 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6 inches loose thickness.

3.10.1.3 Bedding and Initial Backfill

Bedding shall be of the type and thickness shown. Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe. Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with AWWA C600, Type 5, except as specified herein. Backfill to top of pipe shall be compacted to 95 percent of ASTM D 698 maximum density. Provide materials as follows:

a. Class I: Angular, 0.25 to 1.5 inches, graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.

b. Class II: Coarse sands and gravels with maximum particle size of 1.5 inches, including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in ASTM D 2487.

c. Clean, coarse-grained sand classified in accordance gradation of the DOT or SW or SP by ASTM D 2487 for bedding and backfill.

d. Clean, coarsely graded natural gravel, crushed stone or a combination thereof identified as in accordance with Section , gradation of the DOT or having a classification of GW GP in accordance with ASTM D 2487 for bedding and backfill . Maximum particle size shall not exceed 3 inches.

3.10.1.4 Final Backfill

The remainder of the trench, except for special materials for roadways, railroads and airfields, shall be filled with satisfactory material. Backfill material shall be placed and compacted as follows:

a. Roadways, Railroads, and Airfields: Backfill shall be placed up to the required elevation as specified. Water flooding or jetting methods of compaction will not be permitted.

b. Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 12 inch loose thickness, and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Compaction by water flooding or jetting will not be permitted. This requirement shall also apply to all other areas not specifically designated above.

3.10.2 Backfill for Appurtenances

After the manhole, catch basin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 7 days, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be brought up evenly on all sides of the structure to prevent eccentric loading and excessive

stress.

3.11 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

3.11.1 Pipeline Casing

Provide new smooth wall steel pipeline casing under by the boring and jacking method of installation. Provide each new pipeline casing, where indicated and to the lengths and dimensions shown, complete and suitable for use with the new piped utility as indicated. Install pipeline casing by dry boring and jacking method as follows:

3.11.1.1 Bore Holes

Mechanically bore holes and case through the soil with a cutting head on a continuous auger mounted inside the casing pipe. Weld lengths of pipe together in accordance with AWS D1.1/D1.1M. Do not use water or other fluids in connection with the boring operation.

3.11.1.2 Cleaning

Clean inside of the pipeline casing of dirt, weld splatters, and other foreign matter which would interfere with insertion of the piped utilities by attaching a pipe cleaning plug to the boring rig and passing it through the pipe.

3.11.1.3 End Seals

After installation of piped utilities in pipeline casing, provide watertight end seals at each end of pipeline casing between pipeline casing and piping utilities. Provide watertight segmented elastomeric end seals.

3.11.2 Rip-Rap Construction

Construct rip-rap on filter fabric in accordance with DOT State Standard, paragraph in the areas indicated. Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.1 foot.

3.11.2.1 Bedding Placement

Spread bedding material uniformly to a thickness of at least 3 inches on prepared subgrade as indicated.

3.11.2.2 Stone Placement

Place rock for rip-rap on prepared bedding material to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the rip-rap throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above.

3.12 EMBANKMENTS AND STRUCTURAL FILL

3.12.1 Earth Embankments

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 3 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.12.2 Structural Fill

All structural fill placed to facilitate desired site grades shall be constructed from satisfactory material free of organic or frozen material and rocks with any dimension greater than 3 inches. The fill shall be placed in maximum 8 inch loose lifts and compacted to the following criteria. ; beneath concrete slabs and roads: at least 90 percent laboratory maximum density as determined by the geotechnical engineer; .

3.13 SUBGRADE PREPARATION

3.13.1 Proof Rolling

Proof rolling shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. proof roll the existing subgrade of the base course with six passes of a 15 ton, pneumatic-tired roller. Operate the roller in a systematic manner to ensure the number of passes over all areas, and at speeds between 2 1/2 to 3 1/2 mph. When proof rolling, one-half of the passes made with the roller shall be in a direction perpendicular to the other passes. Notify the Contracting Officer a minimum of 3 days prior to proof rolling. Proof rolling shall be performed in the presence of the Contracting Officer. Rutting or pumping of material shall be undercut as directed by the Contracting Officer and replaced with select material.

3.13.2 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Rock encountered in the cut section shall be excavated to a depth of 6 inches below finished grade for the subgrade. Low areas resulting from removal of unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as

specified. After rolling, the surface of the subgrade for airfields shall not show deviations greater than 1/2 inch when tested with a 12 foot straightedge applied both parallel and at right angles to the centerline of the area. The elevation of the finish subgrade shall not vary more than 0.05 foot from the established grade and cross section.

3.13.3 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas and railroads, each layer of the embankment shall be compacted to at least 5 percent of laboratory maximum density.

3.13.3.1 Subgrade for Pavements

Subgrade for pavements shall be compacted to at least 5 percentage laboratory maximum density for the depth below the surface of the pavement shown. When more than one soil classification is present in the subgrade, the top 2 inches of subgrade shall be scarified, windrowed, thoroughly blended, reshaped, and compacted.

3.13.3.2 Subgrade for Shoulders

Subgrade for shoulders shall be compacted to at least 5 percentage laboratory maximum density for the full depth of the shoulder.

3.13.3.3 Subgrade for Airfield Pavements

Compact top 24 inches below finished pavement or top 12 inches of subgrades, whichever is greater, to 100 percent of ASTM D 1557; compact fill and backfill material to 100 percent of ASTM D 1557.

3.14 SHOULDER CONSTRUCTION

Shoulders shall be constructed of satisfactory excavated or borrow material or as otherwise shown or specified. Shoulders shall be constructed as soon as possible after adjacent paving is complete, but in the case of rigid pavements, shoulders shall not be constructed until permission of the Contracting Officer has been obtained. The entire shoulder area shall be compacted to at least the percentage of maximum density as specified in paragraph SUBGRADE PREPARATION above, for specific ranges of depth below the surface of the shoulder. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Shoulder construction shall be done in proper sequence in such a manner that adjacent ditches will be drained effectively and that no damage of any kind is done to the adjacent completed pavement. The completed shoulders shall be true to alignment and grade and shaped to drain in conformity with the cross section shown.

3.15 FINISHING

The surface of excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION. Gutters and ditches shall be finished in a manner that will

result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials. Settlement or washing that occurs in graded, topsoiled, or backfilled areas prior to acceptance of the work, shall be repaired and grades re-established to the required elevations and slopes.

3.15.1 Subgrade and Embankments

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition until ballast, subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base course, ballast, or pavement shall be laid until the subgrade has been checked and approved, and in no case shall subbase, base, surfacing, pavement, or ballast be placed on a muddy, spongy, or frozen subgrade.

3.15.2 Grading Around Structures

Areas within 5 feet outside of each building and structure line shall be constructed true-to-grade, shaped to drain, and shall be maintained 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, the compacted subgrade soil shall be scarified to a 2 inch depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly to a thickness of 4 inches and graded to the elevations and slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry. Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from offsite areas .

3.17 TESTING

The Contractor's laboratory shall be validated by the Materials Testing Center (MTC) and approved by the Contracting Officer or designated representatives on-site prior to starting any work which requires quality control (QC) testing. The Contractor shall use an independent commercial laboratory that has been validated by the Corps of Engineers MTC, for the required test methods. Existing commercial labs that are presently validated by the Corps can be found at the website: http://www.erdc.usace.army.mil/Portals/55/docs/CEERD-GV/CEERD-GM-C/160426_CEERD-GMC_Va

If the Contractor intends to use a laboratory that is not presently validated by the Corps, the Contractor shall provide to the MTC no later than seven (7) days after issuance of Notice to Proceed: 1) a copy of the proposed laboratory's AASHTO accreditation certificate and applicable AMRL/CCRL inspection reports, and 2) a copy of the desk audit validation request, available from http://acwc.sdp.sirsi.net/client/en_US/search/asset/1045309 , for independent validation and desk audit by MTC. The cost for validation by the MTC shall be the responsibility of the Contractor. Copies of the desk audit validation request shall be provided for acceptance by the Contracting Officer or designated representatives on-site. The above information shall be submitted for Government Approval as part of the Contractor's Quality Control Plan.

The Contractor may elect to establish an on-site laboratory for its own purposes, but test results from this operation may not be substituted or used for QC purposes.

Field in-place density shall be determined in accordance with ASTM D 1556 . When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompacted to meet specification requirements. Tests on recompacted areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. 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

One test per 5 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM C 136 .

3.17.2 In-Place Densities

a. One test per 5 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.

b. One test per 5 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.

c. One test per 3 linear feet, or fraction thereof, of each lift of embankment or backfill for airfields.

d. One test per 3 linear feet, or fraction thereof, of each lift of embankment or backfill for railroads.

3.17.3 Check Tests on In-Place Densities

If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 as follows:

a. One check test per lift for each 5 square feet, or fraction thereof, of each lift of fill or backfill compacted by other than hand-operated machines.

b. One check test per lift for each 10 square feet, of fill or backfill areas compacted by hand-operated machines.

c. One check test per lift for each 5 linear feet, or fraction thereof, of embankment or backfill for airfields.

d. One check test per lift for each 10. linear feet, or fraction thereof, of embankment or backfill for railroads.

3.17.4 Moisture Contents

In the stockpile, excavation, or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions shall be performed. During unstable weather, tests shall be made as dictated by local conditions and approved by the Contracting Officer.

3.17.5 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 10 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.17.6 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

3.18 DISPOSITION OF SURPLUS MATERIAL

Surplus material or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber shall be removed from Government property as directed by the Contracting Officer.

-- End of Section --

SECTION 31 11 00

CLEARING AND GRUBBING
08/08

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. Submit the following in accordance with Section 01 30 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Nonsaleable Materials; G

SD-04 Samples

1.2 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the site, and handle in a manner which will maintain the materials in their original manufactured or fabricated condition until ready for use.

PART 2 PRODUCTS

2.1 MATERIALS

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Protection

3.1.1.1 Roads and Walks

Keep roads and walks free of dirt and debris at all times.

3.1.1.2 Trees, Shrubs, and Existing Facilities

Provide protection in accordance with Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS. Protect trees and vegetation to be left standing from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.1.1.3 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 repair 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.

3.2 CLEARING

Clearing shall consist of the felling, trimming, 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. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work. Trees, stumps, roots, brush, and other vegetation in 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. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1-1/2 inches or more in diameter and shall be trimmed of all branches the heights indicated or directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an approved tree-wound paint. Apply herbicide in accordance with the manufacturer's label to the top surface of stumps designated not to be removed.

3.2.1 Grubbing

Grubbing consists of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas. Remove material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, 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. Fill depressions made by grubbing with suitable material and compact to make the surface conform with the original adjacent surface of the ground.

3.3 DISPOSAL OF MATERIALS

3.3.1 Nonsaleable Materials

Written permission to dispose of such products on private property shall be filed with the Contracting Officer. 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. Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed.

-- End of Section --

SECTION 31 16 00

CENTRIFUGALLY CAST CONCRETE PIPE
03/17

PART 1 GENERAL

The work specified herein consists of the repair of culverts by the installation of a cementitious lining centrifugally cast in place for the waterproofing, sealing, structural reinforcement and corrosion protection of existing concrete culvert pipe, corrugated steel culvert pipe, and other material culvert pipe. The centrifugally cast concrete pipe (CCCP) liner should extend over the specified length forming a continuous concrete pipe within a pipe.

These repair means and methods may be engineered for the depth, diameter, shape, traffic loading, groundwater pressures and condition of each pipe segment.

1.1 REFERENCES

This specification references the following ASTM standards which are made a part hereof by such reference and shall be the latest edition and revision thereof. In the event that there are found to be conflicting requirements between this specification and these referenced documents, this specification will govern.

ASTM INTERNATIONAL (ASTM)

ASTM C109/C109M	(2012) Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
ASTM C1202	(2012) Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
ASTM C293	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)
ASTM C403/C403M	(2008) Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
ASTM C469/C469M	(2010) 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 (2012) Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear

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. Submit the following in accordance with Section 01 30 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Dewatering Work Plan; G
Flow Bypass Work Plan; G

SD-03 Product Data

Mortar Material Design; G, AE
Repair Mortar Material; G, AE
Lining Mortar Material; G, AE

SD-05 Design Data

Wall Thickness Design; G, AE

SD-06 Test Reports

Sampling And Testing; G

1.3 QUALITY CONTROL

1.3.1 Safety

The Contractor shall carry out his operations in strict accordance with all applicable OSHA standards. Particular attention is drawn to those safety requirements involving entering confined spaces.

1.3.2 Contractor

Submit for approval, Contractor qualifications verifying 5 years of experience.

1.3.3 Lining

Submit for approval, lining system certification including third-party references, and a minimum of 5 state DOT approvals including at least one state that has done material testing and evaluation.

1.3.4 Sampling and Testing

Sampling and testing is the responsibility of the Contractor.

Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor, subject to approval. A minimum of nine test cubes of the mortar material shall be taken randomly per day to verify strengths at 24 hours, 7 days and 28 days. Thickness can be verified with a wet gage at any random point of the new interior surface. Any areas found

to be thinner than the specified minimum shall immediately receive additional material.

Visual inspection should verify a leak-free, uniform appearance.

PART 2 PRODUCTS

2.1 CEMENTITIOUS LINING

The materials of the cementitious lining, mortar material design, repair mortar material and lining mortar material shall meet the following requirements:

2.1.1 Invert Repair Mortar

The material used in the repair of the missing or deteriorated pipe invert 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. 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 lb/yd3.

The finished, hardened material shall be dense and highly impermeable; the result of a complex formulation of mineral, organic and densifying agents and sophisticated chemical admixtures. 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.

PHYSICAL PROPERTIES	
Set Time at 70 F ASTM C403/C403M	
Initial Set	Approx. 150 min
Final Set	Approx. 240 min
Flexural Strength ASTM C293	
24 hours	min. 800 psi
28 days	min. 1200 psi
Compressive Strength ASTM C109/C109M	
24 hours	5,000 psi
28 days	11,500 psi
Split Tensile Strength ASTM C496/C496M	700 psi
Shear Bond ASTM C882/C882M	1,720 psi
Modulus of Elasticity ASTM C469/C469M	

28 days	min. 3.48 10 psi
Freeze Thaw ASTM C666/C666M	300 Cycle Pass

2.1.2 Pipe Lining Mortar

The pipe lining material shall be a high strength, high build, abrasion resistant and corrosion resistant mortar, based on advanced cements and additives. 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. In addition and due to its properties no more than 10% fly ash shall be permitted in the design. When used, fly ash shall be qualified by state source, type, and content. 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 pipe within a pipe. The above stated performance shall be achieved by a complex formulation of mineral, organic and densifying agents and sophisticated 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 resultant composition shall possess excellent thin-section tough- ness, 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.

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, wood, plastic or other normal construction materials.

The physical properties of the lining mortar shall be as follows:

PHYSICAL PROPERTIES	
Set Time at 70 F ASTM C403/C403M	
Initial Set	Approx. 150 min.
Final Set	Approx. 240 min.
Flexural Strength ASTM C293	
24 hours	min. 600 psi
28 days	min. 1340 psi
Compressive Strength ASTM C109/C109M	
24 hours	3,000 psi
28 days	8,000 psi

Split Tensile Strength ASTM C496/C496M	682 psi
Shear Bond ASTM C882/C882M	2,100 psi
Modulus of Elasticity ASTM C469/C469M	
28 days	min. 3.0 10 psi and not to exceed 5.0 10 psi
Freeze Thaw ASTM C666/C666M	300 Cycle Pass
Coulomb Rating	<75
Chloride permeability ASTM C1202	NYS DOT passed

2.1.3 Mortar Materials

Mortar material design must be an engineered cementitious mortar material designed specifically for the pipe rehabilitation application. Culvert and storm sewer piping is constructed from a variety of materials including, but not limited to; concrete, brick, corrugated metal pipe (with either a galvanic, bituminous, aluminized, or plastic coating), The proposed equal must be capable of adhering to these materials without compromising its densification until the material has its initial set.

2.1.3.1 Thixotrophy

The cement mortar mix must possess the ability to liquefy (or experience a significant decrease in viscosity) when a stress is applied (i.e. stirred) that creates a fluid mixture that can be transported (i.e. pumped) distances up to 500 feet without separating; and once cast into place on the wall of the host pipe structure quickly revert (experience a dramatic increase in viscosity returning to its pre-stressed viscosity) to the provide sufficient "hang-time" for the mortar applied to take its initial set.

2.1.3.2 Permeability

The level of permeability of the hardened liner must be classified as "negligible" per the table in the cited ASTM C1202. The testing documentation should show that the coulomb values from a statistically significant number of test batches are demonstrated to be below the 75 coulomb threshold values for meeting this classification.

2.1.3.3 Modulus of Rupture

Given that the owner wants to minimize the need for additional reinforcement beyond the mix of fibers incorporated into the mix design; testing done verifying the modulus of rupture for the proposed material must be submitted for review. Testing reports generated by a third-party lab should also include the stress-strain curves generated by the testing to show the shape of the trailing part of the curve.

2.1.3.4 Rate of Compressive Strength Gain

Third-party testing shall be submitted which demonstrates the relationship between the time of placement and the gain in compressive strength of the

proposed mortar mix. The results shall be presented in a graphical format to demonstrate the anticipated compressive strength at 1, 3, 8, and 24 hours; and 1, 7, 14, 28, and 56 days. Curves should be fitted to these test values and equations of the fit and the accuracy of the fit (the "R" value) shall be displayed on these two plots.

2.1.3.5 Freeze-Thaw Performance

Beyond the test results of the ASTM C666/C666M; where the project is deemed to be susceptible to actual freeze-thaw action, the supplier of the proposed mix design shall submit a reference list of installations in this demanding type of environment. List shall indicate the date of the install and whether or not there have been follow-up inspections to verify this performance parameter.

2.1.3.6 This-Shell Toughness

Is a function of the use of multiple fiber types that aid in increasing the ductility of the hardened liner; and imparting greater abrasion resistance, impact resistance, and shatter resistance. The engineered cementitious mortar material shall provide third-party testing that demonstrates these engineering science properties have been addressed in the mix design via appropriate qualifications based testing.

2.2 WALL THICKNESS DESIGN

The wall thickness design shall be based upon the compressive and bending strength performance parameters of the liner material. The design loading shall be the sum of any changes in the cover depth after the liner's installation (or other dead loads) and the appropriate highway truck loading for the culvert pipe taking into account the type of soil used for the road's fill and the type of pavement structure (rigid or flexible) at the surface. The calculated minimum finished thickness of the liner shall be based on a maximum possible crack width of 0.0625-inches with a minimum factor of safety of 2.0.

The Liner thickness shall be applied to the thickness specified by the material manufacturer but at no point shall it be less than the required minimum of ½-inch measured from the peaks of the wall surface for smooth wall pipe and the crests of the corrugations for corrugated pipe walls. Where the fabrication of the wall section utilizes nuts and bolts or rivets, the required minimum thickness must also insure that the projections of these fasteners will be at least 0.5 inches.

PART 3 EXECUTION

3.1 FLOW CONTROL

The Contractor shall provide for the flow of water around the culvert where the rehabilitation is located. The bypass shall be made by damming the line at the upstream end and diverting the flow into an adjacent pipe barrel or by pumping, as authorized by Contracting Officer. Contractor to submit a Flow Bypass Work Plan as part of the Dewatering Work Plan for approval by the Contracting Officer.

3.2 TV INSPECTION

Inspection of pipelines shall be performed by experienced personnel trained in locating breaks and obstacles by closed-circuit television.

The interior of the pipeline shall be carefully inspected to determine the location of any conditions which may prevent proper installation, and it shall be noted so that these conditions can be corrected. A videotape and suitable log shall be kept for later reference by Base Engineer.

3.3 OBSTRUCTION REMOVAL

Pipelines shall be cleared of obstructions such as solids, dropped joints, roots or collapsed pipe that will prevent installation of the liner. If an internal inspection reveals an obstruction that cannot be removed by conventional cleaning equipment, then the Contractor shall notify the Contracting Officer. The Contracting Officer may instruct the Contractor to make a point repair excavation to remove or repair the obstruction. Such excavation shall be approved in writing by the Contracting Officer prior to the commencement of the work.

3.4 INFILTRATION CONTROL

All active infiltration must be stopped. Pools of water shall be removed; however, a completely dry surface is not required. The Contractor shall patch holes and fill voids with a Plug and/or Patch.

3.5 SOIL STABILIZATION

All voids behind the pipe wall must be filled with an approved slurry or chemical grout.

3.6 CLEANING

All debris shall be removed from the sewer. The interior surface shall be cleaned with a high-pressure water-blast sufficient to remove all laitance and loose material and flush debris from the pipe. Upon final inspection the pipe shall be free of sand, dirt and all other laitance that may impede the placement of the lining material.

3.7 CENTRIFUGALLY CAST CONCRETE PIPE(CCCP) INSTALLATION

The Contractor shall combine dry mix with the manufacturer's specified amount of potable water with mixing to be accomplished with a high-speed shear type mixer until proper consistency is obtained. The Contractor shall continue to agitate the mortar to prevent thickening beyond the desired fluidity.

The Contractor shall position the bi-directional rotating spincaster within the 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 best speed for applying the thickness that has been specified. 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. Rotation direction of the spincaster shall be changed with each subsequent pass. Throughout the application process the Contractor shall verify the thickness using an appropriate tool.

3.7.1 Hot Weather Application (Above 80 F) per ACI 305.1M-14:

The Contractor shall not apply the mortars when the ambient air and/or surface temperature of the culvert pipe is 100° F or higher. Shade the

material and prepared 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 (Above 45 F) per ACI 306-10:

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 at least 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. Properly ventilate the area when heating. Protect the new liner from freezing.

3.8 CURING/FINISHING

The Contractor shall use an ASTM C309 or ASTM C1315 conforming curing compound.

-- End of Section --

SECTION 32 01 13.63

GILSONITE MODIFIED ASPHALT EMULSION SEAL COATS
02/16

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 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 D140/D140M	(2016) Standard Practice for Sampling Asphalt Materials
ASTM D1474/D1474M	(2013) Standard Test Method for Indentation Hardness of Organic Coatings
ASTM D2007	(2011) Standard Test Method for Characteristic Groups in Rubber Extender and Processing Oils and Other Petroleum-Derived Oils by the Clay-Gel Absorption Chromatographic Method
ASTM D2042	(2015) Standard Test Method for Solubility of Asphalt Materials in Trichloroethylene
ASTM D244	(2009) Emulsified Asphalts
ASTM D2995	(1999; R 2009) Determining Application Rate of Bituminous Distributors
ASTM D4402/D4402M	(2015) Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer
ASTM D5	(2006; E 2006) Penetration of Bituminous Materials
ASTM D75/D75M	(2014) Standard Practice for Sampling Aggregates

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 150/5320-12	(1997, Rev C; Change 1-3, 5 and 6) Measurement, Construction and Maintenance of Skid-Resistant Airport Pavement Surfaces

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD (2009) Manual on Uniform Traffic Control Devices

1.2 SYSTEM DESCRIPTION

1.2.1 Equipment, Plant and Tools

Equipment, plant and tools used in the work are subject to Government approval and must be maintained in a satisfactory working condition at all times. Provide equipment which is adequate and has the capability of producing the results specified. Provide calibrated equipment, such as asphalt distributors, spreaders and similar equipment, that has been recalibrated by an approved calibration laboratory within 12 months prior to commencing work and every 6 months thereafter, by such laboratory from the date of recalibration, during the term of the contract. Submit an equipment list with calibration reports.

1.2.2 Asphalt Distributors

The emulsion must be applied with an equipment manufacturer-approved computer rate-controlled bituminous distributor. The equipment must be in good working order and contain no contaminants or diluents in the tank when product to be applied is added to the tank. Spreader bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight miles per hour or 700 feet per minute. Test the equipment under pressure for leaks and to ensure it is in good working order before use.

The distributor truck must be equipped with a 12 foot, minimum, spreader bar with individual nozzle control. The distributor truck must be capable of specific application rates in the range of 0.05 to 0.25 gallons per square yard. These rates must be computer-controlled rather than mechanical. The distributor truck must have an easily accessible thermometer that constantly monitors the temperature of the emulsion.

In the event of a temperature problem with the material, a distributor truck will be provided that is equipped to effectively heat and mix the material to the required temperature prior to application. Heating and mixing will be done in accordance with the manufacturer's recommendations. Care must be taken not to overheat or over mix the material.

The distributor must be equipped to hand spray the emulsion in areas identified either on the plans or by the Contracting Officer.

1.2.3 Aggregate Spreader

The asphalt distributor truck will be equipped with an aggregate spreader that can apply sand to the emulsion in a single pass operation without driving through wet emulsion. The aggregate spreader must be equipped with a variable control system capable of uniformly distributing the sand at the specified rate at varying application widths and speeds. Spinner type equipment will be acceptable. The sander must have a minimum hopper capacity of at least 3,000 pounds of sand. Push-type hand sanders will be allowed for use around lights, signs and other obstructions.

1.2.4 Power Brooms and Power Blowers

A power broom or blower must be provided for removing loose material from the surface to be treated.

1.2.5 Vacuum Sweepers

Provide self-propelled, vacuum pickup sweepers capable of removing loose sand, water, and debris from pavement surface. Vacuum sweepers with steel bristle will not be allowed.

1.2.6 Equipment Calibration

For the calibration of the aggregate spreader, only option b. is permitted unless aggregate spreader has been calibrated with the same aggregate within the last six months. Equipment calibration for emulsion may be achieved by either one of the two following procedures:

a. First Procedure: Contractor to furnish a State Calibration Certification for the asphalt emulsion distributor, from any state providing that service, or other acceptable agency certification at the approval of the Contracting Officer, and the calibration date must have been within 6 months of the contract award, or up to 12 months if supporting documents substantiate continuous work using the same distributor.

b. Second Procedure: Furnish all equipment, materials and labor necessary to calibrate the asphalt emulsion distributor and the aggregate spreader. Perform all calibrations with the approved job materials and prior to applying the specified coatings to the prepared surface. Perform calibration of the asphalt emulsion distributor in accordance with ASTM D2995. Perform work to calibrate the tank and measuring devices of the distributor. Perform inspection and calibration at the beginning of the work and at least once a day during construction.

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 30 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Contractor Qualifications; G

Provide copies of Qualifications.

Manufacturer Representative’s Experience

Material Performance

Equipment List; G, AE

List of equipment used in the project along with calibration reports.

Friction Test that includes date, time, weather, speed, wet or dry

and operator name for each run of each test; G, AE

Inspection Reports; G, AE

Provide reports and all Quality Assurance records daily when application is made.

SD-04 Samples

Gilsonite Modified Asphalt Emulsion

Aggregates

Provide in accordance with Field Quality Control.

SD-06 Test Reports

Manufacturer's Certificate of Compliance for Bituminous Material,

Manufacturer's Certificate of Compliance for Aggregates

Recommendation by contractor/manufacturer from results of test section application.

Any additional testing as requested by Contracting Officer

Bituminous Materials; G, AE

1.4 QUALITY ASSURANCE

Provide copies of Contractor Qualifications for applicators, personnel and equipment, Certified by Manufacturer to apply product and to have made three (3) applications similar to this project in past two (2) years. Include details of previous work, schedule adherence, quality of workmanship, materials and name and work phone of contracting officer's points of contact.

Obtain Manufacturer's Certificate of Compliance for emulsion and aggregates. Obtain samples at time of delivery to the field as necessary to satisfy the requirements herein.

1.4.1 Manufacturer's Representation

The manufacturer’s representative must have knowledge of the material, procedures, and equipment described in the specification and must be responsible for determining the application rates and must oversee the preparation and application of the seal coat product. Documentation of the manufacturer representative’s experience and knowledge for applying the seal coat product must be furnished to the Contracting Officer a minimum of 10 work days prior to placement of the test sections. The cost of the manufacturer’s representative must be included in the bid price.

1.4.2 Samples

Take aggregate samples for laboratory tests in accordance with ASTM D75/D75M. Take samples of gilsonite modified asphalt emulsion in accordance with ASTM D140/D140M.

1.4.3 Aggregates Source

Select sources from which aggregates are to be obtained and notify the Contracting Officer within days after the award of the Contract. Perform tests for the evaluation of aggregates by using an approved commercial laboratory at no expense to the Government. Tests for determining the suitability of aggregate must include: gradation in accordance with ASTM C136/C136M, and ASTM C117 and must be within the last six months. Independent laboratory testing is required for all new aggregate sources.

1.4.4 Gilsonite Modified Asphalt Emulsion Source

The Contractor must furnish the vendor's certified test reports for bituminous materials, in its concentrated form, to the Contracting Officer, showing that the material meets the properties of Table 1. Bituminous materials must meet the properties of Table 2 and Table 3.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver gilsonite modified asphalt emulsion to the site in a homogenous and undamaged condition. Inspect the materials for contamination and damage. Unload and store the materials with a minimum of handling. Protect stored aggregate from contamination and segregation. Replace defective or damaged materials.

1.6 ENVIRONMENTAL REQUIREMENTS

Apply the coating when the existing surface is dry, and when the weather is not foggy, rainy, or when the wind velocity will prevent the uniform application of the material. Apply gilsonite modified asphalt emulsion seal coat only when both the atmospheric temperature and the pavement surface temperature are above 60 degrees F, unless otherwise directed.

PART 2 PRODUCTS

2.1 GILSONITE MODIFIED ASPHALT EMULSION

The bituminous material must be a gilsonite modified asphalt emulsion. The material must meet the following requirements of the applicable portions of Table 1, 2, and 3.:

Table 1: Concentrated Bituminous Material Properties

Properties	Specification	Limits
Saybolt Furol Viscosity at 77 deg F	ASTM D244	20-100 seconds
Residue by Distillation or Evaporation	ASTM D244	57 percent minimum
Sieve Test	ASTM D244	0.1 percent maximum
24-hour Stability	ASTM D244	1 percent maximum

Table 1: Concentrated Bituminous Material Properties

Properties	Specification	Limits
5-day Settlement Test	ASTM D244	5.0 percent maximum
Particle Charge pH, cationic (see Note 1)	ASTM D244	Positive 6.5 percent maximum pH

Note 1: pH may be used in lieu of the particle charge test which is sometimes inconclusive in slow setting, bituminous emulsions.

The bituminous material concentrate must be diluted with heated water prior to application. The bituminous material, when diluted in the volumetric proportion of one part hot water to one part concentrate must meet the requirements shown in Table 2.:

Table 2: 1 Part Bitumen : 1 Part Water Dilution Emulsion Properties (see Note 2)

Properties	Specification	Limits
Saybolt Furol Viscosity at 77 deg F	ASTM D244	10-50 seconds
Residue by Distillation or Evaporation	ASTM D244	28.5 percent minimum
Pumping Stability (see Note 3)		Pass

Note 2: In ready-to-apply form by volume.

Note 3: Pumping stability is tested by pumping 1 pint of diluted material at 77 deg F,through a 1/4 inch gear pump operation 1,750 rpm for 10 minutes with no significant separation or coagulation.

The bituminous base residue must contain not less than 20 percent uintaite or gilsonite, and must not contain any tall oil pitch or coal tar material. This must be stated in the Manufacturer's Certificate of Compliance for bituminous material. The material must be compatible with asphaltic concrete, and have a 5-year minimum proven performance record at airports with similar climatic conditions. Curing time, under recommended application conditions, must not exceed eight hours.

Table 3: Emulsion Residue by Distillation or Evaporation Tests

Properties	Specification	Limits
Viscosity at 275 deg F	ASTM D4402/D4402M	1,750 cts maximum
Solubility in 1, 1, 1 trichloroethylene	ASTM D2042	97.5 minimum
Penetration	ASTM D5	50 dmm maximum
Asphaltenes	ASTM D2007	15 percent minimum
Saturates	ASTM D2007	15 percent maximum
Polar Compounds	ASTM D2007	25 percent minimum
Aromatics	ASTM D2007	15 percent minimum

The Contractor must furnish vendor's certified test reports showing that the material is the type, grade and quality specified for each load of bituminous material delivered to the project. The certification must also show the shipment number, refinery, consignee, destination, contract number and date of shipment. The test reports and certification must be delivered to the Contracting Officer before permission is granted to use the material. The furnishing of the vendor's certified test report for the bituminous material must not be interpreted as a basis for final acceptance. The manufacturer's material test report certification may be subject to verification by testing the material delivered for use on the project.

The bituminous material storage and handling temperature must be between 50 deg F - 160 deg F and the material must be protected from freezing, or whenever outside temperature drops below 40 deg F for prolonged time periods.

2.2 AGGREGATE

The aggregate material must be a dry, clean, dust and dirt free, sound, durable, angular shaped manufactured specialty sand, such as that used as an abrasive, with a Mohs hardness of 6 to 8. The Contractor must submit manufacturer’s technical data and a manufacturer’s certification indicating that the specialty sand meets the requirements of the specification to the Contracting Officer prior to start of construction. The sand must be approved for use by the Contracting Officer and must meet the following gradation limits when tested in accordance with ASTM C136/C136M and ASTM C117:

Table 4: Aggregate Material Gradation Requirements

Sieve Size	By Weight Min/Max
No. 8	0
No. 16	0-8
No. 30	20-78
No. 50	10-85
No. 100	0-7
No. 200	0-2

The Contractor must submit gradation and manufacturer's specification for review at or prior to the pre-bid for approval. The gradations in the chart represent the limits in determining aggregate source suitability for use in the bituminous surface treatment. The final gradations approved, within the limits designated in Table 4, must provide sufficient friction levels to meet the Minimum Friction Level in Table 3-2, "Friction Level Classification for Runway Pavement Surfaces" of FAA AC 150/5320-12.

2.2.1 Material Performance

Friction tests previously performed in accordance with FAA Advisory Circular, FAA AC 150/5320-12, at 40 and 60 mph-wet, must be submitted showing, as a minimum; friction value of pavement surface prior to sealant application; two values, test between 24 and 96 hours after application, with a minimum of 24 hours between tests; and one value test at no less than 90 days or greater than 360 days after the application. The results of the two tests between 24 and 96 hours must indicate friction is increasing at a rate to obtain similar friction value on the 90th day as the original friction value, and the long term test must indicate no apparent adverse effect with time relative to friction values and existing pavement surface.

The contractor must submit a list of airports which meet the above requirements, as well as technical details on application rates, aggregate rates, and point of contact at these airports to confirm use and success of sealer with aggregate. Friction tests must be submitted from no less than one of the airports on the list and each set of tests described above, must be from one project.

Seal coat material submittal without required friction performance will not be approved. Friction tests performed on this project, if any, cannot be used as a substitute of this requirement.

2.2.2 MOHS Hardness

MOHS hardness must be within 6-8 in accordance with ASTM D1474/D1474M.

2.3 POLYMER

Vinyl acrylic polymer must be approved for use by the manufacturer of the bituminous material for compatibility and must meet the requirements provided in Table 5:

Table 5: Polymer Properties

Properties	Limits
Solids Content	52-57 percent by weight
Weight	8.4-9.4 pounds per gallon
pH	4.0 to 6.0
Particle Charge	Nonionic/Anionic
Mechanical Stability	Excellent
Film Forming Temperature	41 deg F, minimum
Tg	71.6 deg F, maximum

The Contractor must submit manufacturer's specifications for the vinyl acrylic polymer with the bituminous materials submittal for review and approval.

2.4 WATER

Water used in diluting the emulsion must be potable, free from harmful soluble salts and chemicals, and at least 100 deg F.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACE

Provide Inspection Reports of; air and surface temperature during application of seal coat, emulsion temperature and rate of application, dilution rate used, adequacy of surface cleaning and preparation, aggregate rate of application, and protection of site facilities as applicable, each day of application.

Repair and patch all major pavement defects in accordance with the following subparagraphs. All cracks sealed with a joint sealant compatible with the emulsion prior to application of the emulsion.

3.1.1 Hairline Cracks

Cracks that are less than 1/4 inch wide do not need to be sealed.

3.1.2 Small Cracks

Cracks that are 1/4 to 3/4 inch wide must be routed to a nominal width 1/8 inch greater than the existing nominal width and to a depth not less than 3/4 inch, waterblasted and cleaned using compressed air.

3.1.3 Medium Cracks

Cracks that are 3/4 to 2 inches wide must be waterblasted and cleaned using compressed air.

3.1.4 Large Cracks

Cracks that are greater than 2 inches wide must be repaired using pothole repair techniques instead of sealing.

3.1.5 Cleaning Operations

Provide a clean surface for the seal coat. If considered necessary by the manufacturer's representative and is approved by the Contracting Officer, flushing with water will be permitted. Water will be made available for the contractor's use from a hydrant location within 1 mile(s) of the project site at prevailing Government rates. The contractor must provide tools, hoses and hauling equipment for providing and dispensing of the water.

Immediately before applying the sealcoat, the asphalt surface to be treated must be free of all dirt, sand, vegetation, loose paint, excessive oil or grease, rubber deposits or other objectionable material. The surface must be cleaned with a power broom or power blower supplemented by hand sweeping or any other means required to remove deleterious matter to the satisfaction of the Contracting Officer.

3.1.6 Weather Limitations

The asphalt emulsion shall be applied only when the existing pavement surface is dry and when the weather is not foggy, rainy, or when the wind velocity will prevent the uniform application of the material. No material shall be applied when dust or sand is blowing or when rain is anticipated within eight hours of application completion. The atmospheric temperature and the pavement surface temperature shall both be above 60 deg F. During application, account for wind drift.

3.1.7 Protection of Site Facilities

Cover existing buildings, structures, runway edge lights, taxiway edge lights, informational signs, retro-reflective marking and in-pavement duct markers as necessary before applying the emulsion. Should emulsion get on any light or marker, clean property promptly. If cleaning is not satisfactory to the Contracting Officer, the Contractor must replace any light, sign or marker with equivalent equipment at no cost to the Government.

3.2 GILSONITE EMULSION MIXING

The application emulsion must be obtained by blending bituminous material concentrate, polymer and water. Always add heated water to the bituminous material concentrate; never add bituminous material concentrate to heated water. Add one percent polymer, by volume, to the emulsion mix. If the

polymer is added to the emulsion mix at the plant, submit weigh scale tickets to the Contracting Officer. As an option, the polymer may be added to the emulsion mix at the job site provided the polymer is added while the circulating pump is running. The mix must be agitated for a minimum of 15 minutes or until the polymer is mixed to the satisfaction of the Contracting Officer.

3.3 QUANTITIES OF MATERIAL PER SQUARE YARD

The approximate amounts of materials per square yard for the bituminous surface treatment must be as provided in Table 6 for the treatment area(s) at the specified dilution rate(s) as noted on the plans. The exact amounts to be used must be determined by the results of the test section program as directed by the Contracting Officer. Pavements with more progressive deterioration issues may require heavier than normal application rates for emulsion and aggregate. In such cases a manufacturer's representative should be consulted as directed by the Contracting Officer.

Table 6: Application Rate

Dilution Rate	Gilsonite Modified Asphalt Emulsion gal/yd2	Quantity of Aggregate lbs/yd2
1:1 Gilsonite Modified Asphalt Emulsion	0.10-0.15	0.20-0.50

3.3.1 Application of Gilsonite Modified Asphalt Emulsion

The emulsion must be applied upon the properly prepared, clean and dry surface at the application rate approved by the Contracting Officer for each designated treatment area. The emulsion temperature must be at a temperature at or above 130 deg F, but not exceeding 160 deg F or in accordance with the manufacturer's recommendation using a pressure distributor to obtain uniform distribution at all points.

During all applications, the surfaces of adjacent structures must be protected in such manner as to prevent their being spattered or marred. Bituminous materials must not be discharged into borrow pits or gutters or upon the airport area.

3.3.2 Application of Aggregate

The emulsion, along with sand at the rate specified for each designated application area must be spread uniformly over the emulsion in a single pass from a sanding attachment to the asphalt distributor. The aggregate must be spread in the same width of application as the bituminous material and must not be applied in such thickness as to cause overspreading.

Sprinkling of additional aggregate material, and spraying additional bituminous material over areas that show up having insufficient cover or bitumen, must be done by hand whenever necessary. In areas where hand work is necessitated, the sand must be applied before the sealant begins to break.

Sanding must be performed in a manner so as to prevent appreciable amounts of sand from going onto any pavement prior to the emulsion being applied. The Contractor must clean up areas with excess or loose sand and dispose of

off airport property.

3.4 TEST SECTIONS AND AREAS

Prior to production seal coating applying the seal coat, place up to 3 test sections at a location determined by the Contracting Officer approximately 25 feet long by a minimum of 8 feet wide in a single pass of equipment using the approved job materials in accordance with the specification requirements, unless noted otherwise. Perform tests to determine the application rates of the asphalt emulsion and aggregate. Test sections must be performed on pavement areas that are not considered critical to operations. Vary the application rates along the longitudinally along the test section in order to effectively evaluate the pavement absorption rates. If the tests indicate that the seal coat test section does not conform to the specification requirements, make necessary adjustments to the application equipment and to the spreading procedures, and construct additional test sections for conformance to the specifications. Where test sections do not conform to specification requirements, repair or remove seal coat at no expense to the Government; no separate payment will be made for seal coat materials and labor, either in placement or removal of any test section. Removal of seal coat must be performed only if 500 feet of length or greater on a runway surface do not meet the friction requirements of FAA AC 150/5320-12. Perform quality control sampling and testing during construction as specified in paragraph FIELD QUALITY CONTROL. Test sections must be performed in the presence of the Contracting Officer and the Seal Coat Manufacturer's Representative (SCMR). Notify the Contracting Officer 15 days prior to the planned test section date. The SCMR must recommend to the Contracting Officer application rates of materials used in production seal coating. The Contracting Officer must approve the application rates prior to production seal coating.

A qualified manufacturer's representative must be present in the field to assist the Contractor in applying test areas or test sections to determine the optimum rate of application of both sealant and sand.

A test area or section must be applied for each differing HMA pavement surface identified in the project. The test area or sections must be used to determine the material application rate(s) of both sealant and sand prior to full production. The same equipment and method of operations must be utilized on the test section(s) as will be utilized on the remainder of the work.

a. For Taxiway, Taxilane and Apron Surfaces - Prior to full application, the Contractor must place test areas at application rate(s) stipulated by the Contracting Officer or judged necessary by the manufacturer's representative to determine proper application rate. The area to be tested will be designated by the Contracting Officer and will be located on a representative section of the pavement to receive the bituminous surface coat.

   If the test area should prove to be unsatisfactory, necessary adjustments to the application rate, placement operations, and equipment must be made. Additional test areas must be placed and evaluated, if required. Full production must not begin without the Contracting Officer's approval.

b. For Runway and High Speed Taxiway Exit Surfaces - If friction testing is required by the contract, the Contractor will test according to FAA AC 150/5320-12. The contractor must place a series of friction

test sections a minimum of300 feet long by 8 feet wide at application rate(s) determined by application test sections and areas. The area to be tested will be located on a representative section of the pavement to receive the bituminous surface coat.

The Contractor must perform tests for skid resistance of the test sections after a time frame determined by the contractor, manufacturer's representative (if present), and the Contracting Officer. Full application can proceed when the results of the friction evaluation are equal to or greater than the Maintenance Minimum levels provided in Table 3-2, "Friction Level Classification for Runway Pavement Surfaces," in FAA AC 150/5320-12. Documentation will be provided by the manufacture that demonstrates a history of rapid increase of pavement friction to above Maintenance Planning levels provided in Table 3-2 and returning to pre-application numbers shortly thereafter.

If the test section should prove to be unsatisfactory, necessary adjustments to the application rate, placement operations, and equipment must be made. Additional test sections must be placed and evaluated, if required. Full production must not begin without the Contracting Officer's approval.

3.5 FIELD QUALITY CONTROL - SEAL COAT

3.5.1 Aggregate Gradation

Perform gradation tests in accordance with ASTM C136/C136M when directed by the Contracting Officer. When the source of materials is changed or deficiencies are found, the gradation must be repeated and the material already placed must be retested to determine the extent of the unacceptable material where friction issues exist. Replace all in-place unacceptable material or re-apply seal coat material conforming to the specification as directed by Contracting Officer at no additional expense to the Government.

3.5.2 Gilsonite Modified Asphalt Emulsion Sample

Obtain a sample of the asphalt emulsion used under the supervision of the Contracting Officer. The sample will be retained by the contractor until the completion of the project and must be turned over to the government upon request of the Contracting Officer.

3.5.3 Water Compatibility Test

In some localities an incompatibility may exist between the asphalt emulsion and the water to be used for dilution due to their characteristics. Clear, potable water should be used. No less than thirty days prior to commencing work, one half pint of the proposed asphalt emulsion and one half pint of the proposed water must be combined, agitated, and allowed to sit for a period of 24 hours to test their compatibility. If they prove to be incompatible, indicated by separation of the emulsion, clotting, particles settling or other adverse properties from mixing with water, an approved chemical treatment must be provided for all water used for dilution or a different and compatible source of water must be selected. Report results to the Contracting Officer.

3.5.4 Application Inspection

Inspect application of seal coat for uniformity. Furnish a written report within 24 hours of testing citing air and surface temperature during

application, emulsion temperature during application, dilution rate, and rate of emulsion application determined from testing compared to the approved production rates.

3.6 TRAFFIC CONTROL

Protect freshly placed coatings from damage by traffic. Provide sufficient warning signs and barricades to prevent traffic over freshly treated surfaces. Protect treated areas from traffic for at least 2 hours after final application of seal coat material, or for such time as necessary to prevent picking up. Immediately prior to opening for subsequent construction operations (markings) or traffic, broom and vacuum to remove loose material only after material has completely cured. Provide warning signs and barricades for proper traffic control in accordance with MUTCD.

-- End of Section --

SECTION 32 01 19

FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS
08/08

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 C1016	(2014) Standard Test Method for Determination of Water Absorption of Sealant Backing (Joint Filler) Material
ASTM D5893/D5893M	(2016) Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D789	(2015) Determination of Relative Viscosity and Moisture Content of Polyamide (PA)

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. Submit the following in accordance with Section 01 30 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment

SD-04 Samples

Materials; G

1.3 QUALITY ASSURANCE

1.3.1 Test Requirements

Test the joint sealant and backup or separating material for conformance with the referenced applicable material specification. The materials will be tested by the Government. No material shall be used at the project prior to receipt of written notice that the materials meet the laboratory requirements. The cost of the first test of samples will be borne by the Government. If the samples fail to meet specification requirements, replace the materials represented by the sample and test the new materials at the Contractor's expense. Conformance with the requirements of the laboratory tests specified will not constitute final acceptance of the materials. Final acceptance will be based on the performance of the in-place materials. Submit samples of the materials (sealant, primer if

required, and backup material), in sufficient quantity for testing and approval 30 days prior to the beginning of work. No material will be allowed to be used until it has been approved.

1.3.2 Trial Joint Sealant Installation

Prior to the cleaning and sealing of the joints for the entire project, prepare a test section at least 20 feet long using the specified materials and approved equipment, so as to demonstrate the proposed joint preparation and sealing of all types of joints in the project. Following the completion of the test section and before any other joint is sealed, inspect the test section to determine that the materials and installation meet the requirements specified. If it is determined that the materials or installation do not meet the requirements, remove the materials, and reclean and reseal the joints at no cost to the Government. When the test section meets the requirements, it may be incorporated into the permanent work and paid for at the contract unit price per linear foot for sealing items scheduled. Prepare and seal all other joints in the manner approved for sealing the test section.

1.4 DELIVERY, STORAGE, AND HANDLING

Inspect materials delivered to the job site for defects, unload, and store them with a minimum of handling to avoid damage. Provide storage facilities at the job site for maintaining materials at the temperatures and conditions recommended by the manufacturer.

1.5 ENVIRONMENTAL REQUIREMENTS

The ambient air temperature and the pavement temperature within the joint wall shall be a minimum of 50 degrees F and rising at the time of application of the materials. Do not apply sealant if moisture is observed in the joint.

PART 2 PRODUCTS

2.1 SEALANTS

Materials for sealing cracks in the various paved areas indicated on the drawings shall be self leveling and as follows:

Area	Sealing Material
Taxiway M and L	ASTM D 5893

2.2 PRIMERS

When primers are recommended by the manufacturer of the sealant, use them in accordance with the recommendation of the manufacturer.

2.3 BACKUP MATERIALS

Provide backup material that is a compressible, nonshrinking, nonstaining, nonabsorbing material, nonreactive with the joint sealant. The material shall have a melting point at least 5 degrees F greater than the pouring temperature of the sealant being used when tested in accordance with

ASTM D789. The material shall have a water absorption of not more than 5 percent of the sample weight when tested in accordance with ASTM C1016. Use backup material that is 25 plus or minus 5 percent larger in diameter than the nominal width of the crack.

2.4 BOND BREAKING TAPES

Provide a bond breaking tape or separating material that is a flexible, nonshrinkable, nonabsorbing, nonstaining, and nonreacting adhesive-backed tape. The material shall have a melting point at least 5 degrees F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The bond breaker tape shall be approximately 1/8 inch wider than the nominal width of the joint and shall not bond to the joint sealant.

PART 3 EXECUTION

3.1 EXECUTING EQUIPMENT

Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, 30 days prior to use on the project.

3.1.1 Joint Cleaning Equipment

3.1.1.1 Tractor-Mounted Routing Tool

Provide a routing tool, used for removing old sealant from the joints, of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

3.1.1.2 Concrete Saw

Provide a self-propelled power saw, with water-cooled diamond or abrasive saw blades, for cutting joints to the depths and widths specified or for refacing joints or cleaning sawed joints where sandblasting does not provide a clean joint.

3.1.1.3 Sandblasting Equipment

Include with the sandblasting equipment an air compressor, hose, and long-wearing venturi-type nozzle of proper size, shape and opening. The maximum nozzle opening should not exceed 1/4 inch. The air compressor shall be portable and capable of furnishing not less than 150 cfm and maintaining a line pressure of not less than 90 psi at the nozzle while in use. Demonstrate compressor capability, under job conditions, before approval. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 1 inch above the pavement surface. Adjust the height, angle of inclination and the size of the nozzle as necessary to secure satisfactory results.

3.1.1.4 Waterblasting Equipment

Include with the waterblasting equipment a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle, and auxiliary water resupply equipment. Provide water tank and auxiliary resupply equipment of sufficient capacity to permit continuous operations. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 1 inch above the pavement surface. Adjust the height, angle of inclination and the size of the nozzle as necessary to obtain satisfactory results. A pressure gauge mounted at the pump shall show at all times the pressure in psi at which the equipment is operating.

3.1.1.5 Hand Tools

Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces.

3.1.2 Sealing Equipment

3.1.2.1 Cold-Applied, Single-Component Sealing Equipment

The equipment for installing ASTM D5893/D5893M single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

3.2 SAFETY

Do not place joint sealant within 25 feet of any liquid oxygen (LOX) equipment, LOX storage, or LOX piping. Thoroughly clean joints in this area and leave them unsealed.

3.3 PREPARATION OF JOINTS

Immediately before the installation of the sealant, thoroughly clean the joints to remove all laitance, curing compound, filler, protrusions of hardened concrete, and old sealant from the sides and upper edges of the joint space to be sealed.

3.3.1 Existing Sealant Removal

Cut loose the in-place sealant from both joint faces and to the depth shown on the drawings, using the concrete saw as specified in paragraph EQUIPMENT. Depth shall be sufficient to accommodate any separating or backup material that is required to maintain the depth of new sealant to be installed. Prior to further cleaning operations, remove all loose old sealant remaining in the joint opening by blowing with compressed air. Hand tools may be required to remove sealant from random cracks. Chipping, spalling, or otherwise damaging the concrete will not be allowed.

3.3.2 Sawing

3.3.2.1 Refacing of Joints

Accomplish facing of joints using a concrete saw as specified in paragraph EQUIPMENT to saw through sawed and filler-type joints to loosen and remove material until the joint is clean and open to the full specified width and depth. Stiffen the blade with a sufficient number of suitable dummy (used) blades or washers. Thoroughly clean, immediately following the sawing operation, the joint opening using a water jet to remove all saw cuttings and debris.

3.3.2.2 Refacing of Random Cracks

Accomplish sawing of the cracks using a power-driven concrete saw as specified in paragraph EQUIPMENT. The saw blade shall be 6 inches or less in diameter to enable the saw to follow the trace of the crack. Stiffen the blade, as necessary, with suitable dummy (or used) blades or washers. Immediately following the sawing operation, thoroughly clean the crack opening using a water jet to remove all saw cuttings and debris.

3.3.3 Sandblasting - Not Used

3.3.4 Back-Up Material

When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a back-up material to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

3.3.5 Bond Breaking Tape

Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond breaker separating tape to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

3.3.6 Rate of Progress of Joint Preparation

Limit the stages of joint preparation, which include sandblasting, air pressure cleaning and placing of the back-up material to only that lineal footage that can be sealed during the same day.

3.4 PREPARATION OF SEALANT

3.4.1 Single-Component, Cold-Applied Sealants

Inspect the ASTM D5893/D5893M sealant and containers prior to use. Reject any materials that contain water, hard caking of any separated constituents, nonreversible jell, or materials that are otherwise unsatisfactory. Settlement of constituents in a soft mass that can be readily and uniformly remixed in the field with simple tools will not be cause for rejection.

3.5 INSTALLATION OF SEALANT

3.5.1 Time of Application

Seal joints immediately following final cleaning of the joint walls and following the placement of the separating or backup material. Open joints, that cannot be sealed under the conditions specified, or when rain interrupts sealing operations shall be recleaned and allowed to dry prior to installing the sealant.

3.5.2 Sealing Joints

Immediately preceding, but not more than 50 feet ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/8 inch plus or minus 1/16 inch below the pavement surface. Remove and discard excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

3.6 INSPECTION

3.6.1 Joint Cleaning

Inspect joints during the cleaning process to correct improper equipment and cleaning techniques that damage the concrete pavement in any manner. Cleaned joints will be approved prior to installation of the separating or back-up material and joint sealant.

3.6.2 Joint Sealant Application Equipment

Inspect the application equipment to ensure conformance to temperature requirements, proper proportioning and mixing (if two-component sealant) and proper installation. Evidences of bubbling, improper installation, failure to cure or set will be cause to suspend operations until causes of the deficiencies are determined and corrected.

3.6.3 Joint Sealant

Inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified herein at no additional cost to the Government.

3.7 CLEAN-UP

Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

-- End of Section --

SECTION 32 11 23

AGGREGATE BASE COURSES
08/17

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.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 180	(2017) 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
AASHTO T 88	(2013) Standard Method of Test for Particle Size Analysis of Soils

ASTM INTERNATIONAL (ASTM)

ASTM C117	(2017) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	(2015) Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
ASTM C128	(2015) Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate
ASTM C131/C131M	(2014) Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136/C136M	(2014) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C29/C29M	(2017a) Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	(2013) Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

ASTM D1556/D1556M	(2015; E 2016) Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D1557	(2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D2167	(2015) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2487	(2017) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4318	(2017; E 2018) Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D5821	(2013; R 2017) Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6938	(2017a) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D75/D75M	(2014) Standard Practice for Sampling Aggregates
ASTM E11	(2016) Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves

1.2 DEFINITIONS

For the purposes of this specification, the following definitions apply.

1.2.1 Aggregate Base Course

Aggregate base course (ABC) is well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction.

1.2.2 Graded-Crushed Aggregate Base Course

Graded-crushed aggregate (GCA) base course is well graded, crushed, durable aggregate uniformly moistened and mechanically stabilized by compaction.

1.2.3 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum laboratory dry density obtained by the test procedure presented in ASTM D1557 abbreviated as a percent of laboratory maximum dry density. Since ASTM D1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, the degree of compaction for material having more than 30

percent by weight of their particles retained on the 3/4 inch sieve will be expressed as a percentage of the laboratory maximum dry density in accordance with AASHTO T 180 Method D and corrected with AASHTO T 224.

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 30 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Plant, Equipment, and Tools; G

SD-06 Test Reports

Initial Tests; G
In-Place Tests; G

1.4 EQUIPMENT, TOOLS, AND MACHINES

All plant, equipment, and tools used in the performance of the work will be subject to approval by the Contracting Officer before the work is started. Maintain all plant, equipment, and tools in satisfactory working condition at all times. Submit a list of proposed equipment, including descriptive data. Use equipment capable of minimizing segregation, producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

1.5 QUALITY ASSURANCE

Sampling and testing are the responsibility of the Contractor. Perform sampling and testing using an approved laboratory. Work requiring testing will not be permitted until the testing laboratory has been inspected and approved. Test the materials to establish compliance with the specified requirements and perform testing at the specified frequency. The Contracting Officer may specify the time and location of the tests. Furnish copies of test results to the Contracting Officer within 24 hours of completion of the tests.

1.5.1 Sampling

Take samples for laboratory testing in conformance with ASTM D75/D75M. When deemed necessary, the sampling will be observed by the Contracting Officer.

1.5.2 Tests

1.5.2.1 Sieve Analysis

Perform sieve analysis in conformance with ASTM C117 and ASTM C136/C136M using sieves conforming to ASTM E11. .

1.5.2.2 Liquid Limit and Plasticity Index

Determine liquid limit and plasticity index in accordance with ASTM D4318.

1.5.2.3 Moisture-Density Determinations

Determine the laboratory maximum dry density and optimum moisture content in accordance with paragraph DEGREE OF COMPACTION.

1.5.2.4 Field Density Tests

Measure field density in accordance with ASTM D1556/D1556M, ASTM D2167 or ASTM D6938. For the method presented in ASTM D1556/D1556M use the base plate as shown in the drawing. For the method presented in ASTM D6938 check the calibration curves and adjust them, if necessary, using only the sand cone method as described in paragraph Calibration, of the ASTM publication. Tests performed in accordance with ASTM D6938 result in a wet unit weight of soil and ASTM D6938 will be used to determine the moisture content of the soil. Also check the calibration curves furnished with the moisture gauges along with density calibration checks as described in ASTM D6938. Make the calibration checks of both the density and moisture gauges using the prepared containers of material method, as described in paragraph Calibration of ASTM D6938, on each different type of material being tested at the beginning of a job and at intervals as directed. Submit calibration curves and related test results prior to using the device or equipment being calibrated.

1.5.2.5 Wear Test

Perform wear tests on ABC and GCA course material in conformance with ASTM C131/C131M.

1.5.2.6 Soundness

Perform soundness tests on GCA in accordance with ASTM C88.

1.5.2.7 Weight of Slag

Determine weight per cubic foot of slag in accordance with ASTM C29/C29M on the ABC and GCA course material.

1.6 ENVIRONMENTAL REQUIREMENTS

Perform construction when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F, protect all completed areas by approved methods against detrimental effects of freezing. Correct completed areas damaged by freezing, rainfall, or other weather conditions to meet specified requirements.

PART 2 PRODUCTS

2.1 AGGREGATES

Provide ABC and GCA consisting of clean, sound, durable particles of crushed stone, crushed slag, crushed gravel, crushed recycled concrete, angular sand, or other approved material. Provide ABC that is free of lumps of clay, organic matter, and other objectionable materials or coatings. Provide GCA that is free of silt and clay as defined by ASTM D2487, organic matter, and other objectionable materials or coatings. The portion retained on the No. 4 sieve is known as coarse aggregate; that portion passing the No. 4 sieve is known as fine aggregate. When the coarse and fine aggregate is supplied form more than one source, provide aggregate from each source that meets the specified requirements.

2.1.1 Coarse Aggregate

Provide coarse aggregates with angular particles of uniform density. Separately stockpile coarse aggregate supplied from more than one source.

a. Crushed Gravel: Provide crushed gravel that has been manufactured by crushing gravels and that meets all the requirements specified below.

b. Crushed Stone: Provide crushed stone consisting of freshly mined quarry rock, meeting all the requirements specified below.

c. Crushed Recycled Concrete: Provide crushed recycled concrete consisting of previously hardened portland cement concrete or other concrete containing pozzolanic binder material. Provide recycled concrete that is free of all reinforcing steel, bituminous concrete surfacing, and any other foreign material and that has been crushed and processed to meet the required gradations for coarse aggregate. Reject recycled concrete aggregate exceeding this value. Provide crushed recycled concrete that meets all other applicable requirements specified below.

d. Crushed Slag: Provide crushed slag that is an air-cooled blast-furnace product having an air dry unit weight of not less than 70 pcf as determined by ASTM C29/C29M, and meets all the requirements specified below.

2.1.1.1 Aggregate Base Course

The percentage of loss of ABC coarse aggregate must not exceed 50 percent when tested in accordance with ASTM C131/C131M. Provide aggregate that contains no more than 30 percent flat and elongated particles. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. In the portion retained on each sieve specified, the crushed aggregates must contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces determined in accordance with ASTM D5821. When two fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured faces. Manufacture crushed gravel from gravel particles 50 percent of which, by weight, are retained on the maximum size sieve listed in TABLE 1.

2.1.1.2 Graded-Crushed Aggregate Base Course

The percentage of loss of GCA coarse aggregate must not exceed 40 percent loss when tested in accordance with ASTM C131/C131M. Provide GCA coarse aggregate that does not exhibit a loss greater than 18 percent weighted average, at five cycles, when tested for soundness in magnesium sulfate, or 12 percent weighted average, at five cycles, when tested in sodium sulfate in accordance with ASTM C88. Provide aggregate that contains no more than 20 percent flat and elongated particles for the fraction retained on the 1/2 inch sieve nor 20 percent for the fraction passing the 1/2 inch sieve. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. In the portion retained on each sieve specified, the crushed aggregate must contain at least 90 percent by weight of crushed pieces having two or more freshly fractured faces determined in accordance with ASTM D5821. When two fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured

faces. Manufacture crushed gravel from gravel particles 90 percent of which by weight are retained on the maximum size sieve listed in TABLE 1.

2.1.2 Fine Aggregate

Provide fine aggregates consisting of angular particles of uniform density.

2.1.2.1 Aggregate Base Course

Provide ABC fine aggregate that consists of screenings, angular sand, crushed recycled concrete fines, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.

2.1.2.2 Graded-Crushed Aggregate Base Course

Provide GCA fine aggregate consisting of angular particles produced by crushing stone, slag, or gravel that meets the requirements for wear and soundness specified for GCA coarse aggregate. Manufacture fine aggregate from gravel particles 95 percent of which by weight are retained on the 1/2 inch sieve.

2.1.3 Gradation Requirements

Apply the specified gradation requirements to the completed base course. Provide aggregates that are continuously well graded within the limits specified in TABLE 1. Use sieves that conform to ASTM E11.

TABLE 1. GRADATION OF AGGREGATES

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve No. 1
2 inch	100
1-1/2 inch	70-100
1 inch	45-80
1/2 inch	30-60
No. 4	20-50
No. 10	15-40
No. 40	5-25
No. 200	0-8

NOTE 1: Particles having diameters less than 0.02 mm must not be in excess of 3 percent by weight of the total sample tested as determined in accordance with AASHTO T 88.

NOTE 2: The values are based on aggregates of uniform specific gravity. If materials from different sources are used for the coarse and fine aggregates, test the materials in accordance with ASTM C127 and ASTM C128 to determine their specific gravities. Correct the percentages passing the various sieves as directed by the Contracting Officer if the specific gravities vary by more than 10 percent.

2.2 LIQUID LIMIT AND PLASTICITY INDEX

Apply liquid limit and plasticity index requirements to the completed

course and to any component that is blended to meet the required gradation. The portion of any component or of the completed course passing the No. 40 sieve must be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2.3 TESTS, INSPECTIONS, AND VERIFICATIONS

2.3.1 Initial Tests

Perform one of each of the following tests, on the proposed material prior to commencing construction, to demonstrate that the proposed material meets all specified requirements when furnished. Complete this testing for each source if materials from more than one source are proposed.

a. Sieve Analysis .

b. Liquid limit and plasticity index.

c. Moisture-density relationship.

d. Wear.

Submit certified copies of test results for approval not less than 30 days before material is required for the work.

2.3.2 Approval of Material

Tentative approval of material will be based on initial test results.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

When the ABC or GCA is constructed in more than one layer, clean the previously constructed layer 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. Provide adequate drainage during the entire period of construction to prevent water from collecting or standing on the working area.

3.2 OPERATION OF AGGREGATE SOURCES

Clearing, stripping, and excavating are the responsibility of the Contractor. Condition aggregate sources on Government property to readily drain and leave in a satisfactory condition upon completion of the work.

3.3 STOCKPILING MATERIAL

Clear and level storage sites prior to stockpiling of material. Stockpile all materials, including approved material available from excavation and grading, in the manner and at the locations designated. Stockpile aggregates on the cleared and leveled areas designated by the Contracting Officer to prevent segregation. Stockpile materials obtained from different sources separately.

3.4 PREPARATION OF UNDERLYING COURSE OR SUBGRADE

Clean the underlying course or subgrade of all foreign substances prior to constructing the base course(s). Do not construct base course(s) on

underlying course or subgrade that is frozen. Construct the surface of the underlying course or subgrade to meet specified compaction and surface tolerances. Correct ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the specified requirements set forth herein by loosening and removing soft or unsatisfactory material and adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D2487, stabilize the surface prior to placement of the base course(s). Stabilize by mixing ABC or GCA into the underlying course and compacting by approved methods. Consider the stabilized material as part of the underlying course and meet all requirements of the underlying course. Do not allow traffic or other operations to disturb the finished underlying course and maintain in a satisfactory condition until the base course is placed.

3.5 GRADE CONTROL

Provide a finished and completed base course conforming to the lines, grades, and cross sections shown. Place line and grade stakes as necessary for control.

3.6 MIXING AND PLACING MATERIALS

Mix the coarse and fine aggregates in a stationary plant. Make adjustments in mixing procedures or in equipment, as directed, to obtain true grades, to minimize segregation or degradation, to obtain the required water content, and to insure a satisfactory base course meeting all requirements of this specification. Place the mixed material on the prepared subgrade or subbase in layers of uniform thickness with an approved spreader. Place the layers so that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the base course is placed in more than one layer, clean the previously constructed layers of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. Make adjustments in placing procedures or equipment as may be directed by the Contracting Officer to obtain true grades, to minimize segregation and degradation, to adjust the water content, and to insure an acceptable base course.

3.7 LAYER THICKNESS

Compact the completed base course to the thickness indicated. No individual layer may be thicker than 6 inches nor be thinner than 3 inches in compacted thickness. Compact the base course(s) to a total thickness that is within 1/2 inch of the thickness indicated. Where the measured thickness is more than 1/2 inch deficient, correct such areas 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 course will be considered as conforming to the specified thickness requirements. The average job thickness will be the average of all thickness measurements taken for the job and must be within 1/4 inch of the thickness indicated. Measure the total thickness of the base course at intervals of one measurement for each 500 square yards of base course. Measure total thickness using 3 inch diameter test holes penetrating the base course.

3.8 COMPACTION

Compact each layer of the base course, as specified, with approved

compaction equipment. Maintain water content during the compaction procedure to within plus or minus 2 percent of the optimum water content determined from laboratory tests as specified in this Section. Begin rolling 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. Slightly vary the length of alternate trips of the roller. Adjust speed of the roller as needed so that displacement of the aggregate does not occur. Compact mixture with hand-operated power tampers in all places not accessible to the rollers. Continue compaction until each layer is compacted through the full depth to at least 100 percent of laboratory maximum density. Make such adjustments in compacting or finishing procedures as may be directed by the Contracting Officer to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory base course. Remove any materials found to be unsatisfactory and replace with satisfactory material or rework, as directed, to meet the requirements of this specification.

3.9 PROOF ROLLING

In addition to the compaction specified, proof roll areas designated on the drawings by application of 100% coverages of a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 30,000 pounds and inflated to a minimum of 125 psi. A coverage is defined as the application of one tire print over the designated area. In the areas designated, apply proof rolling to the top of the underlying material on which the base course is laid and to the top of the completed base course. Maintain water content of the underlying material and each layer of the base course as specified in Paragraph COMPACTION from start of compaction to completion of proof rolling of that layer. Remove any base course materials or any underlying materials that produce unsatisfactory results by proof rolling and replace with satisfactory materials. Then recompact and proof roll to meet these specifications.

3.10 EDGES OF BASE COURSE

Place the base course(s) so that the completed section will be a minimum of 2 feet wider, on all sides, than the next layer that will be placed above it. Place approved material along the outer edges of the base course in sufficient quantity to compact to the thickness of the course being constructed. When the course is being constructed in two or more layers, simultaneously roll and compact at least a 2 foot width of this shoulder material with the rolling and compacting of each layer of the base course, as directed.

3.11 FINISHING

Finish the surface of the top layer of base course after final compaction and proof rolling by cutting any overbuild to grade and rolling with a steel-wheeled roller. Do not add thin layers of material to the top layer of base course to meet grade. If the elevation of the top layer of base course is 1/2 inch or more below grade, scarify the top layer to a depth of at least 3 inches and blend new material in and compact and proof roll to bring to grade. Make adjustments to rolling and finishing procedures as directed by the Contracting Officer to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable base course. Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, scarify the unsatisfactory portion and rework and recompact it or replace as directed.

3.12 SMOOTHNESS TEST

Construct the top layer so that the surface shows no deviations in excess of 3/8 inch when tested with a 12 foot straightedge. Take measurements in successive positions parallel to the centerline of the area to be paved. Also take measurements perpendicular to the centerline at 50 foot intervals. Correct deviations exceeding this amount by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

3.13 FIELD QUALITY CONTROL

3.13.1 In-Place Tests

Perform each of the following tests on samples taken from the placed and compacted ABC and GCA. Take samples and test at the rates indicated. Perform sampling and testing of recycled concrete aggregate at twice the specified frequency until the material uniformity is established.

a. Perform density tests on every lift of material placed and at a frequency of one set of tests for every 250 square yards, or portion thereof, of completed area.

b. Perform sieve analysis on every lift of material placed and at a frequency of one sieve analysis for every 500 square yards, or portion thereof, of material placed.

c. Perform liquid limit and plasticity index tests at the same frequency as the sieve analysis.

d. Measure the thickness of the base course at intervals providing at least one measurement for each 500 square yards of base course or part thereof. Measure the thickness using test holes, at least 3 inch in diameter through the base course.

3.13.2 Approval of Material

Final approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and fully compacted course(s).

3.14 TRAFFIC

Do not allow traffic on the completed base course.

3.15 MAINTENANCE

Maintain the base course in a satisfactory condition until the full pavement section is completed and accepted. Immediately repair any defects and repeat repairs as often as necessary to keep the area intact. Retest any base course that was not paved over prior to the onset of winter to verify that it still complies with the requirements of this specification. Rework or replace any area of base course that is damaged as necessary to comply with this specification.

3.16 DISPOSAL OF UNSATISFACTORY MATERIALS

Dispose of any unsuitable materials that have been removed outside the limits of Government-controlled land . No additional payments will be made

for materials that have to be replaced.

-- End of Section --

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SECTION 32 12 11

BITUMINOUS SURFACE TREATMENT
11/08

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 C131/C131M	(2014) Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136/C136M	(2014) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C29/C29M	(2016) Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	(2013) Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM D1139/D1139M	(2015) Aggregate for Single or Multiple Bituminous Surface Treatments
ASTM D140/D140M	(2016) Standard Practice for Sampling Asphalt Materials
ASTM D2028/D2028M	(2015) Cutback Asphalt (Rapid-Curing Type)
ASTM D2397/D2397M	(2013) Standard Specification for Cationic Emulsified Asphalt
ASTM D3381/D3381M	(2013) Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D3625/D3625M	(2012) Standard Practice for Effect of Water on Bituminous-Coated Aggregate Using Boiling Water
ASTM D75/D75M	(2014) Standard Practice for Sampling Aggregates
ASTM D946/D946M	(2015) Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D977	(2013; E 2014) Emulsified Asphalt

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 30 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Cutback Asphalt
Asphalt Cement

SD-06 Test Reports

Tests

1.3 QUALITY ASSURANCE

1.3.1 Safety Precautions

No smoking, or open flames shall be permitted within 25 feet of heating, distributing, or transferring operations of bituminous materials other than bituminous emulsions.

1.3.2 Sampling and Testing

Sampling and testing is the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor, subject to approval. Sampling shall be in accordance with ASTM D75/D75M for aggregates and ASTM D140/D140M for bituminous material, unless otherwise directed. Perform aggregate gradation tests on each sample in accordance with ASTM C136/C136M. Perform all other aggregate tests on the initial source samples and repeat tests when there is a change of source. Perform sieve analyses daily from material samples. The tests shall include an analysis of each gradation of material. Perform tests in sufficient number to ensure that materials meet specified requirements. Submit copies of test results, within 24 hours after completion of each test.

1.3.3 Wear Test

Perform the wear test in accordance with ASTM C131/C131M to ensure that aggregates have a percentage of wear not exceeding 40 percent after 500 revolutions. One test shall be performed for every 2 tons of aggregates in stockpiles or at the source.

1.3.4 Soundness Test

Perform the soundness test as specified by ASTM C88 to ensure that aggregates have a weight loss not greater than 12 percent when subjected to five cycles of the magnesium sulfate test. One test shall be performed for every 2 tons of aggregates in stockpiles or at the source.

1.3.5 Stripping Test

Perform stripping tests meeting the requirements of ASTM D3625/D3625M. Deleterious substances shall not exceed the requirements of ASTM D1139/D1139M.

1.4 DELIVERY, STORAGE, AND HANDLING

Inspect the materials delivered to the site for contamination and damage. Unload and store the materials with a minimum of handling. Store aggregates preventing segregation and contamination.

1.5 ENVIRONMENTAL REQUIREMENTS

Apply bituminous surface treatment only when the existing surface or base course is dry or contains moisture not in excess of the amount that will permit uniform distribution and the desired adhesion. Bituminous surface treatment shall not be applied when either the atmospheric temperature, in the shade, is below 50 degrees F or the pavement surface to be treated is below 70 degrees F unless otherwise directed.

PART 2 PRODUCTS

2.1 EQUIPMENT

Provide equipment dependable and adequate for the purpose intended and properly maintained in satisfactory and safe operating condition at all times. Discontinue the use of equipment which fails to produce satisfactory work and replace with satisfactory equipment. Calibrated equipment such as asphalt distributors, scales, batching equipment, spreaders and similar equipment, shall have been recalibrated by an approved calibration laboratory within 12 months prior to commencing work .

2.1.1 Bituminous Distributors

The distributors shall have pneumatic tires of such width and number that the load produced on the base surface does not exceed 650 pounds per inch of tire width. Distributors shall be designed and equipped to distribute bituminous material uniformly at even heat on various widths of surface at readily determined and controlled rates ranging from 0.05 to 2.00 gallons/square yard, with a pressure range of 25 to 75 psi. The allowable variation from any specified rate shall not exceed 5 percent. Distributor equipment shall include a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, a thermometer for reading the temperature of tank contents, and a hose attachment suitable for applying bituminous material to areas not accessible with distributor spray bar. The distributor shall be equipped for circulation and agitation of bituminous material during the heating process.

2.1.2 Single-Pass, Surface-Treatment Machines

The machines shall be capable of spraying bituminous material and spreading aggregate in one pass. Bituminous spraying equipment shall conform to the requirements given above for a bituminous distributor. The machine shall be capable of spreading aggregates at controlled amounts per square yard as specified. In addition, the single-pass, surface-treatment machine shall be capable of placing a surface treatment adjacent to an existing surface treatment, forming a joint of the same thickness and uniformity as other portions of the surface treatment. Ridges or blank spaces will not be permitted. Joints in the second application shall be formed at least 1 foot from those formed in the first application.

2.1.3 Heating Equipment for Storage Tanks

The equipment shall consist of coils and equipment for producing steam or hot oil and be designed to prevent the introduction of steam or hot oil into the material. An armored thermometer with a range of 100 to 400 degrees F shall be affixed to the tank so the temperature of the bituminous material may be determined at all times.

2.1.4 Power Rollers

Power rollers shall be steel-wheeled or pneumatic-tired type, conforming to the following requirements:

a. Steel-wheeled rollers shall have at least one steel drum and weigh a minimum of 5 tons. Steel wheels of the rollers shall be equipped with adjustable scrapers.

b. Pneumatic-tired rollers shall be self-propelled and have wheels mounted on two axles in such manner that the rear tires will not follow in the tracks of the forward group. Tires shall be uniformly inflated to not less than 60 psi nor more than 80 psi pressure. The pneumatic-tired rollers shall be equipped with boxes or platforms for ballast loading and shall be loaded so that the tire print width of each wheel is not less than the clear distance between tire prints.

2.1.5 Mechanical Spreaders

The spreaders shall be adjustable and capable of spreading aggregate at controlled amounts per square yard, as specified.

2.1.6 Brooms and Blowers

The machines shall be of the power type, capable of cleaning surfaces to be treated.

2.1.7 Scales

The scales shall be standard truck scales of the beam type equipped with a weight-recording device. The scales shall be sufficient in size and capacity to accommodate the trucks used in hauling aggregates. The scales shall be tested and approved by an inspector of the State Inspection Bureau charged with scale inspection within the state in which the project is located. If an official of the inspection bureau is not available, the scales shall be tested in accordance with state specifications in the presence of the Contracting Officer. Keep the necessary number of standard weights on hand, at all times, for testing the scales.

2.1.8 Weighhouse

Provide a weatherproof weighhouse constructed in a manner to afford adequate protection for the indicating and recording devices of the scales.

2.2 MATERIALS

Use mineral aggregate and bituminous material of the following types, gradations, grades, and consistencies that meet the requirements of stripping, wear, and soundness tests as specified in paragraph SAMPLING AND TESTING.

2.2.1 Mineral Aggregate

Provide aggregate consisting of crushed stone, crushed gravel, or crushed slag of such nature that thorough coating of bituminous material, used in the work, will not strip off upon contact with water. Moisture content of the aggregate shall be such that the aggregate will be readily coated with the bituminous material. Drying may be required, as directed. Aggregate shall conform to the gradation shown below. Determine gradation of the aggregates by ASTM C136/C136M.

AGGREGATE GRADATION SINGLE BITUMINOUS SURFACE TREATMENT (PERCENT BY WEIGHT PASSING)			
Sieve Designation	No. 1	No. 2	No. 3
1 inch	100	--	--
3/4 inch	90-100	100	--
1/2 inch	20-55	90-100	100
3/8 inch	0-15	40-70	85-100
No. 4	0-5	0-15	10-30
No. 8	--	0-5	0-10
No. 16	--	--	0-5

AGGREGATE GRADATION DOUBLE BITUMINOUS SURFACE TREATMENT (PERCENT BY WEIGHT PASSING)				
Sieve Designation	No. 1	No. 2	No. 3	No. 4
1 inch	100	--	--	--
3/4 inch	90-100	--	100	--
1/2 inch	20-55	100	90-100	--
3/8 inch	0-15	85-100	40-70	100
No. 4	0-5	10-30	0-15	85-100
No. 8	--	0-10	0-5	10-40
No. 16	--	0-5	--	0-10
No. 50	--	--	--	0-5

2.2.1.1 Crushed Stone

Provide crushed stone consisting of clean, sound, durable particles, free of soft or disintegrated pieces, dust, or foreign matter.

2.2.1.2 Crushed Gravel

Provide crushed gravel consisting of clean, sound, durable particles, free of soft or disintegrated pieces or foreign matter. At least 90 percent by weight of the particles shall have at least two fractured faces.

2.2.1.3 Crushed Slag

Provide crushed slag which is an air-cooled blast-furnace product having a dry weight of not less than 70 pcf, and consists of angular particles uniform in density and quality and free of dust and foreign matter. Determine the weight of a cubic foot of slag aggregate by ASTM C29/C29M.

2.2.1.4 Aggregate Quantities

The bituminous material and aggregate shall be spread within the quantity limits shown below. The individual quantities of bituminous material and aggregate may be varied to meet specific field conditions at all times during progress of the work, as directed, without adjustments to contract unit prices. Aggregate weights shown are for aggregates having a specific gravity of 2.65. If the specific gravity of the aggregate used is other than 2.65, appropriate adjustments shall be made in number of pounds required to ensure a constant volume of aggregate per square yard of treatment.

QUANTITIES (PER SQUARE YARD) FOR SINGLE SURFACE TREATMENT		
Gradation No.	Bituminous Material (Gallons)	Aggregate (Pounds)
1	0.30-0.45	35-50
2	0.15-0.30	20-35
3	0.10-0.20	15-25

QUANTITIES (PER SQUARE YARD) FOR DOUBLE SURFACE TREATMENT				
Gradation No.	Bituminous Material (Gallons) First Application	Aggregate (Pounds) First Spreading	Bituminous Material (Gallons) Second Application	Aggregate (Pounds) Second Spreading
1	0.20-0.30	28-34	--	--
2	--	--	0.20-0.30	20-25
3	0.15-0.20	20-25	--	--
4	--	--	0.15-0.20	10-15

2.2.2 Bituminous Materials

2.2.2.1 Cutback Asphalt

Rapid curing cutback asphalt shall conform to ASTM D2028/D2028M, Designation RC-250. Submit temperature-viscosity relationship of cutback asphalt.

2.2.2.2 Emulsified Asphalt

Rapid-setting emulsified asphalt shall conform to ASTM D977, Grade RS-1 or RS-2 or ASTM D2397/D2397M, Grade CRS-1 or CRS-2.

2.2.2.3 Asphalt Cement

Asphalt cement shall conform to ASTM D946/D946M, Penetration Grade 120-150 or ASTM D3381/D3381M, Viscosity Grade AC-2.5 . Submit temperature-viscosity relationship of asphalt cement.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Immediately before applying the first course of bituminous material, clean the surface of loose material with power brooms or power blowers. Take care to remove all dirt, clay, and other loose or foreign matter. Flush the surface with water, when necessary to achieve a clean surface, only when directed by the Contracting Officer; allow the surface to dry after flushing.

3.2 APPLICATION OF FIRST COURSE

3.2.1 Bituminous Material

Apply bituminous material by means of a bituminous distributor at the temperature specified in paragraph APPLICATION TEMPERATURE OF MATERIALS, below or as directed; and within the limits specified in paragraph QUANTITY LIMITS in PART 1. Apply bituminous material in such a manner that uniform distribution is obtained over all surfaces treated. Unless the distributor is equipped to obtain a satisfactory result at the junction of previous and subsequent applications, building paper shall be spread on the surface for a sufficient distance back from the ends of each application so that flow through the sprays may be started and stopped on the paper in order that all sprays will operate at full force on the surface treated. Immediately after application, remove and destroy the building paper. Areas inaccessible to the distributor shall be properly treated with bituminous material using the hose attachment. Protect adjacent buildings, structures, and trees to prevent their being spattered or marred.

3.2.2 Spreading of Aggregate

Immediately following application of bituminous material, spread aggregate uniformly over the surface within the limits of the quantities specified in paragraph QUANTITY LIMITS in PART 1. Spreading shall be done with mechanical spreaders. Spread aggregate evenly by hand on all areas missed by the mechanical spreader. Equipment spreading aggregate shall be operated backwards, so that the bituminous material will be covered ahead of the truck wheels. When hand spreading is employed on inaccessible areas, spread aggregate directly from trucks. Additional aggregate shall

be spread by hand over areas having insufficient cover, and spreading shall continue during these operations when necessary.

3.2.3 Brooming and Rolling

Roll the surface with a pneumatic-tired and a steel-wheeled roller after sufficient aggregate is spread. Continue rolling until no more aggregate can be worked into the treated surface. The use of the steel-wheeled roller will be discontinued, or a lighter weight steel wheel roller substituted, as directed, if the roller being used causes excessive crushing and shattering of the aggregate. If the aggregate is not distributed properly, broom the surface as soon as possible after the first coverage by the roller, but not until the surface has set sufficiently to prevent excessive marking. Brooming, rolling, and supplemental spreading of aggregate shall continue until the surface is cured and rolled sufficiently to key and set the aggregate. In places not accessible to rollers, compact the aggregate with pneumatic tampers. Aggregate that becomes contaminated with foreign matter shall be removed, replaced with clean aggregate, and rerolled, as directed. Maintain and protect the treated areas by use of barricades for a period not to exceed 30 days.

3.3 APPLICATION OF SECOND COURSE

3.3.1 Bituminous Treatment

Apply the bituminous material for the second course within 48 hours after construction of the first course, weather permitting. Remove excess aggregate prior to the second application of bituminous material. If the treated surface is excessively moistened by rain, allow the surface to dry for such time as deemed necessary. Perform the second application of bituminous material in the manner specified in paragraph APPLICATION OF FIRST COURSE, including temperature and QUANTITY LIMITS.

3.3.2 Aggregate

Immediately following the second application of bitumen, aggregate conforming to the gradation and limits specified in paragraph QUANTITY LIMITS shall be spread uniformly over the bituminous material and processed in the manner specified for the first course.

3.3.3 Brooming and Rolling Second Course

The surface shall be rolled and broomed in the manner specified for the first course until a thoroughly bonded, smooth, even-textured surface is produced. Sweep off the surface surplus aggregate and remove it prior to final acceptance.

3.4 APPLICATION TEMPERATURE OF MATERIALS

3.4.1 Cutback Asphalt

Use Saybolt Furol as necessary to provide an application viscosity between 40 and 120 centistokes, kinematic or 20 and 60 seconds.

3.4.2 Emulsified Asphalt

Within the following ranges:

RS-1: 70-140 degrees F.

RS-2, CRS-1 and CSR-2: 125-185 degrees F.

3.4.3 Asphalt Cement

Use Saybolt Furol as necessary to provide an application viscosity between 40 and 120 centistokes, kinematic or 20 and 60 seconds.

3.5 TRIAL APPLICATION

Preliminary to providing a complete surface treatment, treat threelengths of at least 100 feet each for the full width of the distributor bar. Use the appropriate typical application rates specified herein for one surface treatment trial. Make other surface treatment trials using various amounts of materials as may be deemed necessary.

3.6 PROTECTION

Keep all traffic off surfaces freshly treated with bituminous material. Provide sufficient warning signs and barricades so that traffic will not travel over freshly treated surfaces. Protect the treated areas from traffic for at least 24 hours after final application of bituminous material and aggregate, or for such time as necessary to prevent picking up. Immediately prior to opening to traffic, roll the entire treated area with a self-propelled pneumatic-tired roller.

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SECTION 32 12 13

BITUMINOUS TACK AND PRIME COATS
05/17

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 T 102	(2009; R 2013) Standard Method of Test for Spot Test of Asphaltic Materials

ASTM INTERNATIONAL (ASTM)

ASTM D140/D140M	(2016) Standard Practice for Sampling Asphalt Materials
ASTM D2026/D2026M	(2015) Cutback Asphalt (Slow-Curing Type)
ASTM D2028/D2028M	(2015) Cutback Asphalt (Rapid-Curing Type)
ASTM D2995	(1999; R 2009) Determining Application Rate of Bituminous Distributors
ASTM D6373	(2016) Standard Specification for Performance Graded Asphalt Binder
ASTM D946/D946M	(2015) Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D977	(2017) Standard Specification for Emulsified Asphalt

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 30 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Sampling and Testing

1.3 QUALITY ASSURANCE

Certificates of compliance for asphalt materials delivered will be obtained and checked to ensure that specification requirements are met. Quantities of applied material will be determined. Payment will be for amount of

residual asphalt applied. Tack coat materials will not be diluted. Prime coat materials when emulsions are used can be diluted on site with potable water up to 1 part emulsion to 1 part water.

1.4 DELIVERY, STORAGE, AND HANDLING

Inspect the materials delivered to the site for contamination and damage. Unload and store the materials with a minimum of handling.

1.5 EQUIPMENT, TOOLS AND MACHINES

1.5.1 General Requirements

Equipment, tools and machines used in the work are subject to approval. Maintain in a satisfactory working condition at all times. Calibrate equipment such as asphalt distributors, scales, batching equipment, spreaders and similar equipment within 12 months of their use. If the calibration expires during project, recalibrate the equipment before work can continue.

1.5.2 Bituminous Distributor

Provide a self-propelled distributor with pneumatic tires of such size and number to prevent rutting, shoving or otherwise damaging the surface being sprayed. Calibrate the distributer in accordance with ASTM D2995. Design and equip the distributor to spray the bituminous material in a uniform coverage at the specified temperature, at readily determined and controlled total liquid rates from 0.03 to 1.0 gallons per square yard, with a pressure range of 25 to 75 psi and with an allowable variation from the specified rate of not more than plus or minus 5 percent, and at variable widths. Include with the distributor equipment a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading the temperature of tank contents, and a hand hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. The distributor will be capable of circulating and agitating the bituminous material during the heating process.

1.5.3 Heating Equipment for Storage Tanks

Use steam, electric, or hot oil heaters for heating the bituminous material. Provide steam heaters consisting of steam coils and equipment for producing steam, so designed that the steam cannot come in contact with the bituminous material. Fix an armored thermometer to the tank with a temperature range from 40 to 400 degrees F so that the temperature of the bituminous material may be determined at all times.

1.5.4 Power Brooms and Power Blowers

Use power brooms and power blowers suitable for cleaning the surfaces to which the bituminous coat is to be applied.

1.6 ENVIRONMENTAL REQUIREMENTS

Apply bituminous coat only when the surface to receive the bituminous coat is dry. A limited amount of moisture (approximately 0.03 gallon/square yard) can be sprayed on the surface of unbound material when prime coat is used to improve coverage and penetration of asphalt material. Apply bituminous

coat only when the atmospheric temperature in the shade is 50 degrees F or above and when the temperature has not been below 35 degrees F for the 12 hours prior to application, unless otherwise directed.

PART 2 PRODUCTS

2.1 PRIME COAT

Provide asphalt conforming to one of the following grades:

2.1.1 Cutback Asphalt

Provide cutback asphalt conforming to ASTM D2026/D2026M, Grade SC-70 .

2.1.2 Emulsified Asphalt

Provide emulsified asphalt conforming to ASTM D977, Type SS-1 . Asphalt emulsion can be diluted up to 1 part water to 1 part emulsion for prime coat use. Do not dilute asphalt emulsion for tack coat use.

2.2 TACK COAT

2.2.1 Asphalt Cement

Provide asphalt cement conforming to ASTM D946/D946M or ASTM D6373 Grade PG 52-28.

2.2.2 Cutback Asphalt

Provide cutback asphalt conforming to ASTM D2028/D2028M, Grade RC-70 .

2.2.3 Emulsified Asphalt

Provide emulsified asphalt conforming to ASTM D977, Type SS-1 . For prime coats the emulsified asphalt can be diluted with up to 1 part emulsion to 1 part water. No dilution is allowed for tack coat applications. The base asphalt used to manufacture the emulsion is required to show a negative spot when tested in accordance with AASHTO T 102 using standard naphtha.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACE

Immediately before applying the bituminous coat, remove all loose material, dirt, clay, or other objectionable material from the surface to be treated by means of a power broom or blower supplemented with hand brooms. Apply treatment only when the surface is dry and clean.

3.2 APPLICATION RATE

The exact quantities within the range specified, which may be varied to suit field conditions, will be determined by the Contracting Officer.

3.2.1 Tack Coat

Apply bituminous material for the tack coat in quantities of not less than 0.03 gallons nor more than 0.10 gallons per square yard of residual asphalt onto the pavement surface as approved by the Contracting Officer. Do not dilute asphalt emulsion when used as a tack coat.

3.2.2 Prime Coat

Apply bituminous material for the prime coat in quantities of not less than 0.05 gallons nor more than 0.12 gallons per square yard of residual asphalt for asphalt emulsion up to a 1 to 1 dilution rate or for residual asphalt for cutback asphalt.

3.3 APPLICATION TEMPERATURE

3.3.1 Viscosity Relationship

Apply asphalt at a temperature that will provide a viscosity between 10 and 60 seconds, Saybolt Furol, or between 20 and 120 centistokes, kinematic. Furnish the temperature viscosity relation to the Contracting Officer.

3.3.2 Temperature Ranges

The viscosity requirements determine the application temperature to be used. The following is a normal range of application temperatures:

Cutback Asphalts	
MC-30	85-190 degrees F
SC-70, MC-70, RC-70	120-225 degrees F
SC-250, MC-250, RC-250	165-270 degrees F
Asphalt Emulsion	
All Grades	70-160 degrees F
Asphalt Cement	
All Grades	275-350 degrees F

Some of these temperatures for rapid cure cutbacks are above the flash point of the material and care should be taken in their heating.

3.4 APPLICATION

3.4.1 General

Following preparation and subsequent inspection of the surface, apply the bituminous prime or tack coat with the bituminous distributor at the specified rate with uniform distribution over the surface to be treated. Properly treat all areas and spots, not capable of being sprayed with the distributor, with the hand spray. Until the succeeding layer of pavement is placed, maintain the surface by protecting the surface against damage and by repairing deficient areas at no additional cost to the Government. If required, spread clean dry sand to effectively blot up any excess bituminous material. No smoking, fires, or flames other than those from the heaters that are a part of the equipment are permitted within 25 feet of heating, distributing, and transferring operations of cutback materials. Prevent all traffic, except for paving equipment used in constructing the surfacing, from using the underlying material, whether

primed or not, until the surfacing is completed. The bituminous coat requirements are described herein.

3.4.2 Prime Coat

The prime coat is required if it will be at least 7 days before the asphalt mixture is constructed on the underlying (base course, etc.) compacted material. The type of liquid asphalt and application rate will be as specified herein. Protect the underlying layer from any damage (water, traffic, etc.) until the surfacing is placed. If the Contractor places the surfacing within seven days, the choice of protection measures or actions to be taken is at the Contractor's option. Repair (recompact or replace) damage to the underlying material caused by lack of, or inadequate, protection by approved methods at no additional cost to the Government. If the Contractor opts to use the prime coat, apply as soon as possible after consolidation of the underlying material. Apply the bituminous material uniformly over the surface to be treated at a pressure range of 25 to 75 psi; the rate will be as specified above in paragraph APPLICATION RATE. To obtain uniform application of the prime coat on the surface treated at the junction of previous and subsequent applications, spread building paper on the surface for a sufficient distance back from the ends of each application to start and stop the prime coat on the paper and to ensure that all sprayers will operate at full force on the surface to be treated. Immediately after application remove and destroy the building paper.

3.4.3 Tack Coat

Apply tack coat at the locations shown on the drawings. A tack coat should be applied to every bound surface (asphalt or concrete pavement) that is being overlaid with asphalt mixture and at transverse and longitudinal joints. Apply the tack coat when the surface to be treated is clean and dry. Immediately following the preparation of the surface for treatment, apply the bituminous material by means of the bituminous distributor, within the limits of temperature specified herein and at a rate as specified above in paragraph APPLICATION RATE. Apply the bituminous material so that uniform distribution is obtained over the entire surface to be treated. Treat lightly coated areas and spots missed by the distributor by spraying with a hand wand or using other approved method. Following the application of bituminous material, allow the surface to cure without being disturbed for period of time necessary to permit setting of the tack coat. Apply the bituminous tack coat only as far in advance of the placing of the overlying layer as required for that day's operation. Maintain and protect the treated surface from damage until the succeeding course of pavement is placed.

3.5 CURING PERIOD

Following application of the bituminous material and prior to application of the succeeding layer of asphalt mixture allow the bituminous coat to cure and water or volatiles to evaporate prior to overlaying. Maintain the tacked surface in good condition until the succeeding layer of pavement is placed, by protecting the surface against damage and by repairing and recoating deficient areas. Allow the prime coat to cure without being disturbed for a period of at least 48 hours or longer, as may be necessary to attain penetration into the treated course. Furnish and spread enough sand to effectively blot up excess bituminous material.

3.6 FIELD QUALITY CONTROL

Obtain certificates of compliance for all asphalt material delivered to the project. Obtain samples of the bituminous material under the supervision of the Contracting Officer. The sample may be retained and tested by the Government at no cost to the Contractor.

3.7 SAMPLING AND TESTING

Furnish certified copies of the manufacturer's test reports indicating temperature viscosity relationship for cutback asphalt or asphalt cement, compliance with applicable specified requirements, not less than 5 days before the material is required in the work.

3.7.1 Sampling

Unless otherwise specified, sample bituminous material in accordance with ASTM D140/D140M.

3.7.2 Calibration Test

Furnish all equipment, materials, and labor necessary to calibrate the bituminous distributor. Calibrate using the approved job material and prior to applying the bituminous coat material to the prepared surface. Calibrate the bituminous distributor in accordance with ASTM D2995.

3.7.3 Trial Applications

Before applying the spray application of tack or prime coat, apply three lengths of at least 100 feet for the full width of the distributor bar to evaluate the amount of bituminous material that can be satisfactorily applied.

3.7.3.1 Tack Coat Trial Application Rate

Unless otherwise authorized, apply the trial application rate of bituminous tack coat materials in the amount of 0.05 gallons per square yard. Make other trial applications using various amounts of material as may be deemed necessary.

3.7.3.2 Prime Coat Trial Application Rate

Unless otherwise authorized, apply the trial application rate of bituminous materials in the amount of 0.15 gallon per square yard. Make other trial applications using various amounts of material as may be deemed necessary.

3.7.4 Sampling and Testing During Construction

Perform quality control sampling and testing as required in paragraph FIELD QUALITY CONTROL.

3.8 TRAFFIC CONTROLS

Keep traffic off surfaces freshly treated with bituminous material. Provide sufficient warning signs and barricades so that traffic will not travel over freshly treated surfaces.

-- End of Section --

SECTION 32 12 15.13

ASPHALT PAVING FOR AIRFIELDS
11/17

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 156	(2013; R 2017) Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures
AASHTO M 320	(2017) Standard Specification for Performance-Graded Asphalt Binder
AASHTO T 304	(2011; R 2015) Standard Method of Test for Uncompacted Void Content of Fine Aggregate
AASHTO T 308	(2016) Standard Method of Test for Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
AASHTO T 329	(2015) Standard Test Method for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method

ASPHALT INSTITUTE (AI)

AI MS-2	(2015) Asphalt Mix Design Methods

ASTM INTERNATIONAL (ASTM)

ASTM C117	(2017) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	(2015) Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
ASTM C128	(2015) Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate
ASTM C131/C131M	(2014) Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the

	Los Angeles Machine
ASTM C136/C136M	(2014) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C142/C142M	(2017) Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C29/C29M	(2017a) Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C566	(2013) Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM C88	(2013) Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM D140/D140M	(2016) Standard Practice for Sampling Asphalt Materials
ASTM D1461	(2017) Standard Test Method for Moisture or Volatile Distillates in Asphalt Mixtures
ASTM D2172/D2172M	(2017; E 2018) Standard Test Methods for Quantitative Extraction of Asphalt Binder from Asphalt Mixtures
ASTM D2419	(2014) Sand Equivalent Value of Soils and Fine Aggregate
ASTM D242/D242M	(2009; R 2014) Mineral Filler for Bituminous Paving Mixtures
ASTM D2489/D2489M	(2016) Standard Test Method for Estimating Degree of Particle Coating of Asphalt Mixtures
ASTM D2726/D2726M	(2017) Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D3203/D3203M	(2017) Standard Test Method for Percent Air Voids in Compacted Asphalt Mixtures
ASTM D3665	(2012; R 2017) Standard Practice for Random Sampling of Construction Materials
ASTM D3666	(2016) Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D4125/D4125M	(2010) Asphalt Content of Bituminous Mixtures by the Nuclear Method
ASTM D4791	(2010) Flat Particles, Elongated

	Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D4867/D4867M	(2009; R 2014) Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5444	(2015) Mechanical Size Analysis of Extracted Aggregate
ASTM D5821	(2013; R 2017) Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6307	(2016) Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method
ASTM D6925	(2014) Standard Test Method for Preparation and Determination of the Relative Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
ASTM D6926	(2016) Standard Practice for Preparation of Asphalt Mixture Specimens Using Marshall Apparatus
ASTM D6927	(2015) Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures
ASTM D75/D75M	(2014) Standard Practice for Sampling Aggregates
ASTM D979/D979M	(2015) Sampling Bituminous Paving Mixtures
ASTM E1274	(2018) Standard Test Method for Measuring Pavement Roughness Using a Profilograph

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 30 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Placement Plan; G

SD-03 Product Data

Diamond Grinding Plan; G
Mix Design; G
Contractor Quality Control; G

SD-04 Samples

Aggregates

Asphalt Cement Binder
Warm-mix Additive

SD-06 Test Reports

Aggregates; G
QC Monitoring

SD-07 Certificates

Asphalt Cement Binder; G
Testing Laboratory
Warm-mix Additive

1.3 QUALITY ASSURANCE

Acquire the services of an independent commercial laboratory to perform acceptance testing. Acceptance of the plant produced mix and in-place requirements will be on a lot to lot basis. A standard lot for all requirements will be equal to 2000 short tons. Where appropriate, adjustment in payment for individual lots of asphalt pavement will be made based on in-place density, laboratory air voids, grade and smoothness in accordance with the following paragraphs. Grade and surface smoothness determinations will be made on the lot as a whole. Exceptions or adjustments to this will be made in situations where the mix within one lot is placed as part of both the intermediate and surface courses, thus grade and smoothness measurements for the entire lot cannot be made. In order to evaluate laboratory air voids and in-place (field) density, each lot will be divided into four equal sublots.

1.3.1 Sublot Sampling

One random mixture sample for determining laboratory air voids, theoretical maximum density, and for any additional testing the Government Engineer desires, will be taken from a loaded truck delivering mixture to each sublot, or other appropriate location for each sublot. All samples will be selected randomly, using commonly recognized methods of assuring randomness conforming to ASTM D3665 and employing tables of random numbers or computer programs. Laboratory air voids will be determined from three laboratory compacted specimens of each sublot sample in accordance with ASTM D3203/D3203M. The specimens will be compacted within 2 hours of the time the mixture was loaded into trucks at the asphalt plant. Samples will not be reheated prior to compaction and insulated containers will be used as necessary to maintain the temperature.

1.3.2 Additional Sampling and Testing

The Contracting Officer Engineer reserves the right to direct additional samples and tests for any area which appears to deviate from the specification requirements. The cost of any additional testing will be paid for by the Government. Testing in these areas will be treated as a separate lot. Payment will be made for the quantity of asphalt pavement represented by these tests in accordance with the provisions of this section.

1.3.3 In-place Density

For determining in-place density, obtain one random core (4 inches or 6 inches in diameter) at locations identified by the Government Engineer from

the mat (interior of the lane and at least 12 inches from longitudinal joint or pavement edge) of each sublot, and one random core taken from the joint (immediately over joint) of each sublot, in accordance with ASTM D979/D979M. Fill all core holes with asphalt pavement and compact using a standard Marshall hammer to a mat density as specified. Tack coat dry core holes before filling. Each random core will be full thickness of the layer being placed. When the random core is less than 1 inch thick, it will not be included in the analysis. In this case, another random core will be taken. After air drying to meet the requirements for laboratory-prepared, thoroughly dry specimens, cores obtained from the mat and from the joints will be used for in-place density determination in accordance with ASTM D2726/D2726M.

1.3.4 Surface Smoothness

Use a straightedge and profilograph for measuring surface smoothness of runway pavements. Use a straightedge for measuring surface smoothness of all other pavement surfaces. Perform all testing in the presence of the Government Engineer. Maintain detailed notes of the testing results and provide a copy to the Government Engineer immediately after each day's testing. Where drawings show required deviations from a plane surface (for instance crowns, drainage inlets), finish the surface to meet the approval of the Government Engineer.

1.3.4.1 Smoothness Requirements

1.3.4.1.1 Straightedge Testing

Provide finished surfaces of the pavements width no abrupt change of 1/8 inch or more, and all pavements within the tolerances specified in Table 3 when checked with an approved 12 foot straightedge.

Table 3. Straightedge Surface Smoothness--Pavements

Pavement Category	Direction of Testing	Tolerance, inch
Runways and taxiway	Longitudinal	1/8
	Transverse	1/4
Shoulders (outside edge stripe)	Longitudinal	1/4
	Transverse	1/4
Calibration hardstands and compass swinging bases	Longitudinal	1/8
	Transverse	1/8
All other airfields and helicopter paved areas	Longitudinal	1/4
	Transverse	1/4

1.3.4.1.2 Profilograph Testing

Provide finished surfaces of runways with a Profile Index not greater than 7 inches per mile when tested with an approved California-type profilograph.

1.3.4.2 Testing Method

After the final rolling, but not later than 24 hours after placement, test the surface of the pavement in each entire lot in a manner to reveal surface irregularities exceeding the tolerances specified above. If any pavement areas are diamond ground, retest these areas immediately after diamond grinding. The maximum area allowed to be corrected by diamond grinding is 10 percent of the total area of the lot. Test the entire area of the pavement with a profilograph. Check a number of random locations along with any observed suspicious locations primarily at transverse and longitudinal joints with the straightedge.

1.3.4.2.1 Straightedge Testing

Hold the straightedge in contact with the pavement surface and measure the maximum distance between the straightedge and the pavement surface. Determine the amount of surface irregularity by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points. Use the straightedge to measure abrupt changes in surface grade.

1.3.4.2.2 Profilograph Testing

Perform profilograph testing using an approved California profilograph and procedures described in ASTM E1274. Provide equipment that utilizes electronic recording and automatic computerized reduction of data to indicate "must-grind" bumps and the Profile Index for the pavement. Use a "blanking band" that is 0.2 inch wide and the "bump template" span 1 inch with an offset of 0.4 inch. Provide profilograph operated by an approved, factory-trained operator on the alignments specified above. Provide a copy of the reduced tapes to the Government Engineer at the end of each day's testing.

1.3.4.2.3 Bumps ("Must Grind" Areas)

Reduce any bumps ("must grind" areas) shown on the profilograph trace which exceed 0.4 inch in height by diamond grinding until they do not exceed 0.3 inch when retested. Taper diamond grinding in all directions to provide smooth transitions to areas not requiring diamond grinding. The following will not be permitted: (1) skin patching for correcting low areas, (2) planing or milling for correcting high areas. At the Contractor's option, pavement areas, including diamond ground areas, can be rechecked with the profilograph in order to record a lower Profile Index.

1.4 ENVIRONMENTAL REQUIREMENTS

Do not place asphalt pavement upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the Government Engineer, if requested; provided all other requirements, including compaction, are met.

Table 4. Surface Temperature Limitations of Underlying Course	
Mat Thickness, inches	Degrees F
3 or greater	40
Less than 3	45

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Perform the work consisting of pavement courses composed of mineral aggregate and asphalt material heated and mixed in a central mixing plant and placed on a prepared course. Provide hot-mix asphalt (HMA)warm-mix asphalt (WMA) pavement designed and constructed in accordance with this section conforming to the lines, grades, thicknesses, and typical cross sections shown on the drawings. Construct each course to the depth, section, or elevation required by the drawings and rolled, finished, and approved before the placement of the next course. Submit proposed Placement Plan, indicating lane widths, longitudinal joints, and transverse joints for each course or lift.

2.1.1 Asphalt Mixing Plant

Provide plants used for the preparation of asphalt mixture conforming to the requirements of AASHTO M 156 with the following changes:

2.1.1.1 Truck Scales

Weigh the asphalt mixture on approved scales, or on certified public scales at no additional expense to the Government. Inspect and seal scales at least annually by an approved calibration laboratory.

2.1.1.2 Inspection of Plant

Provide access to the Contracting Officer Engineer at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant; verifying weights, proportions, and material properties; checking the temperatures maintained in the preparation of the mixtures and for taking samples. Provide assistance as requested, for the Government Engineer to procure any desired samples.

2.1.1.3 Storage Bins

The asphalt mixture may be stored in non-insulated storage bins for a period of time not exceeding 3 hours. The asphalt mixture may be stored in insulated storage bins for a period of time not exceeding 8 hours. Provide the mix drawn from bins that meets the same requirements as mix loaded directly into trucks.

2.1.2 Hauling Equipment

Provide trucks used for hauling asphalt mixture that have tight, clean, and smooth metal beds. To prevent the mixture from adhering to them, lightly coat the truck beds with a minimum amount of paraffin oil, lime solution, or other approved material. Do not use petroleum based products as a release agent. Provide each truck with a suitable cover to protect the

mixture from adverse weather. When necessary to ensure that the mixture is delivered to the site at the specified temperature, provide insulated or heated truck beds with covers (tarps) that are securely fastened.

2.1.3 Material Transfer Vehicle (MTV)

Provide Material Transfer Vehicles for placement of the asphalt mixture. To transfer the material from the hauling equipment to the paver, use a self-propelled, material transfer vehicle with a swing conveyor that delivers material to the paver from outside the paving lane and without making contact with the paver. Provide MTV capable to move back and forth between the hauling equipment and the paver providing material transfer to the paver, while allowing the paver to operate at a constant speed. Provide Material Transfer Vehicle with remixing and storage capability to prevent physical and thermal segregation.

2.1.4 Asphalt Pavers

Provide mechanical spreading and finishing equipment consisting of a self-powered paver, capable of spreading and finishing the mixture to the specified line, grade, and cross section. Provide paver screed capable of laying a uniform mixture to meet the specified thickness, smoothness, and grade without physical or temperature segregation, the full width of the material being placed. Provide a screed equipped with a compaction device to be used during all placement.

2.1.4.1 Receiving Hopper

Provide paver with a receiving hopper of sufficient capacity to permit a uniform spreading operation and a distribution system to place the mixture uniformly in front of the screed without segregation. Provide a screed that effectively produces a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

2.1.4.2 Automatic Grade Controls

If an automatic grade control device is used, provide a paver equipped with a control system capable of automatically maintaining the specified screed elevation that is automatically actuated from either a reference line or through a system of mechanical sensors or sensor-directed mechanisms or devices which maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. Provide transverse slope controller capable of maintaining the screed at the desired slope within plus or minus 0.1 percent. Do not use the transverse slope controller to control grade. Provide controls capable of working in conjunction with any of the following attachments:

a. Ski-type device of not less than 30 feet in length.

b. Taut stringline set to grade.

c. Short ski or shoe for joint matching.

d. Laser control.

2.1.5 Rollers

Provide rollers in good condition and operated at slow speeds to avoid displacement of the asphalt mixture. Provide sufficient number, type, and

weight of rollers to compact the mixture to the required density while it is still in a workable condition. Do not use equipment which causes excessive crushing of the aggregate.

2.1.6 Diamond Grinding

Those performing diamond grinding are required to have a minimum of three years experience in diamond grinding of airfield pavements. In areas not meeting the specified limits for surface smoothness and plan grade, reduce high areas to attain the required smoothness and grade, except as depth is limited below. Reduce high areas by diamond grinding the asphalt pavement with approved equipment after the asphalt pavement is at a minimum age of 14 days. Perform diamond grinding by sawing with saw blades impregnated with an industrial diamond abrasive. Assemble the saw blades in a cutting head mounted on a machine designed specifically for diamond grinding that produces the required texture and smoothness level without damage to the asphalt pavement or joint faces. Provide diamond grinding equipment with saw blades that are 1/8-inch wide, a minimum of 60 blades per 12 inches of cutting head width, and capable of cutting a path a minimum of 3 feet wide. Diamond grinding equipment that causes raveling, fracturing of aggregate , or disturbance to the underlying material will not be allowed. The maximum area corrected by diamond grinding the surface of the asphalt pavement is 10 percent of the total area of any sublot. The maximum depth of diamond grinding is 1/2 inch. Provide diamond grinding machine equipped to flush and vacuum the pavement surface. Dispose of all debris from diamond grinding operations off Government property. Prior to diamond grinding, submit a Diamond Grinding Plan for review and approval. At a minimum, include the daily reports for the deficient areas, the location and extent of deficiencies, corrective actions, and equipment. Remove and replace all pavement areas requiring plan grade or surface smoothness corrections in excess of the limits specified.

Prior to production diamond grinding operations, perform a test section at the approved location, consisting of a minimum of two adjacent passes with a minimum length of 40 feet to allow evaluation of the finish and transition between adjacent passes. Production diamond grinding operations cannot be performed prior to approval.

2.2 AGGREGATES

Sample aggregates in the presence of a Government Representative. Obtain samples in accordance with ASTM D75/D75M and be representative of the materials to be used for the project. Provide aggregates consisting of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The portion of material retained on the No. 4 sieve is coarse aggregate. The portion of material passing the No. 4 sieve and retained on the No. 200 sieve is fine aggregate. The portion passing the No. 200 sieve is defined as mineral filler. Submit sufficient materials to produce 200 pounds of blended mixture for mix design verification. Submit all aggregate test results and samples to the Government Engineer at least 14 days prior to start of construction. Perform job aggregate testing no earlier than 6 months before contract award.

2.2.1 Coarse Aggregate

Provide coarse aggregate consisting of sound, tough, durable particles, free from films of material that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other

deleterious substances. Provide coarse aggregate particles meeting the following requirements:

a. The percentage of loss not be greater than 40 percent after 500 revolutions when tested in accordance with ASTM C131/C131M.

b. The sodium sulfate soundness loss not exceeding 12 percent, or the magnesium sulfate soundness loss not exceeding 18 percent after five cycles when tested in accordance with ASTM C88.

c. At least 75 percent by weight of coarse aggregate contain at least two or more fractured faces when tested in accordance with ASTM D5821 with fractured faces produced by crushing.

d. The particle shape essentially cubical and the aggregate containing not more than 20 percent, by weight, of flat particles and elongated particles (3:1 ratio of maximum to minimum) when tested in accordance with ASTM D4791.

e. Slag consisting of air-cooled, blast furnace slag, with a compacted weight of not less than 75 pounds per cubic foot when tested in accordance with ASTM C29/C29M.

f. Clay lumps and friable particles not exceeding 0.3 percent, by weight, when tested in accordance with ASTM C142/C142M.

2.2.2 Fine Aggregate

Provide fine aggregate consisting of clean, sound, tough, durable particles. Provide aggregate particles that are free from coatings of clay, silt, or any objectionable material, contain no clay balls, and meet the following requirements:

a. Quantity of natural sand (noncrushed material) added to the aggregate blend not exceeding 15 percent by weight of total aggregate.

b. Individual fine aggregate sources with a sand equivalent value greater than 45 when tested in accordance with ASTM D2419.

c. Fine aggregate portion of the blended aggregate with an uncompacted void content greater than 45.0 percent when tested in accordance with AASHTO T 304 Method A.

d. Clay lumps and friable particles not exceeding 0.3 percent, by weight, when tested in accordance with ASTM C142/C142M.

2.2.3 Mineral Filler

Provide mineral filler consisting of a nonplastic material meeting the requirements of ASTM D242/D242M.

2.2.4 Aggregate Gradation

Provide a combined aggregate gradation that conforms to gradations specified in Table 5, when tested in accordance with ASTM C136/C136M and ASTM C117, and does not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa, but grades uniformly from coarse to fine. Provide a JMF within the specification limits; however, the gradation can exceed the limits when the allowable deviation from the JMF

shown in Tables 8 and 9 are applied.

Table 5. Aggregate Gradations

	Gradation 1
Sieve Size, inch	Percent Passing by Mass
1	100
3/4	100
1/2	90-100
3/8	69-89
No. 4	53-73
No. 8	38-60
No. 16	26-48
No. 30	18-38
No. 50	11-27
No. 100	6-18
No. 200	3-6

2.3 ASPHALT CEMENT BINDER

Provide asphalt cement binder that conforms to AASHTO M 320 Performance Grade (PG)64-22. Provide test data indicating grade certification by the supplier at the time of delivery of each load to the mix plant. When warm-mix asphalt technology involves additives, the asphalt cement shall be graded with the asphalt cement additive included. Submit copies of these certifications to the Government Engineer. The supplier is defined as the last source of any modification to the binder. The Government Engineer may sample and test the binder at the mix plant at any time before or during mix production. Obtain samples for this verification testing in accordance with ASTM D140/D140M and in the presence of the Government Engineer. Provide these samples to the Government Engineer for the verification testing, which will be performed at the Governments expense. Submit 5 gallon sample of the asphalt cement specified for mix design verification and approval not less than 14 days before start of the test section.

2.4 WARM-MIX ASPHALT TECHNOLOGIES/PRODUCTS

Provide warm-mix asphalt technologies/products that have a record of good performance and are included on the local state DOT's qualified products list, if the DOT maintains a qualified products list. Also, include the warm-mix asphalt technologies/products in at least two out of the following three states DOT's qualified products lists: Florida, Texas, and Virginia. These qualified products lists can be found at each state DOT's website.

2.5 MIX DESIGN

Develop the mix design. Perform Job Mix formula (JMF) and aggregates testing no earlier than 6 months before contract award. Provide asphalt mixture composed of well-graded aggregate, mineral filler if required, and asphalt material. Provide aggregate fractions sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of Table 5. Do not produce asphalt pavement for payment until a JMF has been approved. Design the asphalt mixture using hand-held hammer procedures contained in AI MS-2 and the criteria shown in Table 6. Design the asphalt mixture using the Superpave gyratory compactor set at 50 gyrations. Prepare samples at various asphalt contents and compacted in accordance with ASTM D6925. Use laboratory compaction temperatures for Polymer Modified Asphalts as recommended by the asphalt cement manufacturer. If the Tensile Strength Ratio (TSR) of the composite mixture, as determined by ASTM D4867/D4867M is less than 75, reject the aggregates or the asphalt mixture treated with an anti-stripping agent. Add a sufficient amount of anti-stripping agent to produce a TSR of not less than 75. If an antistrip agent is required, provide it at no additional cost to the Government. Provide sufficient materials to produce 200 pounds of blended mixture to the Government Engineer for verification of mix design at least 14 days prior to construction of test section.

2.5.1 JMF Requirements

Submit the proposed JMF in writing, for approval, at least 14 days prior to the start of the test section, including as a minimum:

a. Percent passing each sieve size.

b. Percent of asphalt cement.

c. Percent of each aggregate and mineral filler to be used.

d. Asphalt viscosity grade, penetration grade, or performance grade.

e. Number of blows of hammer per side of molded specimen or number of Superpave gyratory compactor gyrations.

f. Laboratory mixing temperature.

g. Lab compaction temperature.

h. Temperature-viscosity relationship of the asphalt cement.

i. Plot of the combined gradation on the 0.45 power gradation chart, stating the nominal maximum size.

j. Graphical plots and summary tabulation of stability, flow, air voids, voids in the mineral aggregate, and unit weight versus asphalt content as shown in AI MS-2. Include summary tabulation that includes individual specimen data for each specimen tested.

k. Specific gravity and absorption of each aggregate.

l. Percent natural sand.

m. Percent particles with two or more fractured faces (in coarse

aggregate).

n. Fine aggregate angularity.

o. Percent flat or elongated particles (in coarse aggregate).

p. Tensile Strength Ratio and wet/dry specimen test results.

q. Antistrip agent (if required).

r. List of all modifiers.

s. Percentage and properties (asphalt content aggregate gradation, and aggregate properties) of RAP in accordance with paragraph RECYCLED ASPHALT PAVEMENT, if RAP is used.

t. Warm-mix additive.

Table 6. Marshall Design Criteria

Test Property		50 Blow Mix
Stability, pounds minimum		1350(1)
Flow, 0.01 inch		8-18(2)
Air voids, percent		4(4)
Percent Voids in mineral aggregate (minimum)		See Table 7
Dust Proportion(3)		0.8-1.2
TSR, minimum percent	75	75
TSR Conditioned Strength (minimum psi)	60	60

(1) This is a minimum requirement. Provide significantly higher average during construction to ensure compliance with the specifications.

(2) The flow requirement is not applicable for Polymer Modified Asphalts

(3) Dust Proportion is calculated as the aggregate content, expressed as a percent of mass, passing the No. 200 sieve, divided by the effective asphalt content, in percent of total mass of the mixture.

(4) Select the JMF asphalt content corresponding to an air void content of 4 percent. Verify the other properties of Table 6 meet the specification requirements at this asphalt content.

Table 6. Superpave Gyratory Compaction Criteria	
Test Property	Value
Air voids, percent	4(1)
Percent Voids in mineral aggregate (minimum)	See Table 7
Dust Proportion(2)	0.8-1.2
TSR, minimum percent	75
(1) Select the JMF asphalt content corresponding to an air void content of 4 percent. Verify the other properties of Table 6 meet the specification requirements at this asphalt content.	
(2) Dust Proportion is calculated as the aggregate content, expressed as a percent of mass, passing the No. 200 sieve, divided by the effective asphalt content, in percent of total mass of the mixture.	

Table 7. Minimum Percent Voids in Mineral Aggregate (VMA)(1)	
Aggregate (See Table 5)	Minimum VMA, percent
Gradation 2	14
(1) Calculate VMA in accordance with AI MS-2, based on ASTM D2726/D2726M bulk specific gravity for the aggregate.	

2.5.2 Adjustments to JMF

The JMF for each mixture is in effect until a new formula is approved in writing by the Government Engineer. Should a change in sources of any materials be made, perform a new mix design and a new JMF approved before the new material is used. Make minor adjustments within the specification limits to the JMF to optimize mix volumetric properties. Adjustments to the original JMF are limited to plus or minus 4 percent on the No. 4 and coarser sieves; plus or minus 3 percent on the No. 8 to No. 50 sieves; and plus or minus 1 percent on the No. 100 sieve. Adjustments to the JMF are limited to plus or minus 1.0 percent on the No. 200 sieve. Asphalt content adjustments are limited to plus or minus 0.40 from the original JMF. If adjustments are needed that exceed these limits, develop a new mix design.

2.6 RECYCLED ASPHALT PAVEMENT (Shoulder Only)

Provide recycled asphalt consisting of reclaimed asphalt pavement (RAP), coarse aggregate, fine aggregate, mineral filler, and asphalt cement. Provide RAP of a consistent gradation, asphalt content, and properties. Maintain RAP stockpiles free from contamination, including coal-tar sealers. When RAP is fed into the plant, the maximum RAP chunk size is 2 inches. The individual aggregates in a RAP chunk are not to exceed the maximum size aggregate of the gradation specified in Table 5. Design the recycled asphalt mixture using procedures contained in AI MS-2. Provide

RAP job mix that meets the requirements of paragraph MIX DESIGN. RAP is only allowed to be used for shoulder surface course mixes and for any intermediate courses. Limit the amount of RAP so the asphalt binder from the RAP does not exceed 30 percent of the total asphalt content.

2.6.1 RAP Aggregates and Asphalt Cement

Provide a blend of aggregates used in the recycled mix that meet the requirements of paragraph AGGREGATES. Establish the percentage of asphalt in the RAP for the mixture design according to ASTM D2172/D2172M using the appropriate dust correction procedure.

2.6.2 RAP Mix

Select the virgin asphalt binder as described below:

a. For 0-20 percent recycled binder content - no change in virgin binder selection.

b. For 20+ to 30 percent recycled binder content - select virgin binder one grade softer than normal.

PART 3 EXECUTION

3.1 CONTRACTOR QUALITY CONTROL

3.1.1 General Quality Control Requirements

Submit the Quality Control Plan. Do not produce hot-mix warm-mix asphalt pavement for payment until the quality control plan has been approved. In the quality control plan, address all elements which affect the quality of the pavement including, but not limited to:

a. Mix Design and unique JMF identification code

b. Aggregate Grading

c. Quality of Materials

d. Stockpile Management and procedures to prevent contamination

e. Proportioning including percent of warm-mix additive

f. Mixing and Transportation

g. Correlation of mechanical hammer to hand hammer. Determine the number of blows of the mechanical hammer required to provide the same density of the JMF as provided by the hand hammer. Use the average of three specimens per trial blow application.

h. Mixture Volumetrics

i. Moisture Content of Mixtures

j. Placing and Finishing

k. Joints

l. Compaction, including Asphalt Pavement-Portland Cement Concrete joints

m. Surface Smoothness

n. Truck bed release agent

3.1.2 Testing Laboratory

Provide a fully equipped asphalt laboratory located at the plant or job site that is equipped with heating and air conditioning units to maintain a temperature of 75 plus or minus 5 degrees F. Provide laboratory facilities that are kept clean and all equipment maintained in proper working condition. Provide the Government Engineer with unrestricted access to inspect the laboratory facility, to witness quality control activities, and to perform any check testing desired. The Government Engineer will advise in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to adversely affect test results, immediately suspend the incorporation of the materials into the work. Incorporation of the materials into the work will not be permitted to resume until the deficiencies are corrected.

3.1.3 Quality Control Testing

Perform all quality control tests applicable to these specifications and as set forth in the Quality Control Program. Required elements of the testing program include, but are not limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, moisture in the asphalt mixture, laboratory air voids, stability, flow, in-place density, grade and smoothness. Develop a Quality Control Testing Plan as part of the Quality Control Program.

3.1.3.1 Asphalt Content

A minimum of two tests to determine asphalt content will be performed per lot (a lot is defined in paragraph QUALITY ASSURANCE) by one of the following methods: extraction method in accordance with ASTM D2172/D2172M, Method A or B, the ignition method in accordance with the AASHTO T 308, ASTM D6307, or the nuclear method in accordance with ASTM D4125/D4125M, provided each method is calibrated for the specific mix being used. For the extraction method, determine the weight of ash, as described in ASTM D2172/D2172M, as part of the first extraction test performed at the beginning of plant production; and as part of every tenth extraction test performed thereafter, for the duration of plant production. Use the last weight of ash value in the calculation of the asphalt content for the mixture.

3.1.3.2 Aggregate Properties

Determine aggregate gradations a minimum of twice per lot from mechanical analysis of recovered aggregate in accordance with ASTM D5444 or ASTM D6307. For batch plants, test aggregates in accordance with ASTM C136/C136M using actual batch weights to determine the combined aggregate gradation of the mixture. Determine the specific gravity of each aggregate size grouping for each 20,000 tons in accordance with ASTM C127 or ASTM C128. Determine fractured faces for gravel sources for each 20,000 tons in accordance with ASTM D5821. Determine the uncompacted void content of manufactured sand for each 20,000 tons in accordance with AASHTO T 304 Method A.

3.1.3.3 Temperatures

Check temperatures at least four times per lot, at necessary locations, to determine the temperature at the dryer, the asphalt cement in the storage tank, the asphalt mixture at the plant, and the asphalt mixture at the job site.

3.1.3.4 Aggregate Moisture

Determine the moisture content of aggregate used for production a minimum of once per lot in accordance with ASTM C566.

3.1.3.5 Moisture Content of Mixture

Determine the moisture content of the mixture at least once per lot in accordance with AASHTO T 329.

3.1.3.6 Laboratory Air Voids, VMA, Marshall Stability and Flow

Obtain mixture samples at least four times per lot and compacted into specimens, using 50 blows per side with the Marshall hand-held hammer as described in ASTM D6926. After compaction, determine the laboratory air voids and VMA of each specimen, as well as the Marshall stability and flow, as described in ASTM D6927. Provide VMA within the limits of Table 7.

3.1.3.7 In-Place Density

Conduct any necessary testing to ensure the specified density is achieved. A nuclear gauge or other non-destructive testing device may be used to monitor pavement density.

3.1.3.8 Grade and Smoothness

Conduct the necessary checks to ensure the grade and smoothness requirements are met in accordance with paragraph QUALITY ASSURANCE.

3.1.3.9 Additional Testing

Perform any additional testing, deemed necessary to control the process.

3.1.3.10 QC Monitoring

Submit all QC test results to the Government Engineer on a daily basis as the tests are performed. The Government Engineer reserves the right to monitor any of the Contractor's quality control testing and to perform duplicate testing as a check to the Contractor's quality control testing.

3.1.4 Sampling

When directed by the Government Engineer, sample and test any material which appears inconsistent with similar material being produced, unless such material is voluntarily removed and replaced or deficiencies corrected. Perform all sampling in accordance with standard procedures specified.

3.1.5 Control Charts

For process control, establish and maintain linear control charts on both individual samples and the running average of last four samples for the

parameters listed in Table 8, as a minimum. Post the control charts as directed by the Government Engineer and maintain current at all times. Identify the following on the control charts, the project number, the test parameter being plotted, the individual sample numbers, the Action and Suspension Limits listed in Table 8 applicable to the test parameter being plotted, and the test results. Also show target values (JMF) on the control charts as indicators of central tendency for the cumulative percent passing, asphalt content, and laboratory air voids parameters. When the test results exceed either applicable Action Limit, take immediate steps to bring the process back in control. When the test results exceed either applicable Suspension Limit, halt production until the problem is solved. When the Suspension Limit is exceeded for individual values or running average values, the Government Engineer has the option to require removal and replacement of the material represented by the samples or to leave in place and base acceptance on mixture volumetric properties and in place density. Use the control charts as part of the process control system for identifying trends so that potential problems can be corrected before they occur. Make decisions concerning mix modifications based on analysis of the results provided in the control charts. In the Quality Control Plan, indicate the appropriate action to be taken to bring the process into control when certain parameters exceed their Action Limits.

Table 8. Action and Suspension Limits for the Parameters to be Plotted on Individual and Running Average Control Charts

	Individual Samples		Running Average of Last Four Samples	
Parameter to be Plotted	Action Limit	Suspension Limit	Action Limit	Suspension Limit
No. 4 sieve, Cumulative Percent Passing, deviation from JMF target; plus or minus values	6	8	4	5
No. 30 sieve, Cumulative Percent Passing, deviation from JMF target; plus or minus values	4	6	3	4
No. 200 sieve, Cumulative Percent Passing, deviation from JMF target; plus or minus values	1.4	2.0	1.1	1.5

Table 8. Action and Suspension Limits for the Parameters to be Plotted on Individual and Running Average Control Charts				
	Individual Samples		Running Average of Last Four Samples	
Parameter to be Plotted	Action Limit	Suspension Limit	Action Limit	Suspension Limit
Asphalt content, percent deviation from JMF target; plus or minus value	0.4	0.5	0.2	0.3
Laboratory Air Voids, percent deviation from JMF target value	No specific action and suspension limits set since this parameter is used to determine percent payment			
In-place Mat Density, percent of TMD	No specific action and suspension limits set since this parameter is used to determine percent payment			
In-place Joint Density, percent of TMD	No specific action and suspension limits set since this parameter is used to determine percent payment			
VMA				
Gradation 2	14.3	14.0	14.5	14.0

Table 8 cont'd. Marshall Compaction				
Stability, pounds (minimum)				
75 blow JMF	1760	1640	2150	2030
50 blow JMF	950	830	1350	1230
Flow, 0.01 inch				
75 blow JMF	8 min.	7 min.	9 min.	8 min.
	16 max.	17 max.	15 max.	16 max.
50 blow JMF	8 min.	7 min.	9 min.	8 min.
	18 max.	19 max.	17 max.	18 max.

3.2 PREPARATION OF ASPHALT BINDER MATERIAL

Heat the asphalt cement material while avoiding local overheating and providing a continuous supply of the asphalt material to the mixer at a

uniform temperature. Maintain the temperature of unmodified asphalts to no more than 325 degrees F when added to the aggregates. The temperature of modified asphalts is not to exceed 350 degrees F.

3.3 PREPARATION OF MINERAL AGGREGATE

Heat and dry the aggregate for the mixture prior to mixing. No damage to the aggregates due to the maximum temperature and rate of heating used is allowed. Maintain the temperature no lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

3.4 PREPARATION OF HOT-MIX ASPHALT MIXTURE

Weigh or meter the aggregates and the asphalt cement and introduce into the mixer in the amount specified by the JMF. Limit the temperature of the asphalt mixture to 350 degrees F 270 degrees F when the asphalt cement is added. Mix the combined materials until the aggregate obtains a thorough and uniform coating of asphalt binder (testing in accordance with ASTM D2489/D2489M may be required by the Contracting Officer) and is thoroughly distributed throughout the mixture. The moisture content of all asphalt mixture upon discharge from the plant is not to exceed 0.5 percent by total weight of mixture as measured by ASTM D1461.

3.5 PREPARATION OF THE UNDERLYING SURFACE

Immediately before placing asphalt pavement, clean the underlying course of dust and debris. Apply a prime coat in accordance with the contract specifications.

3.6 TEST SECTION

Prior to full production, place a test section for each JMF used. Construct a test section consisting of a maximum of 250 tons and two paver passes wide placed in two lanes, with a longitudinal cold joint. Do not place the second lane of test section until the temperature of pavement edge is less than 175 degrees F. Construct the test section with the same depth as the course which it represents. Ensure the underlying grade or pavement structure upon which the test section is to be constructed is the same or very similar to the underlying layer for the project. Use the same equipment in construction of the test section as on the remainder of the course represented by the test section. Construct the test section as part of the project pavement as approved by the Government Engineer.

3.6.1 Sampling and Testing for Test Section

Obtain one random sample at the plant, triplicate specimens compacted, and tested for stability, flow, and laboratory air voids. Test a portion of the same sample for theoretical maximum density (TMD), aggregate gradation and asphalt content. Test an additional portion of the sample to determine the TSR. Adjust the compactive effort as required to provide TSR specimens with an air void content of 7 plus or minus 1 percent. Obtain four randomly selected cores from the finished pavement mat, and four from the longitudinal joint, and tested for density. Perform random sampling in accordance with procedures contained in ASTM D3665. Construction may continue provided the test results are within the tolerances or exceed the minimum values shown in Table 9. If all test results meet the specified requirements, the test section may remain as part of the project pavement. If test results exceed the tolerances shown, remove and replace the test

section and construct another test section at no additional cost to the Government Owner.

Table 9. Test Section Requirements for Material and Mixture Properties	
Property	Specification Limit
Aggregate Gradation-Percent Passing (Individual Test Result)	
No. 4 and larger	JMF plus or minus 8
No. 8, No. 16, No. 30, and No. 50	JMF plus or minus 6
No. 100 and No. 200	JMF plus or minus 2.0
Asphalt Content, Percent (Individual Test Result)	JMF plus or minus 0.5
Laboratory Air Voids, Percent (Average of 3 specimens)	JMF plus or minus 1.0
VMA, Percent (Average of 3 specimens)	See Table 7
Tensile Strength Ratio (TSR) (At 7 percent plus/minus 1 percent air void content)	75 percent minimum
Conditioned Strength	60 psi minimum
Mat Density, Percent of TMD (Average of 4 Random Cores)	92.0 - 96.0
Joint Density, Percent of TMD (Average of 4 Random Cores)	90.5 minimum

Table 9. cont'd - Marshall Compaction	
Stability, (Average of 3 specimens)	1350 pounds minimum for 50-blow
Flow, 0.01 inch (Average of 3 specimens)	8 - 18 for 50-blow

3.6.2 Additional Test Sections

If the initial test section proves to be unacceptable, make the necessary adjustments to the JMF, plant operation, placing procedures, and rolling procedures before beginning construction of a second test section. Construct and evaluate additional test sections, as required, for conformance to the specifications. Full production paving is not allowed until an acceptable test section has been constructed and accepted.

3.7 TESTING LABORATORY

Laboratories used to develop the JMF, perform Contractor Quality Control

testing, and Government Engineer quality assurance and acceptance testing are required to meet the requirements of ASTM D3666. Perform all required test methods by an accredited laboratory. Submit a certification of compliance signed by the manager of the laboratory stating that it meets these requirements to the Government Engineer prior to the start of construction. At a minimum, include the following certifications:

a. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.

b. A listing of equipment to be used in developing the job mix.

c. A copy of the laboratory's quality control system.

d. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program.

3.8 TRANSPORTING AND PLACING

3.8.1 Transporting

Transport asphalt mixture from the mixing plant to the site in clean, tight vehicles. Schedule deliveries so that placing and compacting of mixture is uniform with minimum stopping and starting of the paver. Provide adequate artificial lighting for night placements. Hauling over freshly placed material is not permitted until the material has been compacted as specified, and allowed to cool to 140 degrees F.

3.8.2 Placing

Place the mix in lifts of adequate thickness and compacted at a temperature suitable for obtaining density, surface smoothness, and other specified requirements. Upon arrival, place the mixture to the full width by an asphalt paver; strike off in a uniform layer of such depth that, when the work is completed, the required thickness and conform to the grade and contour indicated. Do not broadcast waste mixture onto the mat or recycled into the paver hopper. Collect waste mixture and dispose off site. Regulate the speed of the paver to eliminate pulling and tearing of the asphalt mat. Begin placement of the mixture along the centerline of a crowned section or on the high side of areas with a one-way slope. Place the mixture in consecutive adjacent strips having a minimum width of 10 feet. Offset the longitudinal joint in one course from the longitudinal joint in the course immediately below by at least 1 foot; however, locate the joint in the surface course at the centerline of the pavement. Offset transverse joints in one course by at least 10 feet from transverse joints in the previous course. Offset transverse joints in adjacent lanes a minimum of 10 feet. On isolated areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and luted by hand tools.

3.9 COMPACTION OF MIXTURE

3.9.1 General

a. After placing, thoroughly and uniformly compact the mixture by rolling. Compact the surface as soon as possible without causing displacement, cracking or shoving. Determine the sequence of rolling operations and the type of rollers used, except as specified in paragraph ASPHALT PAVEMENT-PORTLAND CEMENT CONCRETE JOINTS and with the

exception that application of more than three passes with a vibratory roller in the vibrating mode is prohibited. Maintain the speed of the roller, at all times, sufficiently slow to avoid displacement of the asphalt mixture and be effective in compaction. Correct at once any displacement occurring as a result of reversing the direction of the roller, or from any other cause.

b. Furnish sufficient rollers to handle the output of the plant. Continue rolling until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained. To prevent adhesion of the mixture to the roller, keep the wheels properly moistened, but excessive water is not permitted. In areas not accessible to the roller, thoroughly compact the mixture with hand tampers. Remove the full depth of any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or is in any way defective, replace with fresh asphalt mixture and immediately compact to conform to the surrounding area. Perform this work at no expense to the Government. Skin patching is not allowed.

3.9.2 Segregation

The Government Engineer can sample and test any material that looks deficient. When the in-place material appears to be segregated, the Government Engineer has the option to sample the material and have it tested and compared to the aggregate gradation, asphalt content, and in-place density requirements in Table 9. If the material fails to meet these specification requirements, remove and replace the extent of the segregated material the full depth of the layer of asphalt mixture at no additional cost to the Government. When segregation occurs in the mat, take appropriate action to correct the process so that additional segregation does not occur.

3.10 JOINTS

Construct joints to ensure a continuous bond between the courses and to obtain the required density. Provide all joints with the same texture as other sections of the course and meet the requirements for smoothness and grade.

3.10.1 Transverse Joints

Do not pass the roller over the unprotected end of the freshly laid mixture, except when necessary to form a transverse joint. When necessary to form a transverse joint, construct by means of placing a bulkhead or by tapering the course. Utilize a dry sawcut on the transverse joint full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. Cutting equipment that uses water as a cooling or cutting agent nor milling equipment is permitted. Remove the cutback material from the project. In both methods, provide a light tack coat of asphalt material to all contact surfaces before placing any fresh mixture against the joint.

3.10.2 Longitudinal Joints

Cut back longitudinal joints which are irregular, damaged, uncompacted, cold (less than 175 degrees F at the time of placing the adjacent lane), or otherwise defective, a maximum of 3 inches from the top edge of the lift with a cutting wheel to expose a clean, sound, near vertical surface for the full depth of the course. Remove all cutback material from the

project. Cutting equipment that uses water as a cooling or cutting agent nor milling equipment is permitted. Provide a light tack coat of asphalt material to all contact surfaces prior to placing any fresh mixture against the joint.

3.10.3 Asphalt Pavement-Portland Cement Concrete Joints

Joints between asphalt pavement and Portland Cement Concrete (PCC) require specific construction procedures for the asphalt pavement. The following criteria are applicable to the first 10 feet or paver width of asphalt pavement adjacent to the PCC.

a. Place the asphalt pavement side of the joint in a direction parallel to the joint.

b. Place the asphalt pavement side sufficiently high so that when fully compacted the asphalt pavement is greater than 1/8 inch but less than 1/4 inch higher than the PCC side of the joint.

c. Compact with steel wheel rollers and at least one rubber tire roller. Compact with a rubber tire roller that weights at least 20 tons with tires inflated to at least 90 psi. Avoid spalling the PCC during placement and compaction of the asphalt pavement. Operate steel wheel rollers in a way that prevents spalling the PCC. Repair any damage to PCC edges or joints as directed by the Government Engineer. If damage to the PCC joint or panel edge exceeds a total of 3 feet, remove and replace the PCC panel at no additional expense to the Government.

d. After compaction is finished, diamond grind a minimum width of 3 feet of the asphalt pavement so that the asphalt pavement side is less than 1/8 inch higher than the PCC side. Perform diamond grinding in accordance with subparagraph DIAMOND GRINDING above. The asphalt pavement immediately adjacent to the joint is not allowed to be lower than the PCC after the grinding operation. Transition the grinding into the asphalt pavement in a way that ensures good smoothness and provides drainage of water. The joint and adjacent materials when completed is required to meet all of the requirements for grade and smoothness. Measure smoothness across the asphalt pavement-PCC joint using a 12 feet straightedge. The acceptable tolerance is 1/8 inch.

e. Consider the asphalt pavement next to the PCC as a separate lot for evaluation. Lots are based on individual lifts. Do not comingle cores from different lifts for density evaluation purposes. Take four cores for each lot of material placed adjacent to the joint. The size of lot is 10 feet wide by the length of the joint being paved. Locate the center of each of the four cores 6 inches from the edge of the concrete. Take each core at a random location along the length of the joint. The requirements for joint density for this lot, adjacent to the PCC joint, are the same as that for the mat density specified in Table 1. For asphalt pavement-PCC joints at taxiways abutting runways, aprons, or other taxiways, take two additional randomly located cores along each taxiway intersection.

f. All procedures, including repair of damaged PCC, are required to be in accordance with the approved Quality Control Plan.

-- End of Section --

SECTION 32 13 13.06

PORTLAND CEMENT CONCRETE PAVEMENT FOR ROADS AND SITE FACILITIES
11/11

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 (ACI)

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 305.1	(2014) Specification for Hot Weather Concreting
ACI 306.1	(1990; R 2002) Standard Specification for Cold Weather Concreting
ACI 325.12R	(2002; R 2013) Guide for Design of Jointed Concrete Pavements for Streets and Local Roads
ACI 330R	(2008) Guide for the Design and Construction of Concrete Parking Lots

ASTM INTERNATIONAL (ASTM)

ASTM C1077	(2017) Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157/C1157M	(2017) Standard Performance Specification for Hydraulic Cement
ASTM C1260	(2014) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C143/C143M	(2015) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150/C150M	(2018) Standard Specification for Portland Cement
ASTM C1567	(2013) Standard Test Method for Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate

	(Accelerated Mortar-Bar Method)
ASTM C1602/C1602M	(2012) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete
ASTM C171	(2016) Standard Specification for Sheet Materials for Curing Concrete
ASTM C172/C172M	(2017) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231/C231M	(2017a) 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 C309	(2011) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C31/C31M	(2018b) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33/C33M	(2018) Standard Specification for Concrete Aggregates
ASTM C494/C494M	(2017) Standard Specification for Chemical Admixtures for Concrete
ASTM C595/C595M	(2018) Standard Specification for Blended Hydraulic Cements
ASTM C618	(2017a) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C78/C78M	(2018) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C94/C94M	(2017a) Standard Specification for Ready-Mixed Concrete
ASTM C989/C989M	(2018) Standard Specification for Slag Cement for Use in Concrete and Mortars
U.S. DEPARTMENT OF DEFENSE (DOD)	
UFC 3-250-01	(2016) Pavement Design for Roads and Parking Areas

1.2 DESIGN

This materials and construction specification is intended to be used on projects where the design was completed using UFC 3-250-01 Pavement Design for Roads, Streets, Walks, and Open Storage Areas, ACI 330R, Guide for the

Design and Construction of Concrete Parking Lots or ACI 325.12R, Guide for Design of Jointed Concrete Pavements for Streets and Local Roads, or equivalent.

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. SUBMITTAL PROCEDURES:

SD-03 Product Data

Curing Materials; G

Admixtures; G

Submit a complete list of materials including type, brand and applicable reference specifications.

SD-05 Design Data

Concrete Mix Design; G

Thirty days minimum prior to concrete placement, submit a mix design, with applicable tests, for each strength and type of concrete for approval. Submit a complete list of materials including type; brand; source and amount of cement, fly ash, slag, and admixtures; and applicable reference specifications. Provide mix proportion data using at least three different water-cement ratios for each type of mixture, which will produce a range of strength encompassing those required for each class and type of concrete required. Submittal must clearly indicate where each mix design will be used when more than one mix design is submitted. Obtain acknowledgement of approvals prior to concrete placement. Submit a new mix design for each material source change.

SD-06 Test Reports

Aggregate Tests; G

Concrete Slump Tests; G

Air Content Tests; G

Flexural Strength Tests; G

SD-07 Certificates

Ready-mixed Concrete Plant; G

Batch Tickets; G

Cementitious Materials; G

1.4 DELIVERY, STORAGE, AND HANDLING

ASTM C94/C94M.

1.5 QUALITY ASSURANCE

1.5.1 Ready-mixed Concrete Plant Certification

Unless otherwise approved by the Contracting Officer, ready mixed concrete must be produced and provided by a National Ready-Mix Concrete Association (NRMCA) certified plant. If a volumetric mobile mixer is used to produce the concrete, rather than ready-mixed concrete, the mixer(s) must conform to the standards of the Volumetric Mixer Manufacturers Bureau (VMMB). Verification must be made by a current VMMB conformance plate affixed to the volumetric mixer equipment.

1.5.2 Contractor Qualifications

Unless waived by the Contracting Officer, the Contractor must meet one of the following criteria:

a. Contractor must have at least one National Ready Mixed Concrete Association (NRMCA) certified concrete craftsman and at least one American Concrete Institute (ACI) Flatwork Finisher Certified craftsman on site, overseeing each placement crew during all concrete placement.

b. Contractor must have no less than three NRMCA certified concrete installers and at least two American Concrete Institute (ACI) Flatwork Finisher Certified installers, who must be on site working as members of each placement crew during all concrete placement.

1.5.3 Required Information

Submit copies of laboratory test reports showing that the mix has been successfully tested to produce concrete with the properties specified and that mix will be suitable for the job conditions. The laboratory test reports must include mill test and all other test for cementitious materials, aggregates, and admixtures. Provide maximum nominal aggregate size, combined aggregate gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Submit test reports along with the concrete mix design. Sampling and testing of materials, concrete mix design, sampling and testing in the field must be performed by a commercial testing laboratory which conforms to ASTM C1077. The laboratory must be approved in writing by the Contracting Officer.

1.5.4 Batch Tickets

ASTM C94/C94M. Submit mandatory batch ticket information for each load of ready-mixed concrete.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cementitious Materials

Cementitious materials in concrete mix must be 20 to 50 percent non-portland cement pozzolanic materials or slag by weight.

2.1.1.1 Cement

ASTM C150/C150M, Type I or II or ASTM C595/C595M, Type IS, IP, or P or

ASTM C1157/C1157M .

2.1.1.2 Fly Ash and Pozzolan

ASTM C618, Type F, or N. Fly ash certificates must include test results in accordance with ASTM C618.

2.1.1.3 Ultra Fine Fly Ash and Ultra Fine Pozzolan

Ultra Fine Fly Ash (UFFA) and Ultra Fine Pozzolan (UFP) must conform to ASTM C618, Class F or N, and the following additional requirements:

a. The strength activity index at 28 days of age must be at least 95 percent of the control specimens.

b. The average particle size must not exceed 6 microns.

2.1.1.4 Slag

ASTM C989/C989M, Slag Cement (formerly Ground Granulated Blast Furnace Slag) Grade 100 or 120. Certificates must include test results in accordance with ASTM C989/C989M.

2.1.1.5 Supplementary Cementitious Materials (SCM) Content

The concrete mix must always contain one of the SCMs listed in Table 1 within the range specified therein, whether or not the aggregates are found to be reactive in accordance with the paragraph ALKALI REACTIVITY TEST".

TABLE 1
SUPPLEMENTARY CEMENTITIOUS MATERIALS CONTENT

Supplementary Cementitious Material	Minimum Content (percent)	Maximum Content (percent)
Class N Pozzolan and Class F Fly Ash		
SiO2 + Al2O3 + Fe2O3 > 70 percent	25	35
SiO2 + A12O3 + Fe2O3 > 80 percent	20	35
SiO2 + A12O3 + Fe2O3 > 90 percent	15	35
UFFA and UFP	7	16
GGBF Slag	40	50

2.1.2 Water

Water must conform to ASTM C1602/C1602M. Hot water must not be used unless approved by the Contracting Officer.

2.1.3 Aggregate

Coarse aggregate must consist of crushed or uncrushed gravel, crushed stone, or a combination thereof. Aggregates, as delivered to the mixers, must consist of clean, hard, uncoated particles. Coarse aggregate must be

washed. Washing must be sufficient to remove dust and other coatings. Fine aggregate must consist of natural sand, manufactured sand, or a combination of the two, and must be composed of clean, hard, durable particles. Both coarse and fine aggregates must meet the requirements of ASTM C33/C33M.

2.1.3.1 Alkali Reactivity Test

Aggregates to be used in all concrete in projects over 50,000 SF in size must be evaluated and tested for alkali-aggregate reactivity in accordance with ASTM C1260. The types of aggregates must be evaluated in a combination which matches the proposed mix design (including Class F fly ash or GGBF slag), utilizing ASTM C1567. Test results of the combination must have a measured expansion of less than 0.08 percent at 28 days. Should the test data indicate an expansion of greater than 0.08%, the aggregate(s) must be rejected and new aggregate sources must be submitted for retesting or may submit additional test results incorporating Lithium Nitrate for consideration.

ASTM C1567 must be performed as follows to include one of the following options:

a. Utilize the low alkali Portland cement and Class F fly ash in combination for the test proportioning. The laboratory must use the Contractor's proposed percentage of cement and fly ash.

b. Utilize the low alkali Portland cement and ground granulated blast furnace (GGBF) slag in combination for the test proportioning. The laboratory must use the Contractor's proposed percentage of cement and GGBF.

c. Utilize the low alkali Portland cement and Class F fly ash and ground granulated blast furnace (GGBF) slag in combination for the test proportioning. The laboratory must use the Contractor's proposed percentage of cement, fly ash and GGBF.

2.1.3.2 Fine Aggregates

ASTM C33/C33M.

2.1.3.3 Coarse Aggregates

ASTM C33/C33M.

2.1.4 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. Where not shown or specified, the use of admixtures is subject to written approval of the Contracting Officer.

ASTM C260/C260M: Air-entraining.

2.1.5 Curing Materials

2.1.5.1 White-Burlap-Polyethylene Sheet

ASTM C171, 0.004 inch thick white opaque polyethylene bonded to 10 oz/linear yard (40 inch) wide burlap.

2.1.5.2 Liquid Membrane-Forming Compound

ASTM C309, white pigmented, Type 2, Class B, free of paraffin or petroleum.

2.1.6 Joint Fillers and Sealants

Provide pre molded joint fillers. New joints must match existing alignment.

2.2 CONCRETE PAVEMENT

2.2.1 Joint Layout Drawings

If jointing requirements on the project drawings are not compatible with the proposed placement sequence, submit a joint layout plan shop drawing to the Contracting Officer for approval. No work must be allowed to start until the joint layout plan is approved. The joint layout plan must indicate and describe in the detail the proposed jointing plan for contraction joints, expansion joints, and construction joints, in accordance with the following:

a. Indicate locations of contraction joints, construction joints, and expansion joints. Spacing between contraction joints must not exceed 15 feet unless noted otherwise or approved by the Contracting Officer.

b. The larger dimension of a panel must not be greater than 125% of the smaller dimension.

c. The minimum angle between two intersecting joints must be 80 degrees, unless noted otherwise or approved by the Contracting Officer.

d. Joints must intersect pavement-free edges at a 90 degree angle the pavement edge and must extend straight for a minimum of 1.5 feet from the pavement edge, where possible.

e. Align joints of adjacent panels.

f. Align joints in attached curbs with joints in pavement when possible.

g. Ensure joint depth, widths, and dimensions are specified.

h. Minimum contraction joint depth must be 1/4 of the pavement thickness. The minimum joint width must be 1/8 inch.

i. Use expansion joints only where pavement abuts buildings, foundations, manholes, and other fixed objects.

2.3 CONTRACTOR-FURNISHED MIX DESIGN

Contractor-furnished concrete mix must be designed in accordance with ACI 211.1 except as modified herein, and the mix design must be as specified herein under paragraph SUBMITTALS. The concrete must have a minimum flexural strength of 650 pounds per square inch at 28 days. The concrete may be air entrained. If air entrainment is used the air content must be 6.0. Maximum size aggregate for slip forming must be 1.5 inches. The slump must be one to 3 inches (or less when slip form is used). For slipformed pavement, at the start of the project, select a maximum allowable slump which will produce in-place pavement meeting the specified tolerances for control of edge slump. The selected slump must be

applicable to both pilot and fill-in lanes.

If the cementitious material is not sufficient to produce concrete of the flexural strength required it must be increased as necessary, without additional compensation under the Contract. The cementitious factor must be calculated using cement, Class F fly ash, and or GGBF slag. The mix must use a SCM material by weight in accordance with Table 1 in "Supplementary Cementitious Materials (SCM) Content"

PART 3 EXECUTION

3.1 FORMS

3.1.1 Construction

Construct forms to be removable without damaging the concrete.

3.1.2 Coating

Before placing the concrete, coat the contact surfaces of forms with a non-staining mineral oil, non-staining form coating compound, biodegradable form release agent, or two coats of nitro-cellulose lacquer. When using existing pavement as a form, clean existing concrete and then coat with asphalt emulsion bondbreaker before concrete is placed.

3.1.3 Grade and Alignment

Check and correct grade elevations and alignment of the forms immediately before placing the concrete.

3.2 MEASURING, MIXING, CONVEYING, AND PLACING CONCRETE

3.2.1 Measuring

ASTM C94/C94M.

3.2.2 Mixing

ASTM C94/C94M, except as modified herein. Begin mixing within 30 minutes after cement has been added to aggregates. When the air temperature is greater than 85 degrees F, place concrete within 60 minutes. With the approval of the Contracting Officer, a hydration stabilizer admixture meeting the requirements of ASTM C494/C494M Type D, may be used to extend the placement time to 90 minutes. Additional water may be added to bring slump within required limits as specified in Section 11.7 of ASTM C94/C94M, provided that the specified water-cement ratio is not exceeded.

3.2.3 Conveying

ASTM C94/C94M.

3.2.4 Placing

Follow guidance of ACI 301, except as modified herein. Do not exceed a free vertical drop of 5 feet from the point of discharge. Deposit concrete either directly from the transporting equipment or by conveyor on to the pre-wetted subgrade or subbase, unless otherwise specified. Do not place concrete on frozen subgrade or subbase. Deposit the concrete between the forms to an approximately uniform height. Place concrete continuously at a

uniform rate, with minimum amount of segregation, without damage to the grade and without unscheduled stops except for equipment failure or other emergencies. If this occurs within 10 feet of a previously placed expansion joint, remove concrete back to joint, repair any damage to grade, install a construction joint and continue placing concrete only after cause of the stop has been corrected.

3.2.5 Vibration

Immediately after spreading concrete, consolidate concrete with internal type vibrating equipment along the boundaries of all slabs regardless of slab thickness, and interior of all concrete slabs 6 inches or more in thickness. Limit duration of vibration to that necessary to produce consolidation of concrete. Excessive vibration will not be permitted. Vibrators must not be operated in concrete at one location for more than 15 seconds. Vibrating equipment of a type approved by the Contracting Officer may be used to consolidate concrete in unreinforced pavement slabs less than 6 inches thick.

3.2.5.1 Vibrating Equipment

Operate equipment, except hand-manipulated equipment, ahead of the finishing machine. Select the number of vibrating units and power of each unit to properly consolidate the concrete. Mount units on a frame that is capable of vertical movement and, when necessary, radial movement, so vibrators may be operated at any desired depth within the slab or be completely withdrawn from the concrete. Clear distance between frame-mounted vibrating units that have spuds that extend into the slab at intervals across the paving lane must not exceed 30 inches. Distance between end of vibrating tube and side form must not exceed 2 inches. For pavements less than 10 inches thick, operate vibrators at mid-depth parallel with or at a slight angle to the subbase. For thicker pavements, angle vibrators toward the vertical, with vibrator tip preferably about 2 inches from subbase, and top of vibrator a few inches below pavement surface. Vibrators may be pneumatic, gas driven, or electric, and must be operated at frequencies within the concrete of not less than 8,000 vibrations per minute. Amplitude of vibration must be such that noticeable vibrations occur at 1.5 foot radius when the vibrator is inserted in the concrete to the depth specified.

3.2.6 Cold Weather

Except with authorization, do not place concrete when ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. When authorized, when concrete is likely to be subjected to freezing within 24 hours after placing, heat concrete materials so that temperature of concrete when deposited is between 65 and 80 degrees F. Methods of heating materials are subject to approval of the Contracting Officer. Do not heat mixing water above 165 degrees F. Remove lumps of frozen material and ice from aggregates before placing aggregates in mixer. Follow practices found in ACI 306.1.

3.2.7 Hot Weather

Maintain required concrete temperature in accordance with Figure NRMCA NOMOGRAPH FOR ESTIMATING EVAPORATION RATE ON THE BASIS OF MENZEL FORMULA in ACI 305.1 to prevent 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. After placement, use fog spray, apply monomolecular film, or use other suitable means to reduce the evaporation rate. Start curing when surface of fresh concrete is sufficiently hard to permit curing without damage. Cool underlying material by sprinkling lightly with water before placing concrete. Follow practices found in ACI 305.1.

3.3 PAVING

Pavement must be constructed with paving and finishing equipment utilizing fixed forms .

3.3.1 Consolidation

The paver vibrators must be inserted into the concrete not closer to the underlying material than 2 inches. The vibrators or tamping units in front of the paver must be automatically controlled so that they stop immediately as forward motion ceases. Excessive vibration must not be permitted. Concrete in small, odd-shaped slabs or in locations inaccessible to the paver mounted vibration equipment must be vibrated with a hand-operated immersion vibrator. Vibrators must not be used to transport or spread the concrete.

3.3.2 Operation

When the paver is operated between or adjacent to previously constructed pavement (fill-in lanes), provisions must be made to prevent damage to the previously constructed pavement, including keeping the existing pavement surface free of debris, and placing rubber mats beneath the paver tracks. Transversely oscillating screeds and extrusion plates must overlap the existing pavement the minimum possible, but in no case more than 8 inches.

3.3.3 Required Results

The paver-finisher must be operated to produce a thoroughly consolidated slab throughout, true to line and grade within specified tolerances. The paver-finishing operation must produce a surface finish free of irregularities, tears, voids of any kind, and other discontinuities. It must produce only a minimum of paste at the surface. Multiple passes of the paver-finisher must not be permitted. The equipment and its operation must produce a finished surface requiring no hand finishing, other than the use of cutting straightedges, except in very infrequent instances. No water, other than true fog sprays (mist), must be applied to the concrete surface during paving and finishing.

3.3.4 Fixed Form Paving

Forms must be steel, except that wood forms may be used for curves having a radius of 150 feet or less, and for fillets. Forms may be built up with metal or wood, added only to the base, to provide an increase in depth of not more than 25 percent. The base width of the form must be not less than eight-tenths of the vertical height of the form, except that forms 8 inches or less in vertical height must have a base width not less than the vertical height of the form. Wood forms for curves and fillets must be adequate in strength and rigidly braced. Forms must be set on firm material cut true to grade so that each form section when placed will be firmly in contact with the underlying layer for its entire base. Forms must not be set on blocks or on built-up spots of underlying material. Forms must remain in place at least 12 hours after the concrete has been

placed. Forms must be removed without injuring the concrete.

3.4 FINISHING CONCRETE

Start finishing operations immediately after placement of concrete. Use finishing machine, except hand finishing may be used in emergencies and for concrete slabs in inaccessible locations or of such shapes or sizes that machine finishing is impracticable. Finish pavement surface on both sides of a joint to the same grade. Finish formed joints from a securely supported transverse bridge. Provide hand finishing equipment for use at all times. Transverse and longitudinal surface tolerances must not exceed 1/4 inch in 10 feet.

3.4.1 Side Form Finishing

Strike off and screed concrete to the required slope and cross-section by a power-driven transverse finishing machine. Transverse rotating tube or pipe is not permitted unless approved by the Contracting Officer. Elevation of concrete must be such that, when consolidated and finished, pavement surface will be adequately consolidated and at the required grade. Equip finishing machine with two screeds which are readily and accurately adjustable for changes in pavement slope and compensation for wear and other causes. Make as many passes over each area of pavement and at such intervals as necessary to give proper compaction, retention of coarse aggregate near the finished surface, and a surface of uniform texture, true to grade and slope. Do not permit excessive operation over an area, which will result in an excess of mortar and water being brought to the surface.

3.4.1.1 Equipment Operation

Maintain the travel of machine on the forms without lifting, wobbling, or other variation of the machine which tend to affect the precision of concrete finish. Keep the tops of the forms clean by a device attached to the machine. During the first pass of the finishing machine, maintain a uniform ridge of concrete ahead of the front screed for its entire length.

3.4.1.2 Joint Finish

Before concrete is hardened, correct edge slump of pavement, exclusive of edge rounding, in excess of 0.02 foot. Finish concrete surface on each side of construction joints to the same plane, and correct deviations before newly placed concrete has hardened.

3.4.1.3 Hand Finishing

Strike-off and screed surface of concrete to elevations slightly above finish grade so that when concrete is consolidated and finished pavement surface is at the indicated elevation. Vibrate entire surface until required compaction and reduction of surface voids is secured with a strike-off template.

3.4.1.4 Longitudinal Floating

After initial finishing, further smooth and consolidate concrete by means of hand-operated longitudinal floats. Use floats that are not less than 12 feet long and 6 inches wide and stiffened to prevent flexing and warping.

3.4.2 Texturing

Before the surface sheen has disappeared and before the concrete hardens, the surface of the pavement must be given a texture as described herein. Following initial texturing on the first day of placement, the Placing Foreman, Contracting Officer representative, and a representative of the Using Agency must inspect the texturing for compliance with design requirements. After curing is complete, all textured surfaces must be thoroughly power broomed to remove all debris. Transverse texturing must produce grooves in straight lines across each lane within a tolerance of plus or minus 1/2 inch of a true line. The concrete in areas of recesses for tie-down anchors, lighting fixtures, and other outlets in the pavement must be finished to provide a surface of the same texture as the surrounding area.

3.4.2.1 Brooming

Finish the surface of the slab by brooming the surface with a new wire broom at least 18 inches wide. Gently pull the broom over the surface of the pavement from edge to edge just before the concrete becomes non-plastic. Slightly overlap adjacent strokes of the broom. Broom perpendicular to centerline of pavement so that corrugations produced will be uniform in character and width, and not more than 1/16 inch in depth. Broomed surface must be free from porous spots, irregularities, depressions, and small pockets or rough spots such as may be caused by accidentally disturbing particles of coarse aggregate embedded near the surface.

3.4.3 Edging

At the time the concrete has attained a degree of hardness suitable for edging, carefully finish slab edges, including edges at formed joints, with an edge having a maximum radius of 1/8 inch. When brooming is specified for the final surface finish, edge transverse joints before starting brooming, then operate broom to obliterate as much as possible the mark left by the edging tool without disturbing the rounded corner left by the edger. Clean by removing loose fragments and soupy mortar from corners or edges of slabs which have crumbled and areas which lack sufficient mortar for proper finishing. Refill voids solidly with a mixture of suitable proportions and consistency and refinish. Remove unnecessary tool marks and edges. Remaining edges must be smooth and true to line.

3.4.4 Repair of Surface Defects

Follow guidance of ACI 301.

3.5 CURING AND PROTECTION

Protect concrete adequately from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks and oil stains, and do not allow it to dry out from the time it is placed until the expiration of the minimum curing periods specified herein. Use White-Burlap-Polyethylene Sheet or liquid membrane-forming compound, except as specified otherwise herein. Do not use membrane-forming compound on surfaces where its appearance would be objectionable, on surfaces to be painted, where coverings are to be bonded to concrete, or on concrete to which other concrete is to be bonded. Maintain temperature of air next to concrete above 40 degrees F for the full curing periods.

3.5.1 White-Burlap-Polyethylene Sheet

Wet entire exposed surface thoroughly with a fine spray of water, saturate burlap but do not have excessive water dripping off the burlap and then cover concrete with White-Burlap-Polyethylene Sheet, burlap side down. Lay sheets directly on concrete surface and overlap 12 inches. Make sheeting not less than 18 inches wider than concrete surface to be cured, and weight down on the edges and over the transverse laps to form closed joints. Repair or replace sheets when damaged during curing. Check daily to assure burlap has not lost all moisture. If moisture evaporates, resaturate burlap and re-place on pavement (re-saturation and re-placing must take no longer than 10 minutes per sheet). Leave sheeting on concrete surface to be cured for at least 7 days.

3.5.2 Liquid Membrane-Forming Compound Curing

Apply compound immediately after surface loses its water sheen and has a dull appearance and before joints are sawed. Agitate curing compound thoroughly by mechanical means during use and apply uniformly in a two-coat continuous operation by suitable power-spraying equipment. Total coverage for the two coats must be at least one gallon of undiluted compound per 200 square feet. Compound must form a uniform, continuous, coherent film that will not check, crack, or peel and must be free from pinholes or other imperfections. Apply an additional coat of compound immediately to areas where film is defective. Respray concrete surfaces that are subject to heavy rainfall within 3 hours after curing compound has been applied in the same manner.

3.5.2.1 Protection of Treated Surfaces

Keep concrete surfaces to which liquid membrane-forming compounds have been applied free from vehicular traffic and other sources of abrasion for not less than 72 hours. Foot traffic is allowed after 24 hours for inspection purposes. Maintain continuity of coating for entire curing period and repair damage to coating immediately.

3.6 FIELD QUALITY CONTROL

3.6.1 Sampling

The Contractor's approved laboratory must collect samples of fresh concrete in accordance with ASTM C172/C172M during each working day as required to perform tests specified herein. Make test specimens in accordance with ASTM C31/C31M.

3.6.2 Consistency Tests

The Contractor's approved laboratory must perform concrete slump tests in accordance with ASTM C143/C143M. Take samples for slump determination from concrete during placement. Perform tests at the beginning of a concrete placement operation and for each batch (minimum) or every 20 cubic yards (maximum) of concrete to ensure that specification requirements are met. In addition, perform tests each time test beams and cylinders are made.

3.6.3 Flexural Strength Tests

The Contractor's approved laboratory must test for flexural strength in accordance with ASTM C78/C78M. Make four test specimens for each set of tests. Test two specimens at 14 days, and the other two at 28 days.

Concrete strength will be considered satisfactory when the minimum of the 28 -day test results equals or exceeds the specified 28-day flexural strength, and no individual strength test is less than 550 pounds per square inch. If the ratio of the 28-day strength test to the specified 28-day strength is less than 65 percent, make necessary adjustments for conformance. Frequency of flexural tests on concrete beams must be not less than four test beams for each 50 cubic yards of concrete, or fraction thereof, placed. Concrete which is determined to be defective, based on the strength acceptance criteria therein, must be removed and replaced with acceptable concrete.

3.6.4 Air Content Tests

Test air-entrained concrete for air content at the same frequency as specified for slump tests. Determine percentage of air in accordance with ASTM C231/C231M on samples taken during placement of concrete in forms.

3.6.5 Plan Grade Testing and Conformance

The surfaces must vary not more than 0.06 foot above or below the plan grade line or elevation indicated. Each pavement category must be checked for conformance with plan grade requirements by running lines of levels at intervals to determine the elevation at each joint intersection.

3.6.6 Test for Pavement Thickness

Full depth cores of 4 inch diameter must be taken of concrete pavement every 1000 square feet to measure thickness.

-- End of Section --

SECTION 32 17 23

PAVEMENT MARKINGS
08/16

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 248	(1991; R 2012) Standard Specification for Ready-Mixed White and Yellow Traffic Paints

ASTM INTERNATIONAL (ASTM)

ASTM D4061	(2013) Standard Test Method for Retroreflectance of Horizontal Coatings
ASTM D6628	(2003; R 2015) Standard Specification for Color of Pavement Marking Materials
ASTM E1710	(2011) Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2177	(2011) Standard Test Method for Measuring the Coefficient of Retroreflected Luminance (RL) of Pavement Markings in a Standard Condition of Wetness
ASTM E2302	(2003; R 2016) Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer

INTERNATIONAL CONCRETE REPAIR INSTITUTE (ICRI)

ICRI 03732	(1997) Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays

MASTER PAINTERS INSTITUTE (MPI)

MPI 97	(2012) Traffic Marking Paint, Latex

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS-STD-595A	(2017) Colors used in Government Procurement

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD	(2015) Manual on Uniform Traffic Control Devices

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-B-1325	(Rev D; Notice 1; Notice 2 2017) Beads (Glass Spheres) Retro-Reflective (Metric)
FS TT-P-1952	(2015; Rev F) Paint, Traffic and Airfield Markings, Waterborne

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. SUBMITTAL PROCEDURES:

SD-03 Product Data

Surface Preparation Equipment List; G

Application Equipment List; G

Exterior Surface Preparation

Safety Data Sheets; G

Solventborne Paint; G

SD-06 Test Reports

Solventborne Paint; G

Test Reports

SD-07 Certificates

Qualifications; G

Solventborne Paint

Volatile Organic Compound, (VOC); G

SD-08 Manufacturer's Instructions

Solventborne Paint; G

1.3 QUALITY ASSURANCE

1.3.1 Regulatory Requirements

Submit certificate stating that the proposed pavement marking paint meets the Volatile Organic Compound, (VOC) regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located. Submit Safety Data Sheets for each product.

1.3.2 Qualifications

Submit documentation certifying that pertinent personnel are qualified for equipment operation and handling of applicable chemicals. The documentation should include experience on five projects of similar size and scope with references for all personnel.

1.3.3 Qualifications For Airfield Marking Personnel

Submit documentation of qualifications in resume format a minimum of 14 days before pavement marking work is to be performed showing personnel who will be performing the work have experience working on airfields, operating mobile self-powered marking, cleaning, and paint removal equipment and performing these tasks. Include with resume a list of references complete with points of contact and telephone numbers. Provide certification for pavement marking machine operator and Foreman demonstrating experience successfully completing a minimum of two airfield pavement marking projects of similar size and scope. Provide documentation demonstrating personnel have a minimum of three years of experience operating similar equipment and performing the same or similar work in similar environments, similar in size and scope of the planned project. The Contracting Officer reserves the right to require additional proof of competency or to reject proposed personnel.

1.4 DELIVERY AND STORAGE

Deliver paint materials, thermoplastic compound materials, and reflective media in original sealed containers that plainly show the designated name, specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer.

Provide storage facilities at the job site for maintaining materials at temperatures recommended by the manufacturer.

1.5 PROJECT/SITE CONDITIONS

1.5.1 Environmental Requirements

1.5.1.1 Weather Limitations for Application

Apply pavement markings to clean, dry surfaces, and unless otherwise approved, only when the air and pavement surface temperature is at least 5 degrees F above the dew point and the air and pavement temperatures are within the limits recommended by the pavement marking manufacturer. Allow pavement surfaces to dry after water has been used for cleaning or rainfall has occurred prior to striping or marking. Test the pavement surface for moisture before beginning work each day and after cleaning. Do not commence marking until the pavement is sufficiently dry and the pavement condition has been approved by the Contracting Officer. Employ the "plastic wrap method" to test the pavement for moisture as specified in paragraph TESTING FOR MOISTURE.

1.5.1.2 Weather Limitations for Removal of Pavement Markings on Roads and Automotive Parking Areas

Pavement surface must be free of snow, ice, or slush; with a surface temperature of at least 40 degrees F and rising at the beginning of

operations, except those involving shot or sand blasting or grinding. Cease operation during thunderstorms, or during rainfall, except for waterblasting and removal of previously applied chemicals. Cease waterblasting where surface water accumulation alters the effectiveness of material removal.

1.5.2 Traffic Controls

Place warning signs conforming to MUTCD near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Place small markers along newly painted lines or freshly placed raised markers to control traffic and prevent damage to newly painted surfaces or displacement of raised pavement markers. Mark painting equipment with large warning signs indicating slow-moving painting equipment in operation.

When traffic must be rerouted or controlled to accomplish the work, provide necessary warning signs, flag persons, and related equipment for the safe passage of vehicles.

1.5.3 Airfield Traffic Control

Coordinate performance of all work in the controlled zones of the airfield with the Contracting Officer and with the Flight Operations Officer or Airfield Manager. Neither equipment nor personnel can use any portion of the airfield without permission of these officers unless the runway is closed.

1.5.4 Airfield Radio Communication

No personnel or equipment will be allowed in the controlled zones of the airfield until radio contact has been made with the control tower and permission is granted by the control tower. A radio for this purpose will be provided by the Government. The Contractor is responsible for the radio and must reimburse the Government for repair or replacement of the radio if it is lost, damaged, or destroyed . Maintain contact with the control tower at all times during work in vicinity of the airfield. Notify the control tower when work is completed and all personnel, equipment and materials have been removed from all aircraft operating surfaces.

1.5.5 Airfield Emergency Landing and Takeoff

Emergencies take precedence over all operations. Upon notification from the control tower of an emergency landing or imminent takeoff, stop all operations immediately and evacuate all personnel and equipment to an area not utilized for aircraft traffic which is at least 250 feet measured perpendicular to and away from the near edge of the runway unless otherwise authorized by the Contracting Officer. Equipment and chemicals or detergents as well as excess water must be able to be removed from the work area within 3 minutes.

1.5.6 Lighting

When night operations are necessary, provide all necessary lighting and equipment. The Government reserves the right to accept or reject night work on the day following night activities by the Contractor.

PART 2 PRODUCTS

2.1 EQUIPMENT

2.1.1 Surface Preparation and Paint Removal

2.1.1.1 Surface Preparation and Paint Removal Equipment for Airfield Pavements

Prepare all airfield surfaces and remove paint from airfield surfaces in accordance with UFGS 32 01 11.51 Rubber and Paint Removal From Airfield Pavements. Provide submittals in accordance with UFGS 32 01 11.51 Rubber and Paint Removal From Airfield Pavements.

2.1.1.2 Surface Preparation Equipment for Roads and Automotive Parking Areas

Submit a surface preparation equipment list by serial number, type, model, and manufacturer. Include descriptive data indicating area of coverage per pass, pressure adjustment range, tank and flow capacities, and safety precautions required for the equipment operation. Mobile equipment must allow for removal of markings without damaging the pavement surface or joint sealant. Maintain machines, tools, and equipment used in the performance of the work in satisfactory operating condition.

2.1.1.2.1 Waterblasting Equipment

Use mobile waterblasting equipment capable of producing a pressurized stream of water that effectively removes paint from the pavement surface without significantly damaging the pavement. Provide equipment, tools, and machinery which are safe and in good working order at all times.

2.1.2 Application Equipment

Submit application equipment list appropriate for the material(s) to be used. Include manufacturer's descriptive data and certification for the planned use that indicates area of coverage per pass, pressure adjustment range, tank and flow capacities, and all safety precautions required for operating and maintaining the equipment. Provide and maintain machines, tools, and equipment used in the performance of the work in satisfactory operating condition, or remove them from the work site. Provide mobile and maneuverable application equipment to the extent that straight lines can be followed and normal curves can be made in a true arc.

2.1.2.1 Paint Application Equipment

2.1.2.1.1 Hand-Operated, Push-Type Machines

Provide hand-operated push-type applicator machine of a type commonly used for application of water based paint or two-component, chemically curing paint, thermoplastic, or preformed tape, to pavement surfaces for small marking projects, such as legends and cross-walks, automotive parking areas, or surface painted signs. Provide applicator machine equipped with the necessary tanks and spraying nozzles capable of applying paint uniformly at coverage specified. Hand operated spray guns may be used in areas where push-type machines cannot be used.

2.1.2.1.2 Self-Propelled or Mobile-Drawn Spraying Machines

Provide self-propelled or mobile-drawn spraying machine with suitable

arrangements of atomizing nozzles and controls to obtain the specified results. Provide machine having a speed during application capable of applying the stripe widths indicated at the paint coverage rate specified herein and of even uniform thickness with clear-cut edges.

2.1.2.1.2.1 Airfield Marking

Provide self-propelled or mobile-drawn spraying machine for applying the paint for airfield pavements with an arrangement of atomizing nozzles capable of applying the specified line width in a single pass. Provide paint applicator with paint reservoirs or tanks of sufficient capacity and suitable gages to apply paint in accordance with requirements specified. Equip tanks with suitable mechanical agitators. Equip spray mechanism with quick-action valves conveniently located, and include necessary pressure regulators and gages in full view and reach of the operator. Install paint strainers in paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator must be readily adaptable for attachment of a dispenser for the reflective media approved for use.

2.1.2.1.2.2 Hand Application

Provide spray guns for hand application of paint in areas where the mobile paint applicator cannot be used.

2.2 MATERIALS

Use waterborne or methacrylate paint for airfield markings. The maximum allowable VOC content of pavement markings is 150 grams per liter. Color of markings are indicated on the drawings and must conform to ASTM D6628 for roads and automotive parking areas and SAE AMS-STD-595A for airfields. Provide materials conforming to the requirements specified herein.

2.2.1 Solventborne Paint

AASHTO M 248.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Testing for Moisture

Test the pavement surface for moisture before beginning pavement marking after each period of rainfall, fog, high humidity, or cleaning, or when the ambient temperature has fallen below the dew point. Do not commence marking until the pavement is sufficiently dry and the pavement condition has been approved by the Contracting Officer or authorized representative.

Employ the "plastic wrap method" to test the pavement for moisture as follows: Cover the pavement with a 12 inch by 12 inch section of clear plastic wrap and seal the edges with tape. After 15 minutes, examine the plastic wrap for any visible moisture accumulation inside the plastic. Do not begin marking operations until the test can be performed with no visible moisture accumulation inside the plastic wrap. Re-test surfaces when work has been stopped due to rain.

3.1.2 Surface Preparation Demonstration

Prior to surface preparation, demonstrate the proposed procedures and equipment. Prepare areas large enough to determine cleanliness and rate of cleaning.

3.1.3 Test Stripe Demonstration

Prior to paint application, demonstrate test stripe application within the work area using the proposed materials and equipment. Apply separate test stripes in each of the line widths and configurations required herein using the proposed equipment. Make the test stripes long enough to determine the proper speed and operating pressures for the vehicle(s) and machinery, but not less than 50 feet long.

3.1.4 Application Rate Demonstration

During the Test Stripe Demonstration, demonstrate compliance with the application rates specified herein. Document the equipment speed and operating pressures required to meet the specified rates in each configuration of the equipment and provide a copy of the documentation to the Contracting Officer prior to proceeding with the work.

3.1.5 Retroreflective Value Demonstration

After the test stripes have cured to a "no-track" condition, demonstrate compliance with the average retroreflective values specified herein. Take a minimum of ten readings on each test stripe with a Retroreflectometer with a direct readout in millicandelas per square meter per lux (mcd/m2/lx). Perform testing in accordance with ASTM D4061, ASTM E1710, ASTM E2177, and ASTM E2302.

3.1.6 Level of Performance Demonstration

The Contracting Officer will be present at the application demonstrations to observe the results obtained and to validate the operating parameters of the vehicle(s) and equipment. If accepted by the Contracting Officer, the test stripe is the measure of performance required for this project. Do not proceed with the work until the demonstration results are satisfactory to the Contracting Officer.

3.2 EXTERIOR SURFACE PREPARATION

Allow new pavement surfaces to cure for a period of not less than 30 days before application of marking materials. Thoroughly clean surfaces to be marked before application of the paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods as required. Remove existing paint markings, and other coatings adhering to the pavement by water blasting.

a. For Portland Cement Concrete pavement, grinding, light shot blasting, or light scarification, to a resulting profile equal to ICRI 03732 CSP 2, CSP 3, and CSP 4, respectively, can be used in addition to water blasting on most pavements, to either remove existing coatings, or for surface preparation.

b. Do not use shot blasting on airfield pavements due to the potential of Foreign Object Damage (FOD) to aircraft. Scrub affected areas, where

oil or grease is present on old pavements to be marked, with several applications of trisodium phosphate solution or other approved detergent or degreaser and rinse thoroughly after each application. After cleaning oil-soaked areas, seal with shellac or primer recommended by the manufacturer to prevent bleeding through the new paint. Do not commence painting in any area until pavement surfaces are dry and clean.

3.2.1 Early Painting of Rigid Pavements

Pretreat rigid pavements that require early painting with an aqueous solution containing 3 percent phosphoric acid and 2 percent zinc chloride. Apply the solution to the areas to be marked.

3.2.2 Early Painting of Asphalt Pavements

For asphalt pavement systems requiring painting application at less than 30 days, apply the paint and beads at half the normal application rate, followed by a second application at the normal rate after 30 days.

3.3 APPLICATION

Apply pavement markings to dry pavements only.

3.3.1 Paint

Apply paint with approved equipment at rate of coverage specified herein. Provide guidelines and templates as necessary to control paint application. Take special precautions in marking numbers, letters, and symbols. Manually paint numbers, letters, and symbols. Sharply outline all edges of markings. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a deficiency in drying of the markings, painting operations must cease until the cause of the slow drying is determined and corrected.

3.3.1.1 Waterborne Paint

3.3.1.1.1 Airfields

For non-reflectorized markings, apply paint conforming to FS TT-P-1952 Type I or II at a rate of 121 plus or minus 6 square feet per gallon MPI 97 at a rate of 105 plus or minus 5 square feet per gallon.

3.3.1.1.2 Roads

Apply paint at a rate of 105 plus or minus 5 square feet per gallon. Apply FS TT-B-1325 Type I (Gradation A) beads at a rate of 7 plus or minus 0.5 pounds of glass spheres per gallon.

3.3.1.2 Solventborne Paint

Apply paint at a minimum wet film thickness of 15 mils. Apply FS TT-B-1325 Type I (Gradation A) beads at a minimum rate of 6 pounds of glass spheres per gallon.

3.3.2 Cleanup and Waste Disposal

Keep the worksite clean and free of debris and waste from the removal and

application operations. Immediately cleanup following removal operations in areas subject to aircraft traffic. Dispose of debris at approved sites.

3.4 FIELD QUALITY CONTROL

3.4.1 Sampling and Testing

As soon as the paint materials are available for sampling, obtain by random selection from the sealed containers, two quart samples of each batch in the presence of the Contracting Officer. Two quarts will be for sampling and testing by the Contractor and two quarts will be for retention by the Government. Accomplish adequate mixing prior to sampling to ensure a uniform, representative sample. A batch is defined as that quantity of material processed by the manufacturer at one time and identified by number on the label. Clearly identify samples by designated name, specification number, batch number, project contract number, intended use, and quantity involved.

At the discretion of the Contracting Officer, samples provided may be tested by the Government for verification.

3.4.2 Material Inspection

Examine material at the job site to determine that it is the material referenced in the report of test results or certificate of compliance. Provide test results substantiating conformance to the specified requirements with each certificate of compliance.

3.4.3 Dimensional Tolerances

Apply all markings in the standard dimensions provide in the drawings. New markings may deviate a maximum of 10 percent larger than the standard dimension. The maximum deviation allowed when painting over an old marking is up to 20 percent larger than the standard dimensions.

3.4.4 Bond Failure Verification

Inspect newly applied markings for signs of bond failure based on visual inspection and comparison to results from Test Stripe Demonstration paragraph.

3.4.5 Retroreflective Markings

Collect and record readings for white and yellow retroreflective markings at the rate of one reading per 1000 linear feet. The minimum acceptable average for white markings is 200 millicandelas per square meter per lux (mcd/m2/lx) (measured with Retroreflectometer). The minimum acceptable average for yellow markings is 175 millicandelas per square meter per lux (mcd/m2/lx). Compute readings by averaging a minimum of 10 readings taken within the area at random locations. Re-mark areas not meeting the retroreflective requirements stated above.

3.4.6 Material Bond Verification and Operations Area Cleanup for Airfields

Vacuum sweep the aircraft operating area before it is opened for aircraft operations to preclude potential foreign object damaged to aircraft engines. Visually inspect the pavement markings and the material captured by the vacuum. Verify that no significant loss of reflective media has occurred to the pavement marking due to the vacuum cleaning.

-- End of Section --

SECTION 32 31 13.53

HIGH-SECURITY CHAIN LINK FENCES AND GATES
04/08

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 A121	(2013) Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
ASTM A153/A153M	(2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A824	(2011; R 2017) Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use With Chain Link Fence
ASTM C94/C94M	(2017a) Standard Specification for Ready-Mixed Concrete
ASTM F567	(2014a) Standard Practice for Installation of Chain Link Fence
ASTM F626	(2014) Standard Specification for Fence Fittings

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. SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fence Installation
Installation Drawings

SD-03 Product Data

Fence Installation

SD-04 Samples

Fence Fabric

Posts
Post Caps
Braces
Line Posts
Bottom Rail
Tension Wire
Barbed Wire
Barbed Wire Supporting Arms
Stretcher Bars
Wire Ties

SD-06 Test Reports

zinc coating
Aluminum Alloy Coating

SD-07 Certificates

Chain Link Fence
Reports
Zinc Coating
aluminum alloy coating
Fence Fabric
Barbed Wire
Stretcher Bars
Concrete

SD-08 Manufacturer's Instructions

Fence Installation
Hardware Assembly
Accessories
Corner, End, and Pull Posts
Line Posts

1.3 QUALITY ASSURANCE

1.3.1 Required Report Data

Submit reports, signed by an official authorized to certify on behalf of the manufacturer, of chain-link fencing listing and accessories regarding weight in ounces for zinc coating, and chemical composition and thickness of aluminum alloy coating.

1.3.2 Assembly and Installation Drawings

Submit Manufacturer's instructions and complete Fence Installation Drawings for review and approval by the Contracting Officer prior to shipment. Drawing details shall include, but are not limited to: Fence Installation, Hardware Assembly, Accessories, Corner, End, and Pull Posts.

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.

PART 2 PRODUCTS

2.1 FENCE FABRIC

2.1.1 General

Provide Secure fabric to posts using stretcher bars or ties spaced 15 inches on center, or by integrally weaving to integral fastening loops of end, corner, pull, and posts for full length of each post. Install fabric on opposite side of posts from area being secured.

2.2 POSTS

2.2.1 Metal Posts for Chain Link Fence

2.2.2 Accessories

a. Provide accessories conforming to ASTM F626. Ferrous accessories shall be zinc or aluminum coated.

b. Furnish truss rods for each terminal post. Provide truss rods with turnbuckles or other equivalent provisions for adjustment.

c. Provide Barbed wire supporting arms of the 45 degree outward angle 3-strand arm type and of the design required for the post furnished. Secure arms by top tension wire.

d. Furnish post caps in accordance with manufacturer's standard accessories.

e. Provide 9 gauge steel tie wire for attaching fabric to rails, braces, and posts and match the coating of the fence fabric. Miscellaneous hardware coatings shall conform to ASTM A153/A153M unless modified.

2.3 BRACES AND RAILS

2.4 WIRE

2.4.1 Wire Ties

Submit samples as specified. Provide wire ties constructed of the same material as the fencing fabric.

2.4.2 Barbed Wire

Provide barbed wire conforming to ASTM A121 zinc-coated, Type Z, Class 3, or aluminum-coated, Type A, with 12.5 gauge wire with 14 gauge, round, 4-point barbs spaced no more than 5 inches apart.

2.4.3 Tension Wire

Provide Type I or Type II tension wire, Class 4 coating, in accordance with ASTM A824.

2.5 CONCRETE

ASTM C94/C94M, using 3/4 inch maximum size aggregate, and having minimum compressive strength of 3000 psi at 28 days. Grout shall consist of one

part portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

2.6 GATES (Not Used)

PART 3 EXECUTION

3.1 FENCE INSTALLATION

Perform complete installation conforming to ASTM F567.

3.1.1 Line and Grade

Install fence to the lines and grades indicated. Clear the area on either side of the fence line to the extent indicated. Space line posts equidistant at intervals not exceeding 10 feet. Terminal (corner,and pull) posts shall be set at abrupt changes in vertical and horizontal alignment. Provide fabric continuous between terminal posts; however, runs between terminal posts shall not exceed 500 feet. Repair any damage to galvanized surfaces, including welding, with paint containing zinc dust in accordance with ASTM A780/A780M.

3.1.2 Excavation

Clear all post holes of loose material. Spread waste material where directed. Eliminate ground surface irregularities along the fence line to the extent necessary to maintain a 2 inch clearance between the bottom of the fabric and finish grade.

3.2 POST INSTALLATION

3.2.1 Earth and Bedrock

a. Set posts plumb and in alignment. Except where solid rock is encountered, set posts in concrete to the depth indicated on the drawings. Where solid rock is encountered with no overburden, set posts to a minimum depth of 18 inches in rock. Where solid rock is covered with an overburden of soil or loose rock, set posts to the minimum depth indicated on the drawing unless a penetration of 18 inches in solid rock is achieved before reaching the indicated depth, in which case terminate depth of penetration. Grout all portions of posts set in rock.

b. Portions of posts not set in rock shall be set in concrete from the rock to ground level. Posts set in concrete shall be set in holes not less than the diameter shown on the drawings. Make diameters of holes in solid rock at least 1 inch greater than the largest cross section of the post. Thoroughly consolidate concrete and grout around each post, free of voids and finished to form a dome. Allow concrete and grout to cure for 72 hours prior to attachment of any item to the posts. Group II line posts may be mechanically driven, for temporary fence construction only, if rock is not encountered. Set driven posts to a minimum depth of 3 feet and protect with drive caps when setting.

c. Test fence post rigidity by applying a 50 pound force on the post, perpendicular to the fabric, at 5 feet above ground. Post movement measured at the point where the force is applied shall be less than or equal to 3/4 inch from the relaxed position. Test every tenth post for rigidity. When a post fails this test, make further tests on the next

four posts on either side of the failed post. All failed posts shall be removed, replaced, and retested at the Contractor's expense.

3.3 RAILS

Bolt bottom rail to double rail ends and securely fasten double rail ends to the posts. Peen bolts to prevent easy removal. Install bottom rail before chain link fabric.

3.4 FABRIC INSTALLATION

a. Install chain link fabric on the side of the post indicated. Attach fabric to terminal posts with stretcher bars and tension bands. Space bands at approximately 15 inch intervals. Install fabric and pull taut to provide a smooth and uniform appearance free from sag, without permanently distorting the fabric diamond or reducing the fabric height. Fasten fabric to line posts at approximately 15 inch intervals and fastened to all rails and tension wires at approximately 24 inch intervals.

b. Cut fabric by untwisting and removing pickets. Accomplish splicing by weaving a single picket into the ends of the rolls to be joined. The bottom of the installed fabric shall be 2 plus or minus 1/2 inch above the ground.

c. After the fabric installation is complete, exercise the fabric by applying a 50 pound push-pull force at the center of the fabric between posts; the use of a 30 pound pull at the center of the panel shall cause fabric deflection of not more than 2.5 inches when pulling fabric from the post side of the fence; every second fence panel shall meet this requirement; resecure and retest all failed panels at the Contractor's expense.

3.5 SUPPORTING ARMS

Install barbed wire supporting arms and barbed wire as indicated on the drawings and as recommended by the manufacturer. Anchor supporting arms to the posts in a manner to prevent easy removal with hand tools Pull barbed wire taut and attach to the arms with clips or other means that will prevent easy removal.

3.6 SECURITY

Install new security fencing, remove existing security fencing, and perform related work to provide continuous security for facility. Schedule and fully coordinate work with Contracting Officer and cognizant Security Officer.

3.7 CLEANUP

Remove waste fencing materials and other debris from the work site each workday.

-- End of Section --

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SECTION 32 92 23

SODDING
04/06

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 C602	(2013a) Agricultural Liming Materials
ASTM D4427	(2013) Peat Samples by Laboratory Testing
ASTM D4972	(2013) pH of Soils

TURFGRASS PRODUCERS INTERNATIONAL (TPI)

TPI GSS	(1995) Guideline Specifications to Turfgrass Sodding

U.S. DEPARTMENT OF AGRICULTURE (USDA)

DOA SSIR 42	(1996) Soil Survey Investigation Report No. 42, Soil Survey Laboratory Methods Manual, Version 3.0

1.2 DEFINITIONS

1.2.1 Stand of Turf

100 percent ground cover of the established species.

1.3 RELATED REQUIREMENTS

Section 31 00 00.00 06 EARTHWORK, applies to this section for pesticide use and plant establishment requirements, with additions and modifications herein.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 30 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fertilizer

Include physical characteristics, and recommendations.

SD-06 Test Reports

Topsoil composition tests (reports and recommendations).

SD-07 Certificates

Sod farm certification for sods. Indicate type of sod in accordance with TPI GSS.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

1.5.1.1 Sod Protection

Protect from drying out and from contamination during delivery, on-site storage, and handling.

1.5.1.2 Fertilizer Gypsum Sulfur Iron and Lime Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer gypsum sulphur iron and lime may be furnished in bulk with certificate indicating the above information.

1.5.2 Storage

1.5.2.1 Sod Storage

Lightly sprinkle with water, cover with moist burlap, straw, or other approved covering; and protect from exposure to wind and direct sunlight until planted. Provide covering that will allow air to circulate so that internal heat will not develop. Do not store sod longer than 24 hours. Do not store directly on concrete or bituminous surfaces.

1.5.2.2 Topsoil

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.

1.5.2.3 Handling

Do not drop or dump materials from vehicles.

1.6 TIME RESTRICTIONS AND PLANTING CONDITIONS

1.6.1 Restrictions

Do not plant when the ground is frozen, snow covered, muddy, or when air temperature exceeds 90 degrees Fahrenheit.

1.7 TIME LIMITATIONS

1.7.1 Sod

Place sod a maximum of thirty six hours after initial harvesting, in accordance with TPI GSS as modified herein.

PART 2 PRODUCTS

2.1 SODS

2.1.1 Classification

Nursery grown, certified as classified in the TPI GSS. Machine cut sod at a uniform thickness of 3/4 inch within a tolerance of 1/4 inch, excluding top growth and thatch. Rolled sod shall be provided from a reputable grower of uniform density, color and texture capable of vigorous growth when planted. Broken pads, irregularly shaped pieces, and torn or uneven ends will be rejected. Wood pegs and wire staples for anchorage shall be as recommended by sod supplier.

2.1.2 Purity

Sod species shall be genetically pure, free of weeds, pests, and disease.

2.1.3 Planting Dates

Lay sod from June to October for warm season spring planting and from April to May for cool season fall planting.

2.1.4 Composition

Sod shall be Bermuda Pennington Sahara or Cheyenne. Brown Top Millet will not be accepted.

2.1.4.1 Sod Farm Overseeding

At the sod farm provide sod with overseeding of type recommended by seed producer.

2.2 TOPSOIL

2.2.1 On-Site Topsoil

Surface soil stripped and stockpiled on site and modified as necessary to meet the requirements specified for topsoil in paragraph entitled "Composition." When available topsoil shall be existing surface soil stripped and stockpiled on-site in accordance with Section 31 00 00.00 06 EARTHWORK.

2.2.2 Off-Site Topsoil

Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be furnished by the Contractor .

2.2.3 Composition

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. Other components shall conform to the following limits:

Silt	25-50 percent
Clay	10-30 percent
Sand	20-35 percent
pH	5.5 to 7.0
Soluble Salts	600 ppm maximum

2.3 SOIL CONDITIONERS

Add conditioners to topsoil as required to bring into compliance with "composition" standard for topsoil as specified herein.

2.3.1 Lime

Commercial grade hydrate or burnt limestone containing a calcium carbonate equivalent (C.C.E.) as specified in ASTM C602 of not less than 15 percent.

2.3.2 Aluminum Sulfate

Commercial grade.

2.3.3 Sulfur

100 percent elemental

2.3.4 Iron

100 percent elemental

2.3.5 Peat

Natural product of derived from a freshwater site and conforming to ASTM D4427. Shred and granulate peat to pass a 1/2 inch mesh screen and condition in storage pile for minimum 6 months after excavation.

2.3.6 Sand

Clean and free of materials harmful to plants.

2.3.7 Perlite

Horticultural grade.

2.3.8 Composted Derivatives

Ground bark, nitrolized sawdust, humus or other green wood waste material free of stones, sticks, and soil stabilized with nitrogen and having the following properties:

2.3.8.1 Particle Size

Minimum percent by weight passing:

No. 4 mesh screen	95
No. 8 mesh screen	80

2.3.8.2 Nitrogen Content

Minimum percent based on dry weight:

Fir Sawdust	0.7
Fir or Pine Bark	1.0

2.3.9 Gypsum

Coarsely ground gypsum comprised of calcium sulfate dihydrate 91 percent, calcium 22 percent, sulfur 17 percent; minimum 96 percent passing through 20 mesh screen, 100 percent passing thru 16 mesh screen.

2.3.10 Calcined Clay

Calcined clay shall be granular particles produced from montmorillonite clay calcined to a minimum temperature of 1200 degrees F. Gradation: A minimum 90 percent shall pass a No. 8 sieve; a minimum 99 percent shall be retained on a No. 60 sieve; and a maximum 2 percent shall pass a No. 100 sieve. Bulk density: A maximum 40 pounds per cubic foot.

2.4 FERTILIZER

2.4.1 Granular Fertilizer

Organic, granular controlled release fertilizer containing the following minimum percentages, by weight, of plant food nutrients:

45 percent available nitrogen
30 percent available phosphorus
5 percent available potassium
5 percent sulfur
15 percent iron

2.5 WATER

Source of water shall be approved by Contracting Officer and of suitable quality for irrigation containing no element toxic to plant life.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Extent Of Work

Provide soil preparation (including soil conditioners), fertilizing, and sodding of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

3.1.2 Soil Preparation

Provide 4 inches of off-site topsoil to meet indicated finish grade. After areas have been brought to indicated finish grade, incorporate fertilizer pH adjusters soil conditioners into soil a minimum depth of 4 inches by disking, harrowing, tilling or other method 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.

3.2 SODDING

3.2.1 Finished Grade and Topsoil

Prior to the commencement of the sodding operation, the Contractor shall verify that finished grades are as indicated on drawings; the placing of topsoil, smooth grading, and compaction requirements have been completed in accordance with Section 31 00 00.00 06 EARTHWORK.

The prepared surface shall be 1.5 inches 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 from the surface debris and stones over a minimum 5/8 inch in any dimension.

3.2.2 Placing

Place sod a maximum of 36 hours after initial harvesting, in accordance with TPI GSS as modified herein. Anchor all sod with wood pegs or staples spaced as recommended by the sod manufacturer but not less than 2 anchors per strip to prevent slippage.

3.2.3 Sodding Slopes and Ditches

For slopes 2:1 and greater, lay sod with long edge perpendicular to the contour. For V-ditches and flat bottomed ditches, lay sod with long edge perpendicular to flow of water. Anchor each piece of sod with wood pegs or wire staples maximum 2 feet on center.

3.2.4 Finishing

After completing sodding, blend edges of sodded area smoothly into surrounding area. Air pockets shall be eliminated and a true and even surface shall be provided. Frayed edges shall be trimmed and holes and missing corners shall be patched with sod.

3.2.5 Rolling

Immediately after sodding, firm entire area except for slopes in excess of 3 to 1 with a roller not exceeding 90 pounds for each foot of roller width.

3.2.6 Watering

Start watering areas sodded as required by daily temperature and wind conditions. Apply water at a rate sufficient to ensure thorough wetting of soil to minimum depth of 6 inches. Run-off, puddling, and wilting shall be prevented. Unless otherwise directed, watering trucks shall not be driven over turf areas. Watering of other adjacent areas or plant material shall be prevented.

3.3 PROTECTION OF TURF AREAS

Immediately after turfing, protect area against traffic and other use.

3.4 RESTORATION

Restore to original condition existing turf areas which have been damaged

during turf installation operations. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work in adjacent areas is complete.

-- End of Section --

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SECTION 33 05 23

TRENCHLESS UTILITY INSTALLATION
08/15

PART 1 GENERAL

Provide utility installation using boring and jacking techniques at locations indicated. The Contractor is responsible for all work related to the provision of utilities installed, including assessing surface, subsurface, and environmental (seasonal) conditions.

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 PETROLEUM INSTITUTE (API)

API Spec 13A	(2010; Errata 1 2014; Errata 2-3 2015) Specification for Drilling-Fluid Materials
API Spec 5L	(2018; ERTA 2018) Specification for Line Pipe

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

AREMA Eng Man	(2017) Manual for Railway Engineering

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 27-00	(2000) Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction
ASCE 28-00	(2001) Standard Practice for Direct Design of Precast Concrete Box Sections for Jacking in Trenchless Construction

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C203	(2008) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel
AWS D1.5M/D1.5	(2015) Bridge Welding Code

ASTM INTERNATIONAL (ASTM)

ASTM A139/A139M	(2016) Standard Specification for Electric-Fusion (ARC)-Welded Steel Pipe

(NPS 4 and over)

ASTM C1091 (2003a; R 2013) Standard Test Method for Hydrostatic Infiltration Testing of Vitrified Clay Pipe Lines

ASTM C150/C150M (2018) Standard Specification for Portland Cement

ASTM C33/C33M (2018) Standard Specification for Concrete Aggregates

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

1.2 DEFINITIONS

As used herein, the terms "shaft" and "pit" are synonymous.

1.2.1 Microtunneling

Unless otherwise specified or indicated, see ASCE 36-15 for definitions.

1.2.2 Jacking Precast Concrete Pipe

Unless otherwise specified or indicated, see ASCE 27-00 for definitions.

1.2.3 Jacking Precast Concrete Box Sections

Unless otherwise specified or indicated, see ASCE 28-00 for definitions.

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. SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Boring and Jacking Plan; G

Statement of Contractor Qualifications; G

SD-03 Product Data

Pipe casing and couplings; G

Lubricating Fluid for pipe exterior; G

Submit manufacturer's standard drawings or catalog cuts, except submit both drawings and cuts for push-on and rubber-gasketed bell-and-spigot joints. Include information concerning gaskets with submittal for joints and couplings.

SD-05 Design Data

Design calculations for pipe casing; G

Access Shaft Construction Plan; G

SD-06 Test Reports

Monitoring Survey; G

SD-08 Manufacturer's Instructions

Installation procedures for pipe casing; G

Safety Data Sheets; G

SD-11 Closeout Submittals

Record Drawings; G

Daily Work Logs of installation operations, including records of the volume of materials removed, daily progress and grout volumes used, and as-built drawings of location and alignment of casing; G

1.4 PRE-CONSTRUCTION

No later than 45 days prior to commencement of the work, submit the following to the Contracting Officer for review and approval:

Boring and Jacking Plan

Access Shaft Construction Plan

Statement of Contractor Qualifications

Submit a complete list of all drilling fluids, additives, and mixtures to be used along with Safety Data Sheets.

1.5 QUALITY CONTROL

1.5.1 STATEMENT OF CONTRACTOR QUALIFICATIONS

Contractors are required to have proven and successful experience in boring and jacking. The experience is the successful completion of similar projects to the tolerances indicated for the size of pipe and quantities shown on the plans, in the anticipated soil conditions indicated in the geotechnical report included in the contract documents. Submit a description of at least three such projects which include, at a minimum, a listing of the location(s), date of projects, owner with contact information, pipe type, size installed, length of installation, type, and manufacturer of equipment used, and other information relevant to the successful completion of the project.

1.5.2 RECORDS

1.5.2.1 DAILY WORK LOG

Maintain a work log of construction events and observations. Include the following information for each days work:

a. Hours worked.

b. Location of boring machine face or shield by station and progress made in advancing pipe.

c. Completed field forms, such as steering control logs, for checking line and grade of boring operation, showing achieved alignment relative to design alignment.

d. Maximum pipe jacking pressures per drive.

e. Ground water control operations and piezometric levels.

f. Descriptions of soil conditions encountered.

g. Any unusual conditions or events, including observed ground movement.

h. Reasons for operational shutdown in event drive is halted.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.6.1 Handling

Handle pipe in a manner to ensure delivery to the excavation site in sound undamaged condition. Avoid damage to coatings and linings on pipe; make repairs if coatings or linings are damaged. Carry, do not drag pipe to the excavation site. Store jointing materials and rubber gaskets that are not to be installed immediately, under cover out of direct sunlight. Handle steel pipe with coal-tar enamel coating in accordance with the provisions for handling coal-tar enamel coated pipe in AWWA C203. Handling coal-tar epoxy coated steel is not permitted below 40 degrees F.

1.7 SAFETY

1.7.1 General

Provide procedures for safe conduct of the work in accordance with EM 385-1-1. When and where installations temporarily disrupt pedestrian use of sidewalk areas for periods exceeding two consecutive work days, provide an alternate route that meets current ABA Accessibility Standard for Department of Defense Facilities.

1.7.2 Equipment

Utilize equipment that employs a common grounding system to prevent electrical shock in the event of underground electrical cable strike. Ensure the grounding system connects all pieces of interconnecting machinery; the drill, mud mixing system, drill power unit, drill rod trailer, operators booth, worker grounding mats, and any other interconnected equipment to a common ground. Utilize equipment having an "electrical strike" audible and visual warning system that notifies the system operators of an electrical strike.

1.7.3 Sheeting, Shoring and Dewatering

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

1.7.4 Tunnel Bore

Unprotected mining of the tunnel bore is not permitted. Fully support the tunnel face and bore at all times.

1.8 QUALITY ASSURANCE

1.8.1 Boring and Jacking Plan

Provide a plan prepared, signed and sealed by a licensed Professional Engineer and include the following:

1.8.1.1 Operational Layout

1.8.1.1.1 Layout Plan

Provide a plan location of the operation, discussing relationship of equipment, the method of construction and details for the following:

a. Access pits configurations and details, including equipment layout.

b. Location of intermediate jacking stations, if required.

c. Casing pipe with connection details.

1.8.1.1.2 Pedestrian Access Around Site

When and where installations disrupt pedestrian use of sidewalk areas for periods exceeding two consecutive days, provide an alternate route that meets current ADA requirements.

1.8.1.2 Method and Procedures

Provide an outline of the methods and procedures, including drawings, schedule of operations, specifications, and manufacturer's catalog data for products in lieu of specifications, methods of operation for boring and jacking operations, and specifically the following:

a. Jacking Equipment and Methods: Provide drawings of the jacking frame, jacking head, reaction blocks, jacking installation, pipe guides, procedures for lubricating exterior of pipe during jacking (if applicable), maximum force that jacking equipment can deliver.

b. Boring Equipment and Methods: Provide a discussion of the methods of operation, design and specifications for boring operation, steerage control, line and grade control methods, proposed procedures for removing or clearing obstructions, and a description of proposed methods for ground stabilization and minimizing over-excavation and loss of ground. Submit safety data sheets for fluids, grout, or chemical products.

c. Casing Annulus and Interior Space Grouting: Identify casing insulators/spacers/centralizers/tiedowns (type, number, spacing and installation instructions,) grout materials and method of placement, description of equipment used and grout pressure employed.

d. Survey Alignment Control: Identify method and equipment to install pipe within specified tolerances.

e. Ground Stabilization: Discuss dewatering and grouting, identification of measures and methods used to stabilize face at heading (if necessary), narrative of equipment, procedure and grout mix, and identification of subcontractor who will perform any required stabilization grouting.

f. Excavation Support System Plan: Provide a plan and discussion of methods to be employed, including design drawings and calculations, sealed and signed by a licensed Professional Engineer.

g. Monitoring/Survey Plan: Develop and provide a discussion of the monitoring/survey plan to be employed to protect structures and utilities from settlement and/or heave, including the following. Incorporate into the plan any supplemental requirements specified in Part 3, paragraph entitled "Field Quality Control".

(1) Structures Assessment: Provide a discussion of structures and utilities to be protected, and measures to be employed for preconstruction and postconstruction assessment of critical structures, namely those located within the zone of active excavation from proposed pipe centerline. Include photographs or video of existing damage to structures in the vicinity of sewer alignment in assessment reports.

(2) Instrumentation Monitoring Plan: Describe of instrumentation design, layout of instrumentation points, equipment installation details, manufacturer's catalog literature, and monitoring report forms.

(3) Surface Settlement Monitoring Plan: Identify on a plan the location of settlement monitoring points, reference benchmarks, survey frequency and procedures, and reporting formats.

h. Contingency Plan: Provide a plan and discuss protection of pavements, adjacent structures, and utilities affected by adverse movements detected by instrumentation. As a minimum, include the following:

(1) Names, telephone numbers, and locations of persons responsible for implementation of contingency plans.

(2) Materials and equipment required to implement contingency plans. Identify the location of all required materials and equipment.

(3) Step-by-step procedure for performing work involved in implementation of the contingency plans.

(4) Clear identification of the objectives of the contingency plans and methods to measure plan success.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

The work includes providing labor, materials, and specialized equipment for the installation of utility pipelines utilizing the boring and jacking methods of installation.

2.1.1 Design Requirements

2.1.1.1 Excavations

Design excavations, including access shaft walls, considering loadings from reaction blocks, traffic loads and any surcharge loads.

2.1.1.1.1 Highway Crossing Criteria

For loadings under highways use HS20 vehicle loading distribution in accordance with AASHTO.

2.1.1.1.2 Railway Crossing Criteria

For pipe crossings under railways use Cooper E-80 locomotive loading distributions in accordance with AREMA Eng Man specifications for culverts. Account for loading due to any multiple tracks.

2.1.1.2 Design Calculations of Pipe Casing

Submit design calculations for pipe casing demonstrating that the equipment used in installing the pipe will not distort or otherwise damage the pipe. Provide calculations of maximum allowable jacking force to be used based on pipe materials to be used. The calculations are to be sealed by a licensed Professional Engineer using soil properties derived from subsurface investigations performed along the utility route.

2.2 EQUIPMENT

2.2.1 Boring and Jacking System

Utilize a continuously monitored boring and jacking system matched to the expected subsurface conditions, a hydraulic jacking system to jack the pipeline, an auger to remove boring spoils, a guidance system to provide installation accuracy within the indicated tolerances, excavation equipment, material handling equipment, a dewatering system, and sheeting/shoring required to provide the work indicated.

2.2.2 Pipe Jacking Equipment

Provide main jacking equipment with a capacity greater than the anticipated jacking load. Provide intermediate jacking stations when the total anticipated jacking force needed to complete the installation may exceed the capacity of the main jacks or the designed maximum jacking force for the pipe. The jacking system is to supply a uniform distribution of jacking forces on the end of the pipe by use of thruster rings and cushioning material.

2.3 MATERIALS

2.3.1 Pipe Casing

Provide straight wall pipe casing of type and diameter indicated of steel pipe.

2.3.1.1 Steel Pipe

2.3.1.1.1 Pipe

Provide steel pipe in conformance with ASTM A139/A139M, Grade B with a minimum yield strength of 35,000 psi . Weld steel pipe seamless, square cut with even lengths that complies with Articles 4.2, 4.3, and 4.4 of the API Spec 5L. Pipe shall have an inside diameter of 59.00 inches and a minimum wall thickness of 0.50 inches .

2.3.1.1.2 Joints

Utilize casing pipe having beveled ends with a single V-groove for field welding. Butt weld joints using a full-penetration weld on the outside circumference of the pipe prior to jacking. The welds are to conform to the latest AWS Welding Code by a certified welder. Unless otherwise specified, inspect and test welds using a non-destructive testing method consisting of magnetic particle examination (MT), in compliance with the AWS code. Visually inspect in compliance with AWS D1.1/D1.1M visual inspection criteria by a certified welder and by the QC manager welds on casing pipe that is sacrificial (fully grouted internally). Non-destructive testing is not required on welds on casing pipe that is sacrificial.

Grouting Plugs: On large pipe, (24-inch diameter or greater), provide pipe with 2-inch diameter tapped holes with threaded plugs for exterior grouting.

2.3.1.1.3 Roundness

The maximum difference between the major and minor outside diameters cannot exceed one percent of the specified nominal outside diameter or 0.25 inch, whichever is less. For pipe exceeding 48 inches in diameter, a maximum deviation of 1/2 inch is permitted provided the circumference tolerance is maintained within 1/4 inch.

2.3.1.1.4 Circumference

Ensure that the outside circumference is within plus one percent of the nominal circumference or within plus 0.50 inches, whichever is less.

2.3.1.1.5 Straightness

The maximum allowable straightness deviation in any 10 foot length cannot exceed 1/8 inch. For lengths over 10 feet, the maximum allowable deviation of the entire pipe length is computed by the following formula, but not to exceed 3/8 inch in any length exceeding 30 foot length: Maximum Allowable Deviation in inches equals (1/8) times (total length in feet) divided by 10.

2.3.1.1.6 Pipe Ends

Ensure that the end of the pipe is perpendicular to the longitudinal axis of the pipe and within 1/16 inch per foot of diameter, with a maximum

allowable deviation of 1/4 inch measured with a square and straightedge across the end of the pipe.

2.3.2 Grout

Provide cement grout for pressure grouting to fill the voids around the casing and for filling the interior annular space between carrier pipe and the casing composed of Portland cement conforming to ASTM C150/C150M, Type II, and sand meeting requirements of ASTM C33/C33M for fine aggregate, sufficiently fluid to inject through the casing and fill voids, with prompt setting to control grout flow. Utilize a grout with a minimum compressive strength of 100 psi attained within 24 hours. Admixtures are to be free of chlorides, corrosive or other material detrimental to the materials the grout contacts.

2.3.3 CONCRETE

Provide 3500 psi concrete.

2.3.4 Lubricating Fluid (Bentonite or Polymer)

Provide material for lubricating the exterior of pipe. Provide bentonite machine requirements of API Spec 13A and having the capacity of mixing with water to form a stable and homogeneous suspension.

2.3.5 SOIL MATERIALS

Provide soil materials in accordance with the requirements specified in Section 31 00 00.00 06 EARTHWORK.

2.4 Incidental Materials

2.4.1 Casing Insulators/Bore Spacers

Provide carbon steel with polyvinyl chloride coating or stainless steel casing insulators/bore spacers 8 inches in length for pipe 12 inches and less in diameter, and 12 inches in length for pipe 14 inches and greater in diameter, having a 2 inch minimum runner width. Orient spacers to allow for grout to flow easily to completely fill the casing pipe with grout throughout its length.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Access Shaft and Pit Construction Plan

No later than 45 days prior to start of construction submit an Access Shaft Construction Plan. Include in the plan a discussion of the method of construction of access shafts used for boring and jacking. Address the excavation methods, dewatering system, sheeting/shoring and bracing systems proposed for use, and any ground stabilization to be employed for the shaft work area or thrust block. Acceptable construction methods include the use of interlocked steel sheet-piling or precast circular concrete segments lowered in place during excavation.

3.1.1.1 Design Requirements

a. Construct shafts of a size commensurate with safe working practices at

locations indicated. Coordinate shaft locations with the Contracting Officer. The Contractor may propose to relocate shafts to better suit the capabilities of the equipment/methods proposed, but may not alter either the indicated pipeline alignment or structures associated with the installed pipeline, nor result in additional claims for compensation.

b. To the extent possible, keep shaft locations clear of pavements in order to minimize disruption to the flow of traffic. Locate support equipment, spoil piles, and materials to minimize disruption to traffic.

c. Support all excavations and prevent movement of the soil, pavement, utilities or structures outside of the excavation. Furnish, place, and maintain sheeting, bracing, and lining required to support the sides of all shafts and to provide adequate protection of the work, personnel, and the general public. Provide a concrete floor in the jacking access shaft. Design loads on the sides of the jacking and receiving pit walls are dependent on the construction method and flexibility of the wall systems.

d. Consider the loading from boring or pipe jacking when preparing the design of the jacking and receiving pit supports as well as special provisions and reinforcement around the breakout location. Design the base of the pits to withstand uplift forces from the full design head of water, unless approved dewatering or other ground modification methods are employed.

e. Construct a thrust block to transfer jacking loads into the soil. Ensure that the backstop and the proposed pipe alignment are square to each other and are designed to withstand the maximum jacking pressure to be used with a factor of safety of at least 2.5. Also, design the thrust block to minimize excessive deflections in such a manner as to avoid disturbance of adjacent structures or utilities or excessive ground movement. Begin jacking operations only after concrete thrust block or treated soil has attained the required strength.

3.2 CONSTRUCTION

3.2.1 Access Shafts

3.2.1.1 Construction Requirements

a. Provide ground stabilization in the work area and the thrust block as required to accomplish the work.

b. Construct a jacking access shaft to accommodate the installation of pipe casings, equipment and piping jacking device. Install thrust blocks(s) as required and consolidate the ground (grout) where the casings exit the shaft. Provide a dry jacking work area having a stable concrete floor that drains to a recessed sump pump to handle nuisance inflow. Groundwater inflows into the jacking shaft are not to exceed 5 gallons/minute; soil inflows are not to exceed a total volume of 2 cubic feet.

c. Construct a receiver shaft to accommodate the installation of pipe casings and the equipment used in the work. Consolidate the ground (grout) where the casings enter the shaft.

d. Furnish, install, and maintain equipment to keep the jacking shaft free

of excess water. Provide surface protection during the period of construction to ensure that surface runoff does not enter shafts. Adhere to the dewatering plan and do not affect surrounding soils or structures beyond the tolerances stated in paragraph entitled "Tolerances."

e. Provide security fence around all access shaft areas and provide shaft cover(s) when the shaft area is not in use.

f. Pit Backfill and Compaction: Upon completion of the pipe jacking and all tests or inspections are complete, remove all equipment, debris, and unacceptable materials from the pits and commence backfilling operation. Complete backfilling, compaction, and pavement repairs in accordance with Section 31 00 00.00 06 EARTHWORK.

3.3 INSTALLATION

3.3.1 Installation of Tracer Wire

Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe in accordance with the American Public Works Association Uniform Color Code. Attach wire to top of pipe in such a manner that will not be displaced during construction operations.

3.3.2 Connections to Existing Lines

Schedule connections to existing lines with the Contracting Officer to cause a minimum interruption of service on the existing line.

3.3.3 Advancing the Pipe

Jack each pipe casing section forward as the excavation progresses in such a way to provide complete and adequate, ground support at all times. Utilize a bentonite slurry applied to the external surface of the pipe to reduce skin friction. Provide a jacking frame for developing a uniform distribution of jacking forces around the periphery of the pipe. Place a plywood spacer on the outer shoulder of the pipe casing joint. Design and construct the thrust reaction backstop to withstand the jacking forces. Continuously maintain a square alignment between the backstop and pipe casing and support the maximum obtainable jacking pressure with a safety factor at least 2.0. Continuously monitor the jacking pressure and rate of cutter head advancement. Exercise special care when setting the pipe guard rails in the jacking pit to ensure correctness of the alignment, grade and stability.

3.3.3.1 Installation Requirements

a. Utilize boring equipment capable of fully supporting the face of the tunnel.

b. Maintain face pressure exerted at the heading by the MTBM as required to prevent loss of ground, groundwater inflows, and settlement or heave of the ground surface by balancing soils and groundwater pressures present.

c. Dewatering for groundwater control is allowed at the jacking and receiving pits only.

d. Do not jack pipe casing until the concrete thrust block and tremie seal

(if selected), and grouted soil zone in jacking and receiving shafts have attained the required strength.

e. Jack the pipe into place without causing damage to the coatings, joints or completed pipe section.

f. After completion of the jacking operation between jacking and receiving shafts, displace the lubricate material from between the pipe casing exterior and the surrounding ground with a cement grout. Control pressure and the amount of grout to avoid pipe damage and displacement of the pipe and soil beyond the tolerances specified in paragraph "Tolerances." Grout within 48 hours after pipe installation has been completed to prevent any surface settlement due to movement of soil material into the void space or loosened zone around the pipe casing.

g. Replace pipe casings damaged during installation.

h. Ensure that the welds of steel pipe attain the full strength of the pipe and are watertight before jacking of the pipe section. Ensure that the inner face of the internal weld seam is flush with the pipe to facilitate the installation of the carrier pipe in the pipe casing.

i. Perform all welding in accordance with requirements for shielded metal arc welding of AWS D1.5M/D1.5 for bridges and AWS D1.1/D1.1M for buildings and other structures.

j. Provide a pipeline that has a consistent diameter across assembled joints.

k. Once the tunneling process has begun, continue with that process uninterrupted until the pipe reaches the receiving shaft. Continue to push any damaged pipe until that damaged pipe section is pushed into the receiving shaft and is removed. Notify the Contracting Officer immediately if any pipe is known to be or believed to be damaged.

3.3.4 Carrier Pipe Installation

3.3.4.1 Cleaning

Clean the inside of the casing of all foreign matter by using a pipe cleaning plug.

3.3.4.2 Carrier Pipe

Inspect with the Contracting Officer, prior to backfilling trenches, the transition of carrier pipe within the casing to non-cased trenching.

3.3.4.3 Casing Insulators/Spacers

Install casing insulators/spacers in accordance with approved submittals and the drawings. On center spacing is not to exceed 4 feet.

3.3.4.4 End Closures/Bulkheads and Grouting of Casing Pipe

a. Closures: Seal ends of casing with brick and mortar.

b. After installing, inspecting and acceptance of the carrier pipe and spacers within the casing pipe, pressure fill the annular space between the carrier pipe and the casing pipe, with cement grout specified

herein. Regulate pump pressures to refusal or in accordance with the approved grouting plan. Place grout in a sequence and manner that will preclude voids or pockets of entrapped air or water. Use a refusal pressure equal to 0.5 psf per foot of overburden.

3.3.5 Ventilation

Provide adequate ventilation for all tunnels and shafts, following confined space entry procedures. Include such factors as the volume required to furnish fresh air in the shafts, and the volume to remove dust that may be caused by the cutting of the face and other operations which may impact the laser guidance system. In the design of the ventilation system, the minimum amount of fresh air to be supplied is 1250 CFM. Routinely test the air in areas accessed by workers in accordance with the most current OSHA methods and standards. The current OSHA allowable gas concentrations or those presented below, whichever are more stringent, shall be met:

Carbon Monoxide	≤0.005 percent
Methane	≤0.25 percent
Hydrogen Sulfide	≤0.001 percent
Oxygen	≥20.0 percent

3.3.6 Lighting

Provide adequate lighting for the nature of the activity being conducted by workers. Separate and insulate with ground fault interrupters power and lighting circuits. Comply with requirements with regards to shatter resistance and illumination requirements.

3.3.7 Spoil Transportation

Match the excavation rate with rate of spoil removal. Utilize a system capable of balancing groundwater pressures and adjustment to maintain face stability for the particular soil conditions of the project.

3.4 TOLERANCES

3.4.1 Tolerances

Maximum allowable lateral deviation is 5 inches; maximum allowable vertical deviation is 5 inches in the position of every completed 300 foot section of jacked pipe casings. Water must be free draining between any two points at the pipe invert. Reverse grades are not permitted.

3.5 FIELD QUALITY CONTROL

Employ the monitoring/survey plan. Maintain daily records in accordance with the paragraph titled RECORDS.

3.5.1 Instrumentation/Survey

3.5.1.1 Mandatory Requirements

Include the following, as a minimum, to supplement Contractor Quality

Control measures employed to monitor ground surface heave or settlement in the monitoring/survey plan.

a. Monitor ground movements associated with the project using established survey points and make changes in the construction methods that control ground movements and prevent damage or detrimental movement to the work and adjacent structures and pavements.

b. Record in the daily work log a summary of monitoring survey results. Clearly identify work not meeting specified requirements, out-of-tolerance results, and impacts on new or existing work from settlement or heave.

c. Install instrumentation and perform monitoring to determine ground settlement surrounding each jacking and receiving pit.

d. Prior to any excavation activities, perform a pre-construction survey of the areas in and surrounding excavations and along the proposed utility alignment to identify any structures, facilities, underground or above ground utilities to be protected within a radius of five times either the depth of any excavation or the depth of trenchless excavation.

3.5.1.2 Supplemental Requirements

3.5.2 Field Tests

Perform field tests, and provide labor, equipment, and incidentals required for testing Section. Submit test results, identifying any results that do not meet specified requirements, to the Contracting Officer within four days of test completion. Provide corrective action and retest pipe not meeting specified requirements. Provide corrective action as recommended by the pipe manufacturer and subject to approval by the Contracting Officer.

3.5.2.1 Pipe Casing

Inspect and verify that pipe material meets the dimensional tolerances specified prior to use. Record each day's inspection results in the daily work log.

3.5.2.1.1 Testing Requirements for Gravity Mains

Perform low pressure air test of all gravity mains (structure to structure) in accordance with ASTM C1091 Standard Test method for Hydrostatic Infiltration testing of Vitrified Clay Pipe Lines.

3.5.2.1.2 Non-Standard Pipe Lengths

Cut non-standard joint lengths from full length pipe having satisfactorily passed the hydrostatic test.

3.5.2.1.3 Elevations

Prior to removal of MTBM equipment, sheeting, and backfilling of access shafts, collect invert information on pipeline installed. Confirm that the elevations meet stated tolerances.

3.6 CLEANUP AND FINAL CLOSEOUT

3.6.1 Site Cleanup

Immediately clean "blow holes" or "breakouts" of drilling fluid to the surface and fill depressions with satisfactory fill material. Dispose of all drilling fluids, soils, and separated materials in compliance with Federal, State, and local environmental regulations.

3.6.2 Drilling Fluid

Immediately upon completion of work of this section, remove all rubbish and debris from the job site. Remove all construction equipment and materials leaving the entire area involved in a neat condition equal to existing conditions prior to construction, unless indicated otherwise.

3.6.3 Record Drawings and Daily Work Logs

Submit an electronic copy and three hard copies of the record drawings to the Contracting Officer within five days after completing the work. Include in the record drawings a plan, profile, and all information recorded during the progress of the work. Clearly tie the record drawings to the project's survey control. Maintain and submit upon completion final Daily Work Logs of installation operations, signed by the superintendent.

3.7 DISPOSITION OF MATERIAL

Remove from Government property surplus or other soil material not required or suitable for fill or backfilling.

Store or legally dispose of excavated material and fluids used in the boring process and shaft construction in compliance with all permits and applicable Federal, State, and local regulations. Comply with Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.

-- End of Section --

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SECTION 33 40 00

STORM DRAINAGE UTILITIES
02/10

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 346	(2009) Specification for Cast-in-Place Concrete Pipe

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

AREMA Eng Man	(2015) Manual for Railway Engineering

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A48/A48M	(2003; R 2012) Standard Specification for Gray Iron Castings
ASTM A536	(1984; R 2014) Standard Specification for Ductile Iron Castings
ASTM B26/B26M	(2014; E 2015) Standard Specification for Aluminum-Alloy Sand Castings
ASTM C1103	(2014) Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM C139	(2014) Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
ASTM C1433	(2016b) Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
ASTM C231/C231M	(2014) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C270	(2014a) Standard Specification for Mortar for Unit Masonry

ASTM C443	(2011) Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C478	(2015a) Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C655	(2014) Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
ASTM C76	(2015) Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C877	(2008) External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
ASTM C923	(2008; R 2013; E 2016) Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM C969	(2002; R 2009) Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM C990	(2009; R 2014) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM D1056	(2014) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1171	(2016; E 2016) Standard Test Method for Rubber Deterioration - Surface Ozone Cracking Outdoors (Triangular Specimens)
ASTM D1557	(2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM 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
ASTM D2167	(2015) Density and Unit Weight of Soil in Place by the Rubber Balloon Method

ASTM D3212	(2007; R 2013) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D6938	(2015) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section01 30 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawing

Jack and Bore Details; G

SD-03 Product Data

Placing Pipe

Submit printed copies of the manufacturer's recommendations for installation procedures of the material being placed, prior to installation.

SD-04 Samples

Pipe for Culverts and Storm Drains

SD-07 Certificates

Pipeline Testing

Hydrostatic Test on Watertight Joints

Determination of Density

Frame and Cover for Gratings

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. 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.

1.3.2 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 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.

2.1.1 Concrete Pipe

Manufactured in accordance with and conforming to ASTM C76, Class III , or ASTM C655, 2,000 D-Load.

2.1.1.1 Cast-In-Place Nonreinforced Conduit

ACI 346, except that testing shall be the responsibility of and at the expense of the Contractor. In the case of other conflicts between ACI 346 and project specifications, requirements of ACI 346 shall govern.

2.2 DRAINAGE STRUCTURES

2.2.1 Precast Reinforced Concrete Box

Manufactured in accordance with and conforming to ASTM C1433.

2.3 MISCELLANEOUS MATERIALS

2.3.1 Concrete

Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for 3,000 psi concrete under Section . 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/C231M. 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.

2.3.2 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 mortar but in no case shall exceed 1 gallons of water per sack of cement. 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.

2.3.3 Precast Concrete Segmental Blocks

Precast concrete segmental block shall conform to ASTM C139, not more than 8 inches thick, not less than 8 inches long, and of such shape that joints can be sealed effectively and bonded with cement mortar.

2.3.4 Precast Reinforced Concrete Manholes

Conform to ASTM C478. Joints between precast concrete risers and tops shall be made with flexible watertight, rubber-type gaskets meeting the requirements of paragraph JOINTS.

2.3.5 Frame and Cover for Gratings

Submit certification on the ability of frame and cover or gratings to carry the imposed live load. Frame and cover for gratings shall be cast gray iron, ASTM A48/A48M, Class 35B; cast ductile iron, ASTM A536, Grade 65-45-12; or cast aluminum, ASTM B26/B26M, Alloy 356.0T6. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans. The word "Storm Sewer" shall be stamped or cast into covers so that it is plainly visible.

2.3.6 Joints

2.3.6.1 Flexible Watertight Joints

a. The design of joints and the physical requirements for preformed flexible joint sealants shall conform to ASTM C990, and rubber-type gaskets shall conform to ASTM C443. Gaskets shall have not more than one factory-fabricated splice, except that two factory-fabricated splices of the rubber-type gasket are permitted if the nominal diameter of the pipe being gasketed exceeds 54 inches.

b. Test Requirements: Watertight joints shall be tested and shall meet test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS. Rubber gaskets shall comply with the oil resistant gasket requirements of ASTM C443. Certified copies of test results shall be delivered to the Contracting Officer before gaskets or jointing materials are installed. Alternate types of watertight joint may be furnished, if specifically approved.

2.3.6.2 External Sealing Bands

Requirements for external sealing bands shall conform to ASTM C877.

2.3.6.3 Flexible Watertight, Gasketed Joints

a. Gaskets: When infiltration or exfiltration is a concern for pipe lines, the couplings may be required to have gaskets. The closed-cell expanded rubber gaskets shall be a continuous band approximately 7 inches wide and approximately 3/8 inch thick, meeting the requirements of ASTM D1056, Type 2 A1, and shall have a quality retention rating of not less than 70 percent when tested for weather resistance by ozone chamber exposure, Method B of ASTM D1171. Rubber O-ring gaskets shall be 13/16 inch in diameter for pipe diameters of 36 inches or smaller and 7/8 inch in diameter for larger pipe having 1/2 inch deep end corrugation. Rubber O-ring gaskets shall be 1-3/8 inches in diameter

for pipe having 1 inch deep end corrugations. O-rings shall meet the requirements of ASTM C990 or ASTM C443. Preformed flexible joint sealants shall conform to ASTM C990, Type B.

b. Connecting Bands: Connecting bands shall be of the type, size and sheet thickness of band, and the size of angles, bolts, rods and lugs as indicated or where not indicated as specified in the applicable standards or specifications for the pipe. Exterior rivet heads in the longitudinal seam under the connecting band shall be countersunk or the rivets shall be omitted and the seam welded. Watertight joints shall be tested and shall meet the test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS.

2.3.6.4 Steel Reinforced Polyethylene (SRPE) Pipe

SRPE joints shall meet the requirements of ASTM D3212.

2.4 STEEL LADDER

Steel ladder shall be provided where the depth of the storm drainage structure exceeds 12 feet. These ladders shall be not less than 16 inches in width, with 3/4 inch diameter rungs spaced 12 inches apart. The two stringers shall be a minimum 3/8 inch thick and 2-1/2 inches wide. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A123/A123M.

2.5 RESILIENT CONNECTORS

Flexible, watertight connectors used for connecting pipe to manholes and inlets shall conform to ASTM C923.

2.6 HYDROSTATIC TEST ON WATERTIGHT JOINTS

2.6.1 Concrete, PVC, PE, SRPE and PP Pipe

A hydrostatic test shall be made on the watertight joint types as proposed. Only one sample joint of each type needs testing; however, if the sample joint fails because of faulty design or workmanship, an additional sample joint may be tested. During the test period, gaskets or other jointing material shall be protected from extreme temperatures which might adversely affect the performance of such materials. Performance requirements for joints in reinforced and nonreinforced concrete pipe shall conform to ASTM C990 or ASTM C443. Test requirements for joints in PVC, PE, and PP plastic pipe shall conform to ASTM D3212.

2.7 EROSION CONTROL RIPRAP

Provide nonerodible rock not exceeding 12 inches in its greatest dimension and choked with sufficient small rocks to provide a dense mass with a minimum thickness of as indicated.

PART 3 EXECUTION

3.1 EXCAVATION FOR PIPE CULVERTS, STORM DRAINS, 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 00.00 06 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 of the pipe plus 24 inches 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.

3.1.2 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. Where bell-and-spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe. Rock excavation shall be as specified and defined in Section 31 00 00.00 06 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.

3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

3.2.1 Concrete Pipe Requirements

When no bedding class is specified or detailed on the drawings, concrete pipe shall be bedded in granular material minimum 4 inch in depth in trenches with soil foundation. Depth of granular bedding in trenches with rock foundation shall be 1/2 inch in depth per foot of depth of fill, minimum depth of bedding shall be 8 inch up to maximum depth of 24 inches. The middle third of the granular bedding shall be loosely placed. Bell holes and depressions for joints shall be removed and formed so entire barrel of pipe is uniformly supported. The bell hole and depressions for the joints shall be not more than the length, depth, and width required for properly making the particular type of joint.

3.3 PLACING PIPE

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated metal

pipe shall be placed in the same vertical plane as the major axis of the pipe. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary.

3.3.1 Concrete Pipe

Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

3.3.2 Jacking Pipe Through Fills

Methods of operation and installation for jacking pipe through fills shall conform to requirements specified in Volume 1, Chapter 1, Part 4 of AREMA Eng Man. Submit jack and bore details to the contracting officer prior to construction.

3.4 DRAINAGE STRUCTURES

3.4.1 Manholes and Inlets

Construction shall be of reinforced concrete, plain concrete, brick, precast reinforced concrete, precast concrete segmental blocks, prefabricated corrugated metal, or bituminous coated corrugated metal; complete with frames and covers or gratings; and with fixed galvanized steel ladders where indicated. Pipe studs and junction chambers of prefabricated corrugated metal manholes shall be fully bituminous-coated and paved when the connecting branch lines are so treated. Pipe connections to concrete manholes and inlets shall be made with flexible, watertight connectors.

3.4.2 Walls and Headwalls

Construction shall be as indicated.

3.5 STEEL LADDER INSTALLATION

Ladder shall be adequately anchored to the wall by means of steel inserts spaced not more than 6 feet vertically, and shall be installed to provide at least 6 inches of space between the wall and the rungs. The wall along the line of the ladder shall be vertical for its entire length.

3.6 BACKFILLING

3.6.1 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 RCP 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 12 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.

3.6.2 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.

3.6.3 Compaction

3.6.3.1 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.

3.6.3.2 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.

3.6.4 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.

3.7 PIPELINE TESTING

3.7.1 Leakage Tests

Lines shall be tested for leakage by low pressure air or water testing or exfiltration tests, as appropriate. Low pressure air testing for concrete pipes shall conform to ASTM C969. Testing of individual joints for leakage by low pressure air or water shall conform to ASTM C1103. Prior to exfiltration tests, the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. An exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipeline to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be reestablished. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by the exfiltration test shall not exceed 0.2 gallons per inch in diameter per 100 feet of pipeline per hour. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished.

3.7.2 Deflection Testing

No sooner than 30 days after completion of installation and final backfill, an initial post installation inspection shall be accomplished. Clean or flush all lines prior to inspection. Perform a deflection test on entire length of installed flexible pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads. Deflection of pipe in the installed pipeline under external loads shall not exceed limits in paragraph PLACING PIPE above as percent of the average inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of a laser profiler or mandrel.

a. Laser Profiler Inspection: If deflection readings in excess of the allowable deflection of average inside diameter of pipe are obtained, remove pipe which has excessive deflection, and replace with new pipe. Initial post installation inspections of the pipe interior with laser profiling equipment shall utilize low barrel distortion video equipment for pipe sizes 48 inches or less. Use a camera with lighting suitable to allow a clear picture of the entire periphery of the pipe interior. Center the camera in the pipe both vertically and horizontally and be

able to pan and tilt to a 90 degree angle with the axis of the pipe rotating 360 degrees. Use equipment to move the camera through the pipe that will not obstruct the camera's view or interfere with proper documentation of the pipe's condition. The video image shall be clear, focused, and relatively free from roll static or other image distortion qualities that would prevent the reviewer from evaluating the condition of the pipe. For initial post installation inspections for pipe sizes larger than 48 inches, visual inspection shall be completed of the pipe interior.

b. Pull-Through Device Inspection: Pass the pull-through device through each run of pipe by pulling it by hand. If deflection readings in excess of the allowable deflection of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show excess allowable deflections of the average inside diameter of pipe, remove pipe which has excessive deflection, replace with new pipe, and completely retest in same manner and under same conditions. Pull-through device: The mandrel shall be rigid, nonadjustable having a minimum of 9 fins, including pulling rings at each end, engraved with the nominal pipe size and mandrel outside diameter. The mandrel shall be 5 percent less than the certified-actual pipe diameter for Plastic Pipe, 5 percent less than the certified-actual pipe diameter for Corrugated Steel and Aluminum Alloy, 3 percent less than the certified-actual pipe diameter for Concrete-Lined Corrugated Steel and Ductile Iron Culvert provided by manufacturer. When mandrels are utilized to verify deflection of flexible pipe products, the Government will verify the mandrel OD through the use of proving rings that are manufactured with an opening that is certified to be as shown above.

c. Deflection measuring device: Shall be approved by the Contracting Officer prior to use.

d. Warranty period test: Pipe found to have a deflection of greater than allowable deflection in paragraph PLACING PIPE above, just prior to end of one-year warranty period shall be replaced with new pipe and tested as specified for leakage and deflection. Inspect 100 percent of all pipe systems under the travel lanes, including curb and gutter. Random inspections of the remaining pipe system outside of the travel lanes shall represent at least 10 percent of the total pipe footage of each pipe size. Inspections shall be made, depending on the pipe size, with video camera or visual observations. In addition, for flexible pipe installations, perform deflection testing on 100 percent of all pipes under the travel lanes, including curb and gutter, with either a laser profiler or 9-fin mandrel. For flexible pipe, random deflection inspections of the pipe system outside of the travel lanes shall represent at least 10 percent of the total pipe footage of each pipe size. When mandrels are utilized to verify deflection of flexible pipe products during the final post installation inspection, the Government will verify the mandrel OD through the use of proving rings.

3.7.3 Post-Installation Inspection

Check each reinforced concrete pipe installation for joint separations, soil migration through the joint, cracks greater than 0.01 inches, settlement and alignment. Check each flexible pipe (HDPE, PVC, CMP, PP) for rips, tears, joint separations, soil migration through the joint, cracks, localized bucking, bulges, settlement and alignment.

a. Replace pipes having cracks greater than 0.1 inches in width or deflection greater than 5 percent deflection. An engineer shall evaluate all pipes with cracks greater than 0.01 inches but less than 0.10 inches to determine if any remediation or repair is required. RCP with crack width less than 0.10 inches and located in a non-corrosive environment (pH 5.5) are generally acceptable. Repair or replace any pipe with crack exhibiting displacement across the crack, exhibiting bulges, creases, tears, spalls, or delamination.

b. Reports: The deflection results and final post installation inspection report shall include: a copy of all video taken, pipe location identification, equipment used for inspection, inspector name, deviation from design, grade, deviation from line, deflection and deformation of flexible pipe systems, inspector notes, condition of joints, condition of pipe wall (e.g. distress, cracking, wall damage dents, bulges, creases, tears, holes, etc.).

3.8 FIELD PAINTING

After installation, clean cast-iron frames, covers, gratings, and steps not buried in masonry or concrete to bare metal of mortar, rust, grease, dirt, and other deleterious materials and apply a coat of bituminous paint. Do not paint surfaces subject to abrasion.

-- End of Section --