



## Macon-Bibb County Government

Procurement Department

Government Center

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Chauncey Wilmore  
Senior Procurement Officer

November 19, 2015

ADDENDUM # 1

To: ALL PROSPECTIVE FIRMS

Re: INVITATION FOR BIDS: **16-017-CW Log Cabin Drive Construction**

**The Invitation for Bids, referenced above, is modified as follows:**

1. A revised bid schedule is provided
  - a. Added pay item for Sod
  - b. Deleted pay item for Maintenance of Permanent Grassing
2. Revised Technical Specs
  - a. Section 700.4A – corrected method of payment for Permanent Grassing to be Lump Sum
  - b. Section 700.5A – Revised payment method and schedule for Permanent Grassing
3. Revised Construction Plan Sheets 1.0, 3.2, 4.4, 4.8, 4.9, and 5.2

Please incorporate this change into the Invitation for Bid and acknowledge receipt of this addendum on your bid form.

Sincerely,

*Chauncey K. Wilmore*

Chauncey K. Wilmore  
Senior Procurement Officer

## LOG CABIN DRIVE ENHANCEMENT PROJECT - BID SCHEDULE

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
150-1000	TRAFFIC CONTROL	LS	LS	\$	\$
163-0232	TEMPORARY GRASSING	LS	LS	\$	\$
163-0240	MULCH	TN	6	\$	\$
163-0300	CONSTRUCTION EXIT	EA	3	\$	\$
163-0529	CONSTRUCT AND REMOVE TEMPORARY BALED STRAW CHECK	EA	30	\$	\$
163-0541	CONSTRUCT AND REMOVE ROCK FILTER DAMS	EA	2	\$	\$
163-0542	CONSTRUCT AND REMOVE STONE FILTER RING	EA	1	\$	\$
163-0550	CONSTRUCT AND REMOVE INLET SEDIMENT TRAP	EA	14	\$	\$
165-0010	MAINTENANCE OF TEMPORARY SILT FENCE, TP A	LF	309	\$	\$
165-0030	MAINTENANCE OF TEMPORARY SILT FENCE, TP C	LF	660	\$	\$
165-0071	MAINTENANCE OF SEDIMENT BARRIER - BALED STRAW	EA	30	\$	\$
165-0101	MAINTENANCE OF CONSTRUCTION EXIT	EA	3	\$	\$
165-0105	MAINTENANCE OF INLET SEDIMENT TRAP	EA	14	\$	\$
165-0110	MAINTENANCE OF ROCK FILTER DAM	EA	1	\$	\$
165-0111	MAINTENANCE OF STONE FILTER RING	EA	1	\$	\$
167-1000	WATER QUALITY MONITORING AND SAMPLING	MO	6	\$	\$
167-1500	WATER QUALITY INSPECTIONS	MO	6	\$	\$
171-0010	TEMPORARY SILT FENCE, TYPE A	LF	309	\$	\$
171-0030	TEMPORARY SILT FENCE, TYPE C	LF	660	\$	\$
210-0100	GRADING COMPLETE	LS	LS	\$	\$
310-5080	GR AGGREGATE BASE CRS, 8 INCH, INCL MATL	SY	1200	\$	\$
402-3103	RECYCLED ASPH CONC 19 MM SUPERPAVE, TYPE II, GP 2 ONLY, INCL BITUM MATL & H LIME	TN	170	\$	\$

## LOG CABIN DRIVE ENHANCEMENT PROJECT - BID SCHEDULE

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
402-3121	RECYCLED ASPH CONC 12.5 MM SUPERPAVE, GP 2 ONLY, INCL BITUM MATL & H LIME	TN	1147	\$	\$
441-0016	DRIVEWAY CONCRETE, 6" THICK	SY	570	\$	\$
441-0104	CONCRETE SIDEWALK, 4 INCH	SY	2400	\$	\$
441-4020	CONCRETE VALLEY GUTTER, 6 INCH	SY	244	\$	\$
441-6012	CONC CURB & GUTTER, 6 IN X 24 IN, TP 2	LF	1376	\$	\$
500-3800	18" CONCRETE HEADWALL	EA	2	\$	\$
500-9999	CLASS "B" CONC, BASE OR PAVEMENT WIDENING	CY	154	\$	\$
550-1180	STORM DRAIN PIPE, RCP, 18 IN	LF	1239	\$	\$
550-2180	SIDE DRAIN PIPE (DRIVEWAY PIPES, BCCMP), 18 IN	LF	212	\$	\$
550-3318	SAFETY END SECTION 18 IN, STORM DRAIN, 4:1 SLOPE	EA	3	\$	\$
550-3418	SAFETY END SECTION 18 IN, SIDE DRAIN, 4:1 SLOPE	EA	10	\$	\$
603-2024	STN DUMPED RIP RAP, TP1, 24 IN	SY	250	\$	\$
611-8050	ADJUST SS MANHOLE TO GRADE	EA	12	\$	\$
611-8120	ADJUST WATER METER BOX TO GRADE	EA	10	\$	\$
641-1200	GUARDRAIL, TP W	LF	20	\$	\$
641-5006	GUARDRAIL ANCHORAGE, TP 6	EA	2	\$	\$
641-5012	GUARDRAIL ANCHORAGE, TP 12	EA	2	\$	\$
653-0120	THERMOPLASTIC PAVEMENT MARKING, ARROW, TYPE 2	EA	2	\$	\$
652-2502	SOLID TRAFFIC STRIPE, 5 IN, YELLOW	LS	LS	\$	\$
653-6006	THERMOPLASTIC TRAFFIC STRIPING, YELLOW	LS	LS	\$	\$
660-2042	ADJUST SANITARY SEWER LATERAL, 4 IN.	LF	400	\$	\$
668-1100	CATCH BASIN, GP 1	EA	8	\$	\$

## LOG CABIN DRIVE ENHANCEMENT PROJECT - BID SCHEDULE

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
668-2100	DROP INLET, GP 1	EA	2	\$	\$
670-9810	ADJUST WATER SERVICE LINE TO GRADE	EA	10	\$	\$
700-6910	PERMANENT GRASSING	LS	LS	\$	\$
700-6911	DELETED				
700-9300	SOD	SY	1450	\$	\$
716-1000	EROSION CONTROL MATS, WATERWAYS	SY	1,255	\$	\$
716-2000	EROSION CONTROL MATS, SLOPES	SY	620	\$	\$
1300-1.07	AS-BUILT DRAWINGS	LS	LS	\$	\$
<b>ROADWAY ENHANCEMENT ITEMS SUBTOTAL</b>					<b>\$</b>
<b>PEDESTRIAN BRIDGE</b>					
PED 001	PEDESTRIAN BRIDGE FOUNDATIONS, DESIGN AND CONSTRUCTION, COMPLETE	LS	LS	\$	\$
PED 002	PEDESTRIAN BRIDGE STRUCTURE, DESIGN AND CONSTRUCTION, COMPLETE	LS	LS	\$	\$
<b>ROADWAY BRIDGE MAINTENANCE SUBTOTAL</b>					<b>\$</b>
<b>ROADWAY BRIDGE (ID 021-0170-0) OVER ROCKY CREEK REPAIR AND MAINTENANCE</b>					
RDBR-001	REPAIR HEADWALL SPALL ON BOTH ENDS OF BRIDGE	LS	LS	\$	\$
RDBR-002	REPAIR EROSION AROUND BOTH ABUTMENTS	LS	LS	\$	\$
535-1105	PAINT EXIST STEEL STRUCTURE, BRIDGE ID 021-0170-0	LS	LS	\$	\$
RDBR-003	REPAIR DAMAGED CONCRETE BRIDGE RAILING	LS	LS	\$	\$
RDBR-004	MISCELLANEOUS MAINTENANCE ITEMS (SEE STATEMENT OF WORK, 01005, Part 1, 1.01.C.e.)	LS	LS	\$	\$
<b>ROADWAY BRIDGE MAINTENANCE SUBTOTAL</b>					<b>\$</b>
<b>TOTAL PROJECT BID PRICE</b>					<b>\$</b>

## Answers to Questions:

Question: I looked at the plans and specs and both talk of sod and grassing. I do see where some grassing is going but nothing with any sod. Also in the plans it shows a list of several different species of plant material, but it doesn't show where they are going? There is no plan for that. Do we know an approx...? Amount of quantities for these items? I am assuming sod and trees and shrubs are paid on unit quantity but I was just wondering because there is no landscape plan, or at least I didn't see it. If you could let me know that on the plant material and quantities and then also where in the plans it shows if an at all. Thanks for your help and I look forward to working with you.

Answer: Sod has been added to the bid schedule and the areas where it is required is shown on Sheet 4.8. See bid amendment 1. See section 700.3.05 on page 115 for the type of grassing allowed. Permanent grassing requires common Bermuda grass in areas that will be mowed regularly and allows for Interstate Lespedeza or Crown Vetch in those sloped areas that will not be mowed regularly. Quantities should be calculated by the contractor based on the disturbed areas. Payment of all grassing is covered in the bid schedule.

Question: The 9.5 mm pay item needs to be 19 mm.

Answer: This has been changed. See bid amendment 1.

Question: I don't see any specifications on the grassing maintenance item for 6 months. Can you please provide a clear description of scope for this item?

Answer: We have eliminated the requirement for grassing maintenance, but this should not be confused with the requirement to establish the grass. Note that follow-on requirements in the specifications for plant establishment in the spring are beyond the performance period of 180 days to construct the project and provide beneficial occupancy to Macon-Bibb. Performance is required at this point until satisfactory establishment of grass is achieved. Liquidated damages do not apply for this work.

## Section 150—Traffic Control

**150.1 General Description** This section describes:

Installation and maintenance of traffic control devices during construction Projects let to Contract by Macon-Bibb County.

Guidelines and procedures for reducing the speed limit in areas where workers are present, or where roadway or roadside conditions create a potential hazard from construction or maintenance activities.

Temporary speed limit reductions in Work zones must comply with Georgia Law (Code Section 40-6-188).

### 150.2 Definitions

The traffic control plan is defined in the Specifications and the current edition of the Manual on Uniform Traffic Control Devices (MUTCD).

Traffic control devices referred to in this section are devices specified in the Contract and the MUTCD and are used by a Contractor to regulate, warn, or guide traffic through a Project under construction.

### 150.3 Related References

#### Referenced Documents

Manual on Uniform Traffic Control Devices (MUTCD) Official Code of Georgia Annotated (OCGA): 40-6-188  
Georgia Utilities Coordinating Committee (GUCC) Manual (also known as Manual on Traffic Control Procedures for Utilities)

### 150.4 Submittals

#### A. Contractor Responsibilities

1. Prior to construction, the Contractor shall submit a detailed staging and traffic control plans for performing specific areas of the Work including but not limited to all traffic shifts, bridge maintenance, lane closures or other activities that disrupt traffic flow. A Plan of operation and sequence of Work, along with any appropriate Provisions for traffic control, shall be submitted to the Macon-Bibb County Engineer for prior approval before beginning any Work. **NOTE: The Contractor's primary responsibility is for safe passage of pedestrian and vehicular traffic through the Work zone with minimal confusion and traffic flow disruption.**
1. Before construction, inspect the initial installation of the traffic control devices.
2. Periodic inspections of the conditions of the devices and their effectiveness in the work zone.
  - a. If problems are encountered, the Macon-Bibb County Engineer can assist with solutions to improve traffic control.
  - b. Document inspection in Contract Diary.
3. Daytime and Nighttime inspections should be made as conditions warrant.
4. Observe traffic movements while operating under the traffic control devices.
5. Report lane closures and openings as follows:
  - a. Report Projects that routinely require a lane closure only once, unless the operation changes, such as stopping Work for a long period of time or switching lanes.

## Section 150—Traffic Control

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- b. Report intermittent lane closures each time they are closed to keep the Macon-Bibb County Engineer aware of the actual Project conditions.
6. Notify the Macon-Bibb County Engineer when unusual situations arise that requires a lane closure
7. The Contractor shall not begin a major traffic shift until the Macon-Bibb County Engineer has approved the following:
  - a. A set of traffic control details
  - b. Any proposed lane shifts, closures, or traffic pacing
  - c. The removal, storage, and protection of any existing street lights, signs, or sign supports

### 150.6 Construction Requirements

**A. Personnel** The Contractor shall designate a qualified Worksite Traffic Control Supervisor (WTCS) who shall be responsible for administering the traffic control Plan according to the Contract.

#### 1. Worksite Traffic Control Supervisor (WTCS):

Be responsible for selecting, installing and maintaining all traffic control devices in accordance with the Plans, Specifications, Special Provisions and the MUTCD.

Have appropriate training in safe traffic control practices in accordance with Part VI of the MUTCD.

Ensure that all traffic control devices are effective and comply with the Traffic Control Plan.

Exercise full authority to act on behalf of the Contractor in administering the Traffic Control Plan.

Be available on a 24-hour basis and be able to respond effectively to an emergency within 45 minutes of notification.

Supervise the installation of the traffic control devices before construction.

Review any modifications to the Traffic Control Plan before submitting them to the Macon-Bibb County Engineer.

Inspect the traffic control devices on a regular basis to ensure that they meet the requirements of the Traffic Control Plan.

Monitor the Work to ensure that all potential hazards are kept clear of the traffic and that dust, mud, and debris do not interfere with normal traffic operations or adjacent property.

**NOTE: No Work shall begin on any phase of the Project unless the appropriate traffic control devices have been placed.**

#### 1. Flagger

Flaggers shall be provided as required to handle traffic.

All flaggers shall meet the requirements of the MUTCD and shall have received training and a certificate upon completion of the training from a GDOT approved training program.

Failure to provide a certified flagger as required will be reason for the Macon-Bibb County Engineer to suspend work involving the flagger(s) until the Contractor provides certified flagger(s).

## Section 150—Traffic Control

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Flaggers must have proof of certification and a valid identification available when performing flagger duties.

Flaggers shall wear high-visibility clothing in compliance with MUTCD.

Flaggers shall use a Stop/Slow paddle meeting the requirements of the MUTCD for controlling traffic.

Flags used shall meet the minimum requirement of the MUTCD.

### **B. Equipment 1. Traffic Control Devices**

All traffic control devices used during the construction of a project shall meet the Standards utilized in the MUTCD, and shall comply with the requirements of these Specifications, Project Plans, and Special Provisions. All traffic control devices used on any project shall be NCHRP 350 compliant.

#### **2. Reflectorization Requirements**

a. Omitted

b. All other Highways:

All reflectorization for permanent mounting height construction signs (Black on Orange), object markers, and channelization devices shall meet the reflectorization requirements of Section 913, Type III or IV unless otherwise specified.

Portable signs which have rigid or flexible sign blanks shall have Type V diamond grade sheeting.

Warning signs (W3-1a) for stop conditions that have rumble strips located in the travelway shall be reflectorized with Type V fluorescent yellow diamond grade sheeting.

All other signs shall meet the requirements of Type I unless otherwise specified.

### **150.7 Construction**

#### **A. Inspection**

During the day and night, the Macon-Bibb County Engineer will periodically inspect the traffic control devices and determine their effectiveness in the Work zone. The frequency of these inspections will depend on the type and volume of Work. During an inspection, observe traffic movement while the devices are operating.

#### **C. Restrictions**

The Macon-Bibb County Engineer may restrict construction operations if the Work would seriously disrupt traffic flow when unusual traffic conditions exist, such as during holidays and bad weather.

#### **D. Determining Reduced Speed Limits**

Macon-Bibb County is responsible for determining the appropriate speed limit reduction for all roadways under its supervision.

A temporary speed reduction zone will be established for a section of roadway according to an identified need such as:

When workers are near a travel lane.



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When Work is being performed near a travel lane.

When Temporary concrete barrier is located less than 2 feet from the travelway.

When the Contractor's request is justified.

### **E. Work Zone Speed Limits**

The minimum reduction of the posted speed limit will be no less than 10 mph and a maximum reduction of no greater than 20 mph.

Do not use regulatory speed limit signs (black on white) to reduce speeds to less than 10 mph below the original speed limit unless one or more of the following conditions exist in the Work zone:

Sharp cresting vertical curves

Horizontal shifts

Work is performed near a travel lane

### **F. Signing Requirements for reduced speed limits**

To temporarily reduce the speed limit in a Work zone, use the following guidelines.

1. Erect a standard R2-5a (Reduced Speed Ahead) sign a minimum of 600 ft in advance of the reduced speed zone.
2. Erect a standard R2-1 (Speed Limit XX) sign a minimum of 600 ft in advance of the beginning of the reduced speed zone, if the speed limit will be reduced a total of 20 mph. This sign reduces the speed in 10 mph (16 kph) increments.
3. Erect a black on white regulatory R2-Special (Work Zone/Speed Limit XX/Minimum Fine \$100) sign 600 ft past the previous sign erected in Step 1 or 2.
4. Erect intermediate R2-1 (Speed Limit XX) signs at intervals not exceeding one mile within the reduced speed zone.
5. Erect a standard R2-1 (Speed Limit XX) sign 600 ft past the Work zone. This sign shall post the normal speed limit for the roadway.
6. Cover or remove all existing speed limit signs while the temporary reduction in the speed limit is in effect.

All signs will be erected in compliance with the minimum requirements of the MUTCD.

### **G. Documentation**

The Contractor shall record the following:

The date and time that each temporary speed reduction zone is installed and removed

The limits of the zone

The traffic direction, if applicable

## Section 150—Traffic Control

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**H. Portable Changeable Message Signs** When using a Portable Variable Message Sign (PCMS) on a Project, place the PCMS ahead of the construction activity or road condition to prepare the motorist. Do not place the PCMS in permanent location miles in advance of the Work zone. The PCMS message should be concise and meaningful. Display messages no more than two flashes as described below: (One flash is desirable, motorists may not see nor comprehend longer messages.)

The first flash should direct the motorist to take a specific action, such as MERGE/RIGHT, KEEP/RIGHT, or REDUCE/SPEED.

The second flash, if necessary, should inform the motorist of road conditions, such as LEFT/LANE/CLOSED, LANE/NARROWS/AHEAD, SHOULDER/DROP/OFF, WATER/IN/ROAD or TRUCKS/IN AND OUT.

Do not use confusing or frightening messages such as USE CAUTION, HAZARD AHEAD, or DANGER. Also, avoid messages such as BUCKLE/UP or DRIVE/SAFELY that diminish the impact of important messages. When the PCMS is not needed, turn off the sign and remove it from the roadside.

The Macon-Bibb County Engineer reserves the right to require additional flaggers, signs, warning lights, channelization devices and other safety devices as may be necessary to properly protect, warn and safeguard the traveling public. Continued failure of the contractor to comply with the requirement of this or any other related section will result in the Engineer issuing a written order to stop work (i.e. Stop Work Order). Upon issuance of a stop work order, all work on the right of way will be suspended, except erosion control and traffic control, until corrective actions or deficiencies are addressed, and the Engineer issues a written resume work order.

**150.8 Measurement** When listed in the Contract, payment for Traffic Control will be made at the Lump Sum price bid, which will include all traffic control not paid for separately, and will be paid as follows: **For each progress payment requested, the total Project percent complete minus the previous payments will be paid, not to exceed 100 (one-hundred) percent.**

## Section 163—Miscellaneous Erosion Control Items

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### 163.1 General Description

This work includes constructing and removing:

- Baled straw erosion checks
- Temporary Grass
- Temporary Mulch
- Temporary Ditch Checks
- Construction Exits
- Inlet Sediment Traps

Other temporary erosion control structures shown on the Plans or directed by the Engineer

#### A. Baled Straw Erosion Checks

Construct baled straw erosion checks according to the Plan details.

#### B. Temporary Grass

Use a quick growing species of temporary grass such as rye grass, millet, or a cereal grass suitable to the area and season.

Use temporary grass in the following situations:

- To control erosion where permanent grassing cannot be planted. The Engineer will direct the planting.
- To protect an area for longer than temporary mulch is expected to last (60 calendar days).

#### C. Temporary Mulch

When stage construction or other conditions prevent completing a roadway section continuously, apply temporary mulch to control erosion for 60 calendar days or less.

Use temporary mulch on erodible areas on or off the Right of Way, including borrow pits, temporary haul roads, or waste areas. Apply mulch as follows:

1. Plant temporary grass on areas stabilized only with temporary mulch. Mulch the area again after 60 calendar days.
2. Uniformly spread the mulch over the designated areas from 2 in to 4 in (50 mm to 100 mm) thick.
3. After spreading the mulch, walk in the mulch by using a tracked vehicle (preferred method), empty sheep foot roller, light discing, or other means that preserves the finished cross section of the prepared areas. The Engineer will approve of the method.
4. Place temporary mulch on slopes as steep as 2:1 by using a tracked vehicle to imbed the mulch into the slope.

5. When grassing operations begin, leave the mulch in place and plow the mulch into the soil during seed bed preparation. The mulch will become beneficial plant food for the newly planted grass.
6. Place mulch to protect the newly planted grass. This mulch is required in addition to the mulch specified in step 5.

**D. Temporary Ditch Checks**

Temporary ditch checks shall be constructed and placed according to Plan details. Temporary ditch checks may be constructed of stone plain rip rap.

Place plastic filter fabric on ditch section before placing rip rap.

Temporary ditch checks shall be cleaned of sediment when 1/2 the height of the temporary ditch check has been reached. They remain in place until the permanent ditch protection is in place or being installed and the removal is approved by the Engineer.

These ditch checks may remain in place to aid in establishing permanent grass in vegetated waterways, if approved by the Engineer.

**E. Construction Exits**

Locate construction exits at any point where vehicles will be leaving the project onto a public roadway. Install construction exits at the locations shown in the plans and in accordance with plan details.

**F. Inlet Sediment Trap**

Inlet sediment traps consist of a temporary device placed around a storm drain inlet to trap sediment. An excavated area adjacent to the sediment trap will provide additional sediment storage.

Inlet sediment traps may be constructed of Type C silt fence, plastic frame and filter, hay bales, baffle box, or other filtering materials approved by the Engineer.

Construct inlet sediment traps according to the appropriate specification for the material selected for the trap.

Place inlet sediment traps as shown on the Plans.

**163.3 Measurement**

**A. Temporary Grass**

Temporary grass is measured for payment by lump sum, including all required lime.

**B. Temporary Mulch**

Temporary mulch is measured for payment by the ton. The weight for measurement will be the product of the number of bales used and the average weight per bale as determined on scales provided by the contractor or state certified scales. The contractor shall provide written documentation to the Engineer as to the average weight of the bales.

**C. Baled Straw Erosion Checks**

Baled straw erosion checks are measured by each. Type “B” temporary silt fence is measured as baled straw when substituted by the Contractor or the Engineer.

**D. Omitted**

**E. Construction Exits**

Construction exits are measured per each which will include all work necessary to construct the exit including the required geotextile fabric placed beneath the aggregate.

**F. Inlet Sediment Trap**

Inlet sediment traps, regardless of the material selected, are measured per each which includes all work necessary to construct the trap including any incidentals and providing the excavated area for sediment storage.

**163.5 Payment**

**A. Temporary Grass**

Temporary Grass is paid for by the lump sum. Payment is full compensation for all equipment, labor, ground preparation, materials, fertilizer, mulch, and other incidentals including Lime.

**B. Temporary Mulch**

Temporary mulch is paid for by the ton. Payment is full compensation for all materials, labor, maintenance, equipment and other incidentals.

**G. Baled Straw Erosion Checks**

Baled straw erosion checks, complete in place and accepted is paid for at the Contract Unit Price bid. Payment is full compensation for constructing, and removing (when directed) the straw checks.

When the Contractor substitutes a Type “B” silt fence for baled straw erosion checks, or when the Engineer directs this substitution, payment is made at the bid price per each for baled straw erosion checks.

**H. Omitted**

**I. Construction Exits**

Construction exits are paid for per each. Payment is full compensation for all materials including the required geotextile, construction, and removal.

**Miscellaneous Erosion Control Items**

**J. Omitted**

**K. Inlet Sediment Trap**

## Section 163—Miscellaneous Erosion Control Items

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Inlet sediment traps are paid for per each. Payment is full compensation for all materials, construction, and removal.

If temporary erosion control measures are required due to Contractor negligence, carelessness, or failure to install permanent controls as part of the work as scheduled, the Contractor shall perform such work at no additional expense to Macon-Bibb County.

If the Contractor secures his or her own borrow pit, erosion control measures will be at his or her expense.

The Items in this Section (except temporary grass and temporary mulch) are made as partial payments as follows:

- When the item is installed and put into operation the Contractor will be paid 75 percent of the Contract price.
- When the Engineer instructs the Contractor that the Item is no longer required and is to remain in place or is removed, whichever applies, the remaining 25 percent will be paid.

Payment is made under:

Item No. 163	Construct and remove baled straw erosion check__	Per linear foot
Item No. 163	Construct and remove temporary ditch checks__	Per each
Item No. 163	Construct and remove construction exits	Per each
Item No. 163	Construct and remove inlet sediment trap	Per each
Item No. 163	Temporary Grass	Lump Sum
Item No. 163	Temporary Mulch	Ton

## Section 165—Maintenance of Temporary Erosion and Sedimentation Control Devices

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### 165.1 General Description

This work consists of providing maintenance on temporary erosion and sediment control devices, including but not limited to the following:

- Silt fence
- Check dams
- Silt retention barriers
- Rock filter dams
- Stone filter berms
- Stone filter rings

It also consists of removing sediment that has accumulated at the temporary erosion and sediment control devices.

### General

As a minimum, clean the sediment from all temporary erosion control devices (except sediment basins) installed on the project when one half the capacity, by height, depth or volume has been reached. Clean the sediment from all temporary sediment basins installed on a project when one third the capacity of the storage volume has been filled.

Handle sediment excavated from any erosion or sediment control device in one of the following ways:

- Remove sediment from the immediate area and immediately stabilize it to prevent the material from refilling any erosion or sediment control device.
  - Place and mix it in the roadway embankment, or waste it in an area approved by the Engineer.
  - Repair or replace at no cost to Macon-Bibb County, any erosion or sediment control devices that are not functioning properly or are damaged due to negligence or abuse.

#### A. Temporary Silt Fence

Maintenance of Temporary Silt Fence consists of furnishing all labor, tools, materials, equipment and necessary incidentals to remove and dispose of accumulated sediment down to the original ground line (0 % filled). Also included is the removal of sediment accumulations (“filtercake”) on the fabric by tapping the fabric on the downstream side.

#### B. Check Dams (all types)

Maintenance of Temporary Erosion Control Check Dams shall consist of all labor, tools, materials, equipment and necessary incidentals to remove and dispose of accumulated sediment down to the original ground line (0% filled). This item also includes the removal of any material deposited in sump

holes. When applicable, this item will include the removal of sediment accumulations on the fabric by tapping the fabric on the downstream side, or from the baled straw by similar means.

### **C. Sediment Barrier (baled straw)**

Maintenance of sediment barrier (baled straw) consists of furnishing all labor, tools, materials, equipment and necessary incidentals to remove and dispose of accumulated sediment down to the original ground line (0 % filled). Also included is the removal of sediment accumulations on the bales by tapping.

### **D. Triangular Silt Barrier**

Maintenance of Triangular Silt Barrier consists of all labor, tools, materials, equipment and necessary incidentals to remove and dispose of accumulated sediment down to the original ground line (0% filled).

### **E. Construction Exit:**

Maintenance of the construction exit consists of all labor, tools, materials, equipment and incidentals, including additional stone and geotextile fabric as required to prevent the tracking or flow of soil onto public roadways. This includes, scarifying existing stone, cleaning existing stone, or placement of additional stone.

Cleaning of the construction exit by scraping and/or brooming only will not be measured for payment.

### **F. Inlet Sediment Trap**

Maintenance of inlet sediment traps consists of all labor, tools, materials, equipment and necessary incidentals to remove and properly dispose of accumulated sediment in the trap and/or the excavated area adjacent to the trap. It also includes any maintenance that is required to remove sediment accumulations (“filtercake”) from the material selected to construct the inlet sediment trap.

### **G. Rock Filter Dams**

Maintenance of rock filter dams consists of all labor, tools, materials, equipment, and necessary incidentals to remove and dispose of accumulated sediment down to the original ground line (0% filled). This item also includes the removal of any material deposited in sump holes.

### **H. Stone Filter Berms**

Maintenance of stone filter berms consists of all labor, tools, materials, equipment, and necessary incidentals to remove and dispose of accumulated sediment down to the original ground line (0% filled). This item also includes the removal of any material deposited in sump holes.

### **I. Stone Filter Rings**

Maintenance of stone filter rings consists of all labor, tools, materials, equipment, and necessary incidentals to remove and dispose of accumulated sediment down to the original ground line (0% filled). This item also includes the removal of any material deposited in sump holes.

## **165.2 Measurement**



## Section 165 – Maintenance of Temporary Erosion and Sedimentation Control Devices

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### **A. Temporary Silt Fence:**

Maintenance of temporary silt fence, Type A, B, or C, is the actual linear feet (meter) of silt fence, measured in place, where sediment is removed.

### **B. Check Dams (All Types):**

Maintenance of temporary erosion control check dams as specified on the Plans as each of baled straw, silt fence or rip rap, measured in place, where sediment is removed.

### **C. Silt Retention Barrier:**

Maintenance of temporary silt retention barrier as specified on the Plans, is measured by the linear foot (meter) where sediment is removed.

### **D. Omitted**

### **E. Omitted**

### **F. Construction Exit:**

Maintenance of construction exit at the location specified on the Plans, or as directed by the Engineer is measured per each.

### **G. Inlet Sediment Trap**

Maintenance of inlet sediment trap at the location specified on the Plans, or as added by the Engineer is measured per each.

### **H. Rock Filter Dams**

Maintenance of rock filter dams as specified on the plans is measured as a single unit.

### **J. Omitted.**

### **K. Stone Filter Rings**

Maintenance of stone filter rings as specified on the plans is measured as a single unit.

## **165.5 Payment**

### **1. Temporary Silt Fence:**

Maintenance of temporary silt fence, Type A, B, or C, is paid for at the contract unit price bid per linear foot (meter).

### **2. Check Dams (All Types):**

## Section 165 – Maintenance of Temporary Erosion and Sedimentation Control Devices

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Maintenance of Check Dams as specified on the Plans is paid for at the contract unit price bid per each.

### 3. Sediment Barrier (baled straw):

Maintenance of sediment barrier (baled straw) as specified on the Plans is paid for at the contract unit price bid per each.

### 4. Construction Exit:

Maintenance of the construction exit at the location specified on the Plans or as added by the Engineer is paid for at the contract unit price per each.

### 5. Rock Filter Dams

Maintenance of rock filter dams as specified on the plans is paid for at the contract unit price bid per each.

### 6. Stone Filter Rings

Maintenance of stone filter rings as specified on the plans is paid for at the contract unit price bid per each.

Payment will be made under:

Item No. 165	Maintenance of temporary silt fence Type_____	per linear foot
Item No. 165	Maintenance of check dams (all types)	per linear foot
Item No. 165	Maintenance of sediment barrier (baled straw)	per linear foot
Item No. 165	Maintenance of construction exit	per each
Item No. 165	Maintenance of inlet sediment trap	per each
Item No. 165	Maintenance of rock filter dam	per each
Item No. 165	Maintenance of stone filter ring	per each

## Section 167—Water Quality Monitoring

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### 167.1 General Description

This Specification establishes the Contractor's responsibility to meet the requirements of the National Pollutant Discharge Elimination System (NPDES) Infrastructure Permit No. GAR 100002 as it pertains to Part IV. Erosion, Sedimentation and Pollution Control Plan.

#### 167.1.01 Definitions

Certified Personnel— certified personnel are defined as persons who have successfully completed the appropriate certification course approved by the Georgia Soil and Water Conservation Commission.

#### 167.1.02 Related References

##### A. Referenced Documents

NPDES Infrastructure Permit No. GAR 100002

Environmental Protection Divisions Rules and Regulations (Chapter 391-3-26)

Georgia Soil and Water Conservation Commission Certification Level IA course. OCGA 12-7

### 167.2 Personnel

Use certified personnel to perform all monitoring, sampling, inspections, and rainfall data collection.

Use the Contractor designated WECS or select a prequalified consultant from the Qualified Consultant List (QCL) to perform water quality monitoring.

Ensure that monitoring consultants' employees who perform monitoring, sampling, inspections, and rainfall data collection are GASWCC Certified.

### 167.3 Construction

#### A. General

Perform inspections, rainfall data collection, testing of samples, and reporting the test results on the project according to the requirements in Part IV of the NPDES Infrastructure permit and this Specification.

Take samples manually or with the use of automatic samplers, according to the permit. Analyze all according to the permit, regardless of the method used to collect the samples.

If samples are analyzed in the field using portable turbidimeters, the monitoring results shall state that they are being used and a digital readout of NTUs is what is provided.

Submit bench sheets, work sheets, etc., when using portable turbidimeters. There are no exceptions to this requirement.

## Section 167 — Water Quality Monitoring

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Perform required inspections and submit all reports required by this Specification within the time frames specified. Failure to perform the inspections within the time specified will result in the cessation of all construction activities with the exception of traffic control and erosion control. Failure to submit the required reports within the times specified will result in non-refundable deductions as specified in Subsection 161.5.01.B.

### B. Inspections

Inspection forms may change during the contract to reflect regulatory agency needs or the need of Macon-Bibb County. Any costs associated with the change of inspection forms shall be considered incidental.

The Engineer shall inspect the installation and condition of each erosion control device required by the erosion control plan within seven days after initial installation. This inspection is performed for each stage of construction when new devices are installed. The WECS shall ensure all installation deficiencies reported by the Engineer are corrected within two business days.

Ensure that the inspections of the areas listed below are conducted by certified personnel and at the frequencies listed.

Document all inspections on appropriate forms.

1. Daily:
  - a. Petroleum product storage, usage and handling areas
  - b. All locations where vehicles enter/exit the site

Continue these inspections until all entry and exit sites are stabilized and fuel is not stored or transferred on the site. Utilize the Daily inspection form.

2. Weekly and after Rainfall Events:

Conduct inspections on these areas every seven calendar days and within twenty-four hours after the end of a rainfall event that is 0.5 in (13 mm) or greater:

- a. Disturbed areas not permanently stabilized
- b. Material storage areas
- c. Structural control measures, Best Management Practices (BMPs)
- d. Water quality monitoring locations and equipment

Continue these inspections until all BMPs have been removed. Utilize the EC-1 Form.

3. Monthly:

Once per month, inspect all areas where final stabilization has been completed. Look for evidence of sediments or pollutants entering the drainage system and or receiving waters. Inspect all permanent erosion control devices that remain in place to verify the maintenance status and that the devices are functioning properly.

## Section 167 — Water Quality Monitoring

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Continue these inspections until the Notice of Termination is submitted. Utilize the Monthly inspection form.

### C. Reports:

#### 1. Inspection Reports:

Summarize the results of inspections noted above in writing on the appropriate Daily, Weekly, Monthly or form. Include the following information:

- Date(s) of inspection
- Name of personnel performing inspection
- Status of devices
- Observations
- Action taken

Signature of personnel performing the inspection

Any incidents of non-compliance

The inspection form certification sheet shall be signed by the project WECS and the inspector performing inspections on behalf of the WECS (if not the same person).

Submit all inspection reports to the Engineer within twenty-four hours of the inspection.

The Engineer will review the submitted reports and inspect the project to determine their accuracy.

The Engineer will notify the certified personnel of any additional items that should be added to the inspection report. Correct any items listed in the inspection report requiring routine maintenance within 72 (seventy-two) hours of notification.

Assume responsibility for all costs associated with additional sampling as specified in Part IV.D.6.d.3.(c) of the NPDES GAR 100002 permit if either of these conditions arise:

- BMPs shown in the Plans are not properly installed and maintained, or
- BMPs designed by the Contractor are not properly designed, installed and maintained.

#### 2. Monitoring Reports

##### a. Report Requirements

Include in all reports, the following certification statement, signed by the WECS or consultant providing monitoring on the project:

“I certify under penalty of law that this document and all attachments were prepared under my direct supervision in accordance with a system designed to assure that certified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the

best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

b. When a rainfall event requires a sample to be taken, submit a report of the monitoring results to the Engineer within seven working days of the date the sample was obtained. Include the following information:

- 1.) Date of sampling
- 2.) Rainfall amount on sample date (sample date only)
- 3.) NTU of sample & analysis method
- 4.) Location where sample was taken (station number, etc.)
- 5.) Receiving water or outfall sample
- 6.) Project number and county
- 7.) Whether the sample was taken by automatic sampler or manually (grab sample)

c. Report Requirements with No Qualifying Rainfall Events

In the event that a qualifying rainfall event does not occur prior to the submittal of the NOT (Notice of Termination), submit a report that states “No qualifying rainfall event occurred and no samples were taken.” d. Test Results

Provide monitoring test results to the Engineer within 48 hours of the samples being analyzed. This notification may be verbal or written. This notification does not replace the requirement to submit the formal monitoring summary to the Engineer within 7 working days of the samples being collected.

### 3. Rainfall Data Reports

Record the measurement of rainfall once each twenty-four hour period. Measure rainfall data at the active phase of construction on the site.

Project rain gauges and those used to trigger the automatic samplers are to be emptied after every rainfall event. This will prevent a cumulative effect and prevent automatic samplers from taking samples even though the rainfall event was not a qualifying event.

The daily rainfall data supplied by the WECS to the Engineer will be the official rainfall data for the project. 167.3.06 Quality Acceptance

### 167.4 Measurement

Water Quality Inspections in accordance with the inspection and reports sub-sections will be measured for payment by the month up to the time the Contract Time expires. Required inspections and reports after Contract Time has expired will not be measured for payment.

## Section 167 — Water Quality Monitoring

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Water Quality Monitoring and Sampling are measured per each. When the monitoring location is receiving water, the upstream and downstream samples constitute one sample. When the monitoring location is an outfall, a single outfall sample constitutes one sample.

### 167.5 Payment

Payment for Water Quality Monitoring and Sampling will be made as follows:

Water Quality Monitoring and Sampling per each is full compensation for meeting the requirements of the monitoring sections of the NPDES permit and this Specification, obtaining samples, analyzing samples, any and all necessary incidentals, and providing results of turbidity tests to the Engineer, within the time frame required by the NPDES Infrastructure permit, and this Specification.

This item is based on the rainfall events that require sampling as described in Part IV.D.5 of the permit.

Macon-Bibb County will not pay for samples taken and analyzed for rainfall events that are not qualifying events as compared to the daily rainfall data supplied by the WECS.

Water Quality Inspections will be paid at the Contract Price per month. This is full compensation for performing the requirements of the inspection section of the NPDES permit and this Specification, any and all necessary incidentals, and providing results of inspections to the Engineer, within the time frame required by the NPDES Infrastructure permit, and this Specification.

Payment will be made under:

Item No. 167	Water quality inspections	Per month
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Water Quality Monitoring and Sampling will be paid per each.

Payment will be made under:

Item No. 167	Water quality monitoring and sampling	Per each
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## Section 171—Silt Fence

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### 171.1 General Description

This work includes furnishing, installing, and removing a water permeable filter fabric fence to remove suspended particles from drainage water.

### 171.2 Materials

For Type A, B, and C fences, use fabric as specified in Subsection 881.2.07, "Silt Fence Filter Fabric."

#### 171.2.01 Delivery, Storage, and Handling

During shipment and storage, wrap the fabric in a heavy-duty covering that will protect the cloth from sunlight, mud, dust, dirt, and debris. Do not expose the fabric to temperatures greater than 140 °F (60 °C).

When installed, the Engineer will reject the fabric if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.

### 171.3 Construction

Install the silt fence according to this Specification, as shown on the Plans, or as directed by the Engineer.

#### A. Install Silt Fence

1. Install silt fence by either of the following methods:
  - a. Excavated Trench Method

Excavate a trench 4 to 6 in (100 to 150 mm) deep using equipment such as a trenching machine or motor grader. If equipment cannot be operated on the site, excavate the trench by hand.

- b. Soil Slicing Method

Create a mechanical slice in the soil 8 to 12 in deep to receive the silt fence. Ensure that the width of the slice is not more than 3 in. Mechanically insert the silt fence fabric into the slice in a simultaneous operation with the slicing that ensures consistent depth and placement.

2. Install the first post at the center of the low point (if applicable). Space the remaining posts a maximum of 6 ft apart for Types A and B fence and 4 ft (1.2 m) apart for Type C fence.
  3. Bury the posts at least 18 in (450 mm) into the ground. If this depth cannot be attained, secure the posts enough to prevent the fence from overturning from sediment loading.
  4. Attach the filter fabric to the post using wire, cord, staples, nails, pockets, or other acceptable means.
    - a. Staples and Nails (Wood Posts): Evenly space staples or nails with at least five per post for Type A fence and four per post for Type B fence.



## Section 171 – Silt Fence

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- b. Pockets: If using pockets, and they are not closed at the top, attach the fabric to a wood post using at least one additional staple or nail, or to a steel post using wire.

Ensure that the additional attachment is within the top 6 in of the fabric.

- c. Install the filter fabric so that 6 to 8 in of fabric is left at the bottom to be buried. Provide a minimum overlap of 18 in at all splice joints.
  - d. For Type C fences, attach the filter fabric to the top of a woven wire support fence at the midpoint between posts.
5. Install the fabric in the trench so that 4 to 6 in of fabric is against the side of the trench with 2 to 4 in of fabric across the bottom in the upstream direction.
  6. Backfill and compact the trench to ensure that flow cannot pass under the barrier. When the slice method is used, compact the soil disturbed by the slice on the upstream side of the silt fence first, and then compact the downstream side.

### B. Remove the Silt Fence

1. Keep the silt fence in place unless the Engineer directs. A removed silt fence may be used at other locations if the Engineer approves of its condition.
2. After removing the silt fence, return the area to a pleasing appearance. Seed and mulch the area according to [Section 700](#).
3. When installing a silt fence across a waterway that produces significant runoff, place a settling basin in front of the fence to handle the sediment load, if required. Construct a suitable sump hole or storage area according to [Section 163](#).

#### 171.3.06 Quality Acceptance

Approved silt fence is listed in [QPL 36](#). Approved fabrics must consistently exceed the minimum requirements of this Specification.

At the time of installation, the Engineer will reject the fabric if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.

#### 171.3.07 Contractor Warranty and Maintenance

Maintain the silt fence until the Project is accepted or until the fence is removed. Also, remove and dispose of the silt accumulations at the silt fence.

Remove and replace any deteriorated filter fabric that reduces the effectiveness of the silt fence.

Repair or replace any undermined silt fence at no additional cost to Macon-Bibb County.

#### 171.4 Measurement

The quantity of silt fence to be paid for is the actual number of linear feet (meters) of silt fence, measured in place from end post to end post of each separate installation. The silt fence must be complete and accepted.

## Section 171 – Silt Fence

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### 171.5 Payment

Silt fence Type A, B, or C measured as defined in Subsection 171.4, "Measurement," is paid for at the Contract Unit Price bid per linear foot (meter).

Payment is full compensation for the following:

- Furnishing materials
- Erecting and maintaining the fence
- Removing accumulated silt
- Dressing and grassing, when required
- Removing the fence, when required Payment for this Item is made as follows:
  - Seventy-five percent of the Contract Price bid per linear foot (meter) is paid when each fence is complete in place.
  - Twenty-five percent is paid at removal or acceptance.

If the silt fence must be repaired or removed, perform the work at no additional cost to Macon-Bibb County.

Payment will be made under:

Item No. 171	Silt fence, type A	Per linear foot
Item No. 171	Silt fence, type C	Per linear foot

## Section 210—Grading Complete

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### 1. SCOPE

This work includes:

- Excavating of all materials including ditches, undesirable material (including removal and replacement), and borrow (if required)
- Hauling
- Forming embankments
- Constructing shoulders and subgrades
- Finishing, dressing, and disposing of undesirable or surplus material
- Clearing and grubbing unless these items are established as Pay Items in the Contract
- Removing and disposing of miscellaneous roadway items, including but not limited to curbs, drainage structures, and pavements (unless established as separate contract items)
- Ensure that the completed grading work conforms to the horizontal and vertical alignment and typical cross- sections shown on the Plans or as directed by the Engineer.

### 2. GENERAL

The Contractor shall accept the site in its existing condition, and shall assume the risk of encountering whatever materials as may occur. Refer to and comply with Soils Report.

### 3. DEWATERING AND PROTECTION AGAINST WATER

The Contractor shall remove water from the site and shall lower the ground water level as necessary to complete the excavations to the required depths and as required to maintain the excavations sufficiently dry so that all required work can be accomplished. The Contractor shall do such well construction, well pointing, sheeting, ditching, diking and pumping and shall construct necessary drains, channels, sumps and cofferdams to keep his excavations and new structures clear of ground water, storm water or sewage and to keep his construction areas dry during the progress of the work and until the finished work is accepted by the Owner, except as otherwise specified.

The Contractor shall be responsible for the effect of dewatering operations on adjacent property and for the effect on water supplies located in the vicinity of the project.

Adequate measures and protection shall be provided by the Contractor to protect his work from damage from uplift due to ground water, storm water, or flood water.

Any damages which may result shall be the Contractor's responsibility.

The Contractor shall accept all responsibility for damage to the work of this Contract because of floods and water pressures and other water damages and shall accept all risks of floods and other events which may occur.

All water discharged by pumping operations shall be discharged so as not to interfere with work under this Contract or with existing structures and operations. Route of dewatering pipe shall be subject to the Engineer's review. Discharge facilities and water quality shall comply with applicable regulations of State and Federal agencies.

Dewatering operations shall be uninterrupted and continuous during the course of the work so as not to endanger any construction in place or to present a hazard to workmen in and around the site. The Contractor shall take all measures necessary including, but not limited to, standby equipment and constant attendance to insure that the dewatering system remains operational and effective throughout the period of time that it is required.

#### **4. MATERIALS**

##### **A. Earth Fill.**

Earth fill, including pavement subgrades, shall consist of all suitable materials from required excavations. Suitable materials for earth fill shall generally be composed of sands, clay-sand mixtures and silt-sand mixtures. Clay-sand and silt-sand mixtures shall be approved by the soil technician prior to being incorporated in fills. Highly plastic clays and silts, and organic soils will be considered as unsuitable materials.

##### **B. Excavated Materials.**

All suitable materials from excavations shall be used in the permanent construction required under these Specifications. Suitable materials shall be excavated separately from materials to be wasted and the suitable materials shall be segregated by loads during the excavation operations and shall be placed in temporary stockpiles and later placed in the designated locations. Excavated materials, which, after drainage, are suitable for the embankment but which, when excavated are too wet for immediate compaction in the embankment, shall be placed temporarily in stockpiles until the moisture content is reduced sufficiently to permit them to be placed in the earth fills.

##### **C. Excess Materials.**

All excess material from required excavations shall be removed from the site unless written authorization is given by the Engineer to stockpile the material on the site.

#### **5. EXCAVATION**

Excavation shall include the loosening, loading, removing, transporting, stockpiling and disposing of all materials, wet or dry, necessary to be removed to construct all structures included in this Contract to the lines and grades, and at the locations, shown on the Contract Drawings. Excavation for outside piping, storm sewers and utilities systems is included in other Sections of these Specifications.

Excavation for structures shall conform to the depth and dimensions necessary for the proper installation of all structures detailed on the Contract Drawings. Unless shown on the Drawings excavation shall not be carried below the elevations shown on the Drawings. Where bottoms of excavations are slightly unstable and the Drawings do not require a stabilized granular backfill

## **Section 210 – Grading Complete**

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and the Engineer does not direct additional excavation and replacement, the Contractor may provide a gravel course, but such work will be considered as for the Contractor's convenience and will not be considered as extra work..

Where any unauthorized excavation is made below the elevation indicated on the Contract Drawings, the excavation shall be restored to the proper elevation with compacted, well graded granular backfill. Such backfill shall be compacted as specified in the Article entitled "Compaction".

Excavation for pipes under and adjacent to structures shall be made after the installation of the granular backfill. Excavations shall be made to the required depths, grades, alignment, and trench widths required for the installation of the pipe. Temporary sheeting and bracing shall be used as required to confine the trench size and width. Trench size and width shall conform to the requirements in Section 02221.

Excavation shall be made for roadways and other site work to the required depths, grades and alignment.

Excavations, where conditions require, shall be properly shored, sheeted and braced by the Contractor to maintain excavation in a condition to permit the safe and efficient installation of all items of Contract work. Upon completion of the various Contract items, all temporary forms, shores and bracing shall be removed. While being withdrawn, all voids left by the sheeting and bracing shall be carefully filled with sand and compacted.

### **6. TOPSOIL CONSERVATION**

Over areas requiring excavation and/or fill, there may be limited amounts of existing topsoil, suitable for future use. The Contractor shall strip all such topsoil and shall stockpile it for future use under this Contract. Except for topsoil material available from the excavation, topsoil shall be obtained from off-site borrow.

### **7. UNSUITABLE MATERIAL**

Where material encountered is unsuitable for subgrade construction of roads, paved areas, buildings and walks, such material shall be excavated to the required depth of compaction (generally two feet below pavement base course), disposed of off the site and property of the Owner and replaced with suitable material. Unsuitable materials are those classified as MH, CH, OH, OL, and Peat in accordance with the Unified Soil Classification System. Excess water in material will not be a basis for establishing unsuitable material regardless of gradation. The Engineer shall be notified immediately upon encountering of unsuitable material.

### **8. BORROW**

It is anticipated that suitable material for required fill and backfill can be obtained from required excavation. Suitable materials shall be secured by the Contractor from off-site sources if required.

### **9. BACKFILLING**

All excavation shall be backfilled to the lines and grades shown on the Contract Drawings. Backfill adjacent to structures shall not be placed until forms, form lumber and all debris from construction has been

## Section 210 – Grading Complete

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entirely removed from around the work. No backfilling shall be done in unsuitable weather or over ground that is frozen or too wet.

Backfill shall not be placed against structures until the concrete has cured at least 7 days. Backfill, in general, shall be placed in horizontal layers not in excess of 12 inches in thickness, except in the cases of embankment construction around structures and under roadway and piping locations, where backfill shall be placed in 6 inch layers, with each layer thoroughly compacted as specified hereinafter, prior to the addition of the succeeding layer.

Fill material shall be suitable material taken from the excavation. All sticks, debris, organic matter, frozen material, stones or cobbles over 6 inches in maximum dimension, and other deleterious material shall be removed from the backfill material prior to its use.

### 10. COMPACTION

#### A. General.

Compaction of earth fill and all pavement subgrades shall be performed to the percentages of maximum standard or modified dry densities and to the depths as shown on the drawing or as follows:

Subgrades Under Paved Areas and Structures.

98 Percent Standard (ASTM Test D698) 24 Inches

95 Percent Standard (ASTM Test D698) Below 24 Inches

Pedestrian Traffic Subgrades.

95 Percent Standard (ASTM Test D698) Full Depth

Unpaved Areas To Be Grassed Or Sodded.

95 Percent Standard (ASTM Test D698) Full Depth

#### B. Moisture Content.

All compaction shall be performed at material moisture contents within 3 percentage points, plus or minus of optimum. Compaction and proof rolling equipment shall be as outlined in Section 02500 or as may be required for the type of fill being compacted.

### 11. TESTING

#### A. General.

The Contractor will select a qualified independent testing laboratory for the purpose of identifying soils, checking densities, and classifying soils materials during construction. Payment for the testing will be by the Contractor and will be included in the cost of work done under the specifications.

One compaction test per 500 cubic yards of fill and 1,500 square yards of base, and one "proctor" test shall be conducted for each type of fill material to determine if the proper compaction has been attained.

#### B. Moisture-Density Tests.

## Section 210 – Grading Complete

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Testing shall be in accordance with ASTM Methods D698 and D1557. A test shall be performed on each type of material used in the work regardless of source. Tests will be accompanied by particle-size analyses of the soils tested (ASTM Methods D421 and D422). Changes in color, gradation, plasticity or source of fill material will require the performance of additional tests. Copies of all test results shall be furnished to the Engineer.

### C. Field Density Tests.

Tests shall be made in accordance with ASTM method D1556. If the mica content of the fill soils is low, ASTM D2922 may be used at the discretion of the soil technician. If any compaction test reveals that fill or backfill is not compacted as specified, the Contractor shall scarify and recompact as required to achieve the specified density. Additional compaction tests shall be made to verify proper compaction. These additional tests, required due to failure of the original test, shall be paid for by the Contractor and not be reimbursed by the Owner.

### D. Submittals.

The soils technicians will submit formal reports of all compaction tests and retests to the Contractor and Engineer as soon as possible upon completion of the required tests. This report information is to include but not be limited to the following:

1. Date of the test and date submitted.
2. Location of test.
3. Wet weight, moisture content and dry weight of field sample.
4. Description of soil.
5. Maximum dry density and moisture content of the lab sample which best matches the field sample in color, texture, grain size and maximum dry density.
6. Ratio of field dry density to maximum lab dry density expressed as a percentage.
7. Comments concerning the field density passing or failing the specified compaction. Comments about re-compaction if required.

### E. Compaction Results.

The soils technician is to advise the Engineer and Contractor immediately of any compaction tests failing to meet the specified minimum requirements. No additional lift is to be placed on a lift with any portion failing.

## 12. **GRADING**

Upon completion of other construction operations, the entire site, within the limits shown on the Drawings, shall be brought to the finished grades shown. All surfaces shall be sloped to the grades indicated and which will provide proper drainage. All surfaces shall be raked smooth and shall be free of all vegetable matter, debris and stones larger than 2-1/2 inches. Allow for thickness of required topsoil.

## Section 210 – Grading Complete

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### 13. Quality Acceptance

When the Engineer determines that the existing material in areas where fills are to be placed is undesirable, the Engineer may require the Contractor to remove the undesirable material and replace it with suitable material.

- Compact the replacement materials according to the applicable portions of Section 208.
- In cut areas, where the material below the template line is undesirable for subgrade or shoulders, undercut it to a depth established by the Engineer and replace it with suitable material.
- Compact the replacement materials as specified herein.

### 14. Payment

#### A. Grading Complete

This Item completed and accepted will be paid for at the Lump Sum Price bid. Payment is full compensation for all work and materials specified in this Section.

#### B. Undercut Excavation

Undercutting areas not shown in the Plans when directed by the Engineer will be paid for at the rate of \$5.00 per cubic yard.

**Payment will be made under:**

<b>Item No. 210</b>	<b>Grading complete</b>	<b>Per lump sum</b>
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## Section 310—Graded Aggregate and Concrete Base Construction

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### 310.1 General Description

This work includes constructing a base, subbase or shoulder course composed of mineral aggregates. Construct according to these Specifications and to the lines, grades, thickness, and typical cross-sections shown on the Plans or established by the Engineer.

#### A. Placing Material – Graded Aggregate

Use the following steps to mix base and spread subbase or shoulder course.

##### 1. Mixing

When blending two sizes of aggregate, proportion the aggregate and water, if needed, into the central plant. Mix until producing a homogeneous and uniform mixture.

##### 2. Spreading

To obtain the specified thickness, uniformly spread materials to the proper depth with a mixture spreader. Do not use materials containing frost or frozen particles. a. One-Course Construction

Lay one course to a maximum thickness of 8 in (200 mm) compacted.

##### b. Multiple-Course Construction

If the thickness of the base, subbase or shoulder course exceeds 8 in (200 mm), construct it in 2 or more courses of equal thickness.

#### B. Compacting Material

Use the following steps to compact and finish a base, subbase, or shoulder course.

##### 1. Moisture Content

Ensure that the moisture content of materials is uniformly distributed and allows compaction to the specified density.

Unless approved by the Engineer, no graded aggregate will be shipped to a project when the moisture content of the material exceeds two percent of optimum moisture.

##### 2. Compaction

After shaping the spread material to line, grade, and cross-section, roll to uniformly compact the course. If using Group 1 aggregate, roll to at least 98 percent of maximum dry density. If using Group 2 aggregate, roll to at least 100 percent of the maximum dry density.

If using graded aggregate mixtures composed of either group as base for paved shoulders 6 ft (1.8 m) wide or less, compact to at least 96 percent of the maximum dry density.

## Section 310 – Graded Aggregate Construction

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Regardless of compaction, ensure that the compacted base is sufficiently stable to support construction equipment without pumping. If the base material is unstable from too much moisture, dry and rework the base material. Dry and rework the underlying subgrade, if necessary.

### a. One-Course Construction

- 1) After compaction, shape to the required grade, line, and cross-section.
- 2) Add water as necessary to develop the proper moisture content.
- 3) Roll until the surface is smooth, closely knit, and free of cracks.
- 4) Correct all defects.

### b. Multiple-Course Construction

- 1) After compacting the first course, shape the surface again to line, grade, and cross-section.
  - 2) Add water as necessary to develop the proper moisture content.
  - 3) Spread and compact the second and any succeeding courses without rolling the first course again.
  - 4) Finish the surface according to the procedure specified for one-course construction.
- c. Irregular Areas

In places inaccessible to the roller, obtain the required compaction with mechanical tampers.

### C. Finishing

Finish immediately after the placing and compacting operations.

### E. Priming the Base

Apply bituminous prime unless using:

- Graded aggregate base under Portland cement concrete pavement
- Graded aggregate base under asphaltic concrete 5 in or more in total thickness

### 310.3.06 Quality Acceptance

#### A. Compaction Tests

1. Determine the maximum dry density from representative samples of compacted material, according to AASHTO T180, Method D.
2. Determine the in-place density of finished courses according to GDT 21 or GDT 59, where applicable.

#### B. Finished Surface

Check the finished surface of the base, subbase, or shoulder course as follows:

## Section 310 – Graded Aggregate Construction

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1. Check the longitudinal surface using a 15 ft (4.5 m) straightedge parallel to the centerline.
2. Check the transverse surface by using one of the following tools:
  - A template, cut true to the required cross-section and set with a spirit level on non-superelevated sections
  - A system of ordinates, measured from a stringline
  - A surveyor's level
3. Ensure that ordinates measured from the bottom of the template, stringline, or straightedge, to the surface do not exceed 1/4 in (6 mm) at any point. Rod readings shall not deviate more than 0.02 ft (6 mm) from required readings.

### C. Thickness Tolerances

1. Thickness Measurements
  - a. Thickness requirements apply to shoulder construction where the Plans specify a uniform thickness, or where the shoulders will be surfaced.
  - b. Determine the thickness of the base, subbase, or shoulder course, by making as many checks as necessary to determine the average thickness.
2. Deficient Thickness
  - a. If any measurement is deficient in thickness more than 1/2 in (13 mm), make additional measurements to determine the deficient area.
  - b. Correct any area deficient between 1/2 in (13 mm) and 1 in (25 mm) to the design thickness by using one of the following methods according to these Specifications:
    - Add additional quantities of the same materials and reconstruct to the required thickness
    - Leave in place and accept payment for the materials and area at ½ the Contract Unit Price for the deficient area.
  - c. Correct any area deficient in thickness by more than 1 inch (25 mm) by adding additional quantities of the same material and reconstructing to the required thickness in accordance with these Specifications.
  - d. If payment is made by the ton (megagram), payment for additional material to correct deficiencies will be made at the Contract Unit Price with no additional cost to the Department for scarification, mixing or compaction.
  - e. If payment is made by the square yard (meter), no payment will be made for additional material required to correct deficiencies or for reconstructing deficient work.
3. Average Thickness

## Section 310 – Graded Aggregate Construction

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- a. The average thickness per linear mile (kilometer) is determined from all measurements within the mile (kilometer) increments except the areas deficient by more than 1/2 in (13 mm) and not corrected.
- b. The average thickness shall not exceed the specified thickness by more than 1/2 in (13 mm).
- c. If the basis of payment is per ton (megagram), and the average thickness for any mile (kilometer) increment exceeds the allowable 1/2 in (13 mm) tolerance, the excess quantity in that increment will be deducted from the Contractor's payments.
- d. The excess quantity is calculated by multiplying the average thickness that exceeds the allowable 1/2 in (13 mm) tolerance by the surface area of the base, subbase, or shoulder.
- e. If the basis of payment is per square yard (meter), no deduction will be made for excess thickness.

### 310.4 Measurement

#### A. Graded Aggregate

Where specified for payment by the ton, graded aggregate base, subbase or shoulder materials are measured in tons, mixed and accepted. When hauling material to the roadway, the actual weight of each loaded vehicle is determined with an approved motor truck scale.

Where specified for payment by the square yard (meter) for a certain thickness, the surface length is measured along the centerline, and the width is specified on the Plans. Measure irregular areas, such as turnouts and intersections, by the square yard (meter).

#### B. Bituminous Prime

Bituminous prime is not measured for separate payment.

### 310.5 Payment

#### A. Graded Aggregate

Graded aggregate base, subbase, or shoulder course will be paid for at the Contract Unit Price per square yard, complete, in place, and accepted. This payment shall be full compensation for:

- Materials
- Shaping and compacting the existing roadbed
- Loading, hauling, and unloading
- Crushing and processing
- Mixing
- Spreading
- Watering
- Compacting and shaping
- Maintenance
- Priming, when required

## Section 310 – Graded Aggregate Construction

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- All incidentals necessary to complete The Work

Payment will be made under:

<b>Item No. 310</b>	<b>Graded aggregate (base, subbase, shoulder course)—including material</b>	<b>Per square yard</b>
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When using narrow sections of Portland cement concrete to widen existing bases or bases and pavements, use Class B concrete as shown on the Plans or as directed by the Engineer.

Class B concrete used for base and pavement widening will be measured and paid for by the cubic yard (meter) complete in place and accepted.

<b>500</b>	<b>Class B concrete base or pavement widening</b>	<b>Per cubic yard</b>
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## Section 321216 – Asphalt Paving

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### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Hot-mix asphalt patching.
  - 2. Hot-mix asphalt paving.
  - 3. Hot-mix asphalt overlay.
- B. Related Requirements:
  - 1. Section 312000 "Earth Moving" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
  - 2. Section 321373 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include technical data and tested physical and performance properties.
  - 2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
  - 3. Job-Mix Designs: For each job mix proposed for the Work.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each paving material.
- B. Material Test Reports: For each paving material, by a qualified testing agency.
- C. Field quality-control reports.

## Section 312216 – Asphalt Paving

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### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by GDOT.
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Georgia DOT for asphalt paving work.
  - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

### 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
  - 1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
  - 2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
  - 3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
  - 4. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
  - 5. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

## PART 2 - PRODUCTS

### 2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- C. Fine Aggregate: AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
  - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

## Section 312216 – Asphalt Paving

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### 2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320, PG 64-22 or PG 67-22 d.
- B. Asphalt Cement: ASTM D 3381/D 3381M for viscosity-graded material ASTM D 946/D 946M for penetration-graded material.
- C. Cutback Prime Coat: ASTM D 2027, medium-curing cutback asphalt, MC-30, MC-70, MC-250.
- D. Emulsified Asphalt Prime Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- E. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- F. Fog Seal: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- G. Water: Potable.
- H. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

### 2.3 AUXILIARY MATERIALS

- A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled [tires] [asphalt shingles] [or] [glass] from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.
- B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.
- C. Sand: AASHTO M 29, Grade No. 2 or No. 3.
- D. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.
- E. Joint Sealant: AASHTO M 324], Type II or III, hot-applied, single-component, polymer-modified bituminous sealant.

### 2.4 MIXES

- 1. Surface Course Limit: Recycled content no more than 10 percent by weight.



## Section 312216 – Asphalt Paving

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- B. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes **approved by GDOT; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"**; and complying with the following requirements:
  - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
  - 2. Base Course: 19 mm "Superpave" hot mix asphalt is to be spread and finished to a mat thickness of 3.0 in.
  - 3. Surface Course: 12.5 mm "Superpave" hot mix asphalt is to be spread and finished to a mat thickness of 1.5 in.
- C. Omitted

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  - 1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
  - 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

#### 3.2 PATCHING

- A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
  - 1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
  - 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

## Section 312216 – Asphalt Paving

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- C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd.
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.
- E. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

### 3.3 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than **1 inch** in existing pavements.
  - 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.
  - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
  - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
  - 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

### 3.4 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
  - 1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.
- C. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

## Section 312216 – Asphalt Paving

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1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  2. Protect primed substrate from damage until ready to receive paving.
- D. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  2. Protect primed substrate from damage until ready to receive paving.
- E. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### 3.5 PLACING HOT-MIX ASPHALT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
  2. Place hot-mix asphalt surface course in single lift.
  3. Spread mix at a minimum temperature of 250 deg F (121 deg C).
  4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
  5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.
  2. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### 3.6 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
  - 1. Clean contact surfaces and apply tack coat to joints.
  - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
  - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
  - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time.
  - 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
  - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

### 3.7 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
  - 1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
  - 1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent or greater than 100 percent.
  - 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent or greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

## Section 312216 – Asphalt Paving

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- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### 3.8 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Base Course: Plus or minus 1/2 inch.
  - 2. Surface Course: Plus 1/4 inch, no minus.
  
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
  - 1. Base Course: **1/4 inch.**
  - 2. Surface Course: **1/8 inch.**
  - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

### 3.9 FIELD QUALITY CONTROL

- A. Testing Agency: The Contractor will engage a qualified testing agency to perform tests and inspections.
  
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
  
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
  
- D. Asphalt Traffic-Calming Devices: Finished height of traffic-calming devices above pavement will be measured for compliance with tolerances.
  
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to **AASHTO T 168**.
  - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
  - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
    - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than three cores taken.

## Section 312216 – Asphalt Paving

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- b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

- F. Replace and compact hot-mix asphalt where core tests were taken.
- G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

### 3.10 WASTE HANDLING

- A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

### 4.00 MEASUREMENT

- A. Recycled asphaltic concrete mixture, complete in place and accepted, is measured in tons. The weight is determined by recorded weights if an approved recording device is used. Or, the weight is determined by weighing each loaded vehicle on an approved motor truck scale as the material is hauled to the roadway.

### 4.01 PAYMENT

The work performed and the materials furnished as described in this Specification will be paid for at the Contract Unit Price per ton (megagram). Payment is full compensation for providing materials, hauling and necessary crushing, processing, placing, rolling and finishing the recycled mixture, and providing labor, tools, equipment, and incidentals necessary to complete the work, including hauling and stockpiling RAP or RAS material.

#### 3.11 Payment will be made under:

Item No. 402	Recycled asphaltic concrete 9.5 mm Superpave, group-2 only, including bituminous materials and hydrated lime	Per ton
Item No. 402	Recycled asphaltic concrete 12.5 mm Superpave, group-2 only, including bituminous materials and hydrated lime	Per ton

END OF SECTION 321216

## Section 441—Miscellaneous Concrete

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### 441.1 General Description

This work includes placing Portland cement concrete as follows:

- As sidewalks
- In concrete curbs, gutters, curb and gutters, and valley gutters
- As nonreinforced headwalls
- As velocity dissipators and concrete slope drains
- Curb cut wheel chair ramps

This work includes subgrade preparations including:

- Fine grading and backfilling
- Forming, furnishing, placing, and finishing concrete
- Constructing weep holes and furnishing and placing the coarse aggregate
- Furnishing and placing preformed joint fillers as shown on the Plans

Placing driveway concrete as shown on the Plans. Nominal 4 in or 6 in thick as specified or to match existing pavement.

### 441.2 Materials

Use concrete that conforms to the minimum requirements for Class “A” (3000 psi).

Place miscellaneous concrete only when the air temperature is 40 °F (4 °C) and rising. Protect concrete from freezing for the first 24 hours. Hand finishing is allowed.

### 441.3 Construction Requirements

#### 441.3.02 Equipment

##### A. Forms

Forms are subject to the Engineer’s approval. Use forms that are:

- Wood or metal that is readily available
- Straight and oiled before each use
- Use metal divider plates and templates.

Use the slip form placement method when applicable. If the slip form method does not produce a product with the proper quality, shape, grade, or alignment, the Engineer may require using fixed forms.

##### B. Weep Holes

Provide weep hole drain pockets filled with coarse aggregate to use with weep hole drain pipe or formed openings according to the Plan details.

#### 441.3.03 Preparation

## Section 441—Miscellaneous Concrete

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Before placing the concrete, excavate for toe walls, edge walls, and weep hole drain pockets; place coarse aggregate in weep hole drain pockets; and grade, finish, and compact the subgrade surface. Use mechanical tamps for compaction if necessary.

### 441.3.04 Construction

#### A. Extent and Thickness of Pavement

See the Plans to determine the areas to be paved and the dimensions.

Thicknesses are subject to a minus tolerance of 0.5 in (13 mm). Do not perform overlay pours. B. Preparation of Subgrade

Finish the subgrade for miscellaneous concrete to the line and grade on the Plans and the following:

1. Compact the subgrade to the same degree as the roadway on which it is placed.

The Contractor shall complete final grading, compacting, dressing, placing, and maintenance to the structures until completion.

2. When placing paving on the front slopes of ditches and shoulders, place any required special materials during the roadway construction.
3. When fitting spillways to concrete pavement, set the specified dowel bars into the pavement when it is laid. Use metal parting strips to hold the ends of dowels bent into the grooves.

#### C. Concrete

1. Mixing

Mix Class A concrete as specified in [Section 500](#) with the following exceptions:

- a. Use of small capacity job-site batchers and one-bag mixers is allowed. The rate of concrete placement in [Subsection 500.3.05.P](#), "Meet the Minimum Placement Rates" is waived for miscellaneous concrete.
- b. Proportion concrete ingredients volumetrically if the Engineer has approved equipment calibration and operation and the operator is certified by the Office of Materials and Research.

2. Placing and Finishing

Place and finish concrete as follows:

- a. Deposit concrete within forms or against other pavements on a compacted and wetted subgrade to the depth to produce the specified thickness.

NOTE: Do not place concrete on a muddy or frozen surface.

- b. Vibrate the headwalls.



c. Strike off the concrete to a plane surface and finish it with a Type IV or Type V finish as defined in Subsection 500.3.05.AB, “Finish Concrete” and complete the following:

- 1) Concrete Slope Paving. Give a final finish with a stiff-bristle broom. With the Engineer’s approval, mechanically convey the concrete to the forms.
- 2) Concrete Sidewalks. Give a Type V finish unless otherwise noted on the Plans. Test the surface with a 10 ft (3 m) straightedge laid parallel to the center line. Eliminate irregularities greater than 0.25 in (6 mm) per 10 ft (3 m) while the concrete is still plastic. Ensure that concrete sidewalk constructed as curb cut (wheelchair) ramps has a rough or textured finish.
- 3) Concrete Paved Ditches. Ensure that the surface of the bottom and sides of paved ditches are uniform and true to grade and cross section. Ensure that straight-grade tangents do not deviate more than 1 in (25 mm) within 10 ft (3 m) when tested with a 10 ft (3 m) straightedge. Do not allow deviation if it reduces the ditch paving thickness, causes water to pond, or alters the direction of flow. Finish the ditch paving by floating with wood or metal floats to bring mortar to the surface to cover the coarse aggregate. Use reinforcing that conforms to Plan details if required.
- 4) Concrete Curbs, Gutters, and Median. Finish according to Subsection 441.3.05.C.2, “Placing and Finishing.” Remove face forms as soon as possible and finish the exposed surfaces with a wood float. Use a straightedge to test the edge of the gutter and top of the curb and median to conform to the requirements for the adjacent pavement. Irregularities shall not exceed 0.25 in (6 mm) in 10 ft (3 m). Place the curb and gutter using a machine as long as the results are satisfactory.
- 5) Curb Cut Wheel chair Ramps. Construct a Type I, II, or III ramp according to Georgia Standard 9031W. Tie ramps into adjacent paved or unpaved sidewalk and use a rough or textured finish.

### 3. Joints

Follow these procedures to construct joints on slopes, ditches, sidewalks, and curbs, gutters, and medians.

#### a. Slope Paving

Place paving on slopes in horizontal or vertical courses, but not a mixture of both.

- 1) Construct horizontal courses approximately level and at least 3 ft (1m) but no more than 6 ft (1.8 m) wide measured along the slope.

When needed, construct trapezoidal courses at the top and bottom to accommodate sloping berm and ditch line conditions.

- 2) Edge the paving at construction joints between courses with a 0.25 in (6 mm) radius tool.

## Section 441—Miscellaneous Concrete

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- 3) Provide vertical contraction or construction joints spaced along the horizontal course at right angles to the horizontal construction joints at approximately 40 ft (12 m) intervals, in line not staggered.

No other vertical lines will be required in horizontal courses.

When using vertical contraction joints, cut them with a tool one-third the depth of the paving during the finishing operation. Edge the contraction joints the same as construction joints.

Vertical courses approximately equal and at least 3 ft (1 m) but no more than 5 ft (1.5 m) wide across the plane of the slope. The desired width is 4 ft (1.2 m). Horizontal lines are not required in vertical courses.

Separate slope paving from the masonry of structures, sidewalks, curbs, and rigid-type roadway pavements of preformed joint filler that are 0.5 in (13 mm) thick.

### b. Concrete Paved Ditches

Form joints in concrete paved ditches as follows:

- 1) Space contraction joints at 30 ft (9 m) intervals.
- 2) Place expansion joints only where the paved ditch joins the roadway pavement or some other structure.
- 3) Do not use joint sealers for expansion or contraction joints.

### c. Concrete Sidewalk

Form transverse contraction joints using a tool designed to form a groove one-third the depth of the sidewalk at intervals shown on the Plans.

Where sidewalks abut the curb and gutter, ensure that alternate joints coincide. Round the edges with a 0.25 in (6 mm) edger. Make expansion joints according to the materials, dimensions, and locations specified on the Plans.

### d. Concrete Curbs, Gutters, and Medians

Form contraction joints or expansion joints on curbs, gutters, and medians.

- 1) **Contraction Joints.** Ensure that joints in curb, gutters, and medians are spaced the same as the joints in paving. Form joints by using metal divider plates or sawing them as in [Section 430](#).

Form joints at least one-fifth but not greater than one-fourth the depth of the concrete. Except for sawed joints, finish the joints with a 0.25 in (6 mm) edging tool.

For curbs, gutters, and medians adjacent to pavement other than concrete, contraction joints shall be as follows:

- For header curb and combination curb and gutter, install contraction joints spaced no more than 20 ft (6 m) apart.

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- For gutter median, install a contraction joints spaced no more than 20 ft (6 m) apart.
  - 2) Expansion Joints. Form expansion joints according to the Plan details or as directed. Ensure that they coincide with the expansion joints in the adjoining pavement or gutter.

Cut the joint fillers to the same cross section as the construction. Trim flush the material that protrudes after the concrete is finished.

When miscellaneous concrete items are not adjacent to concrete construction, provide expansion joints at an interval of at least 500 ft (150 m).

### e. Curb Cut Wheelchair Ramps

Locate and form expansion joints for curb cut wheelchair ramps according to Georgia Standard 9031W for ramp Type I, II, or III.

## 4. Curing

Use curing methods specified in Subsection 430.3.05.L, "Cure the Concrete." (see below) Ensure that the membrane curing compound is Type 2, if used. Pack honeycombed areas immediately after removing the forms.

### *[L. Cure the Concrete*

*Immediately after finishing the concrete, cure the entire surface when the concrete will not mar. Use one or more of these*

*methods:*

#### *1. Impervious Membrane Method*

*To use this method:*

*a. Spray the entire surface of the pavement with white pigmented curing compound immediately after finishing*

*the surface and before the concrete has set.*

*If the pavement is cured initially with cotton mats, burlap, or cotton fabric, apply the compound after removing*

*the mats.*

*NOTE: Do not apply curing compound during rain.*

*b. Use mechanical sprayers to apply curing compound under pressure at a minimum rate of 1 gal per 150 ft<sup>2</sup> (1 L*

*per 3.5 m<sup>2</sup>).*

*c. Thoroughly mix the compound with uniformly dispersed white pigments.*

*d. During application, use a mechanical device to stir the compound continuously.*

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*e. Use a hand sprayer (if required) to spray odd widths, odd shapes, and concrete surfaces exposed by removing*

*forms.*

*f. Do not apply curing compound to the inside faces of joints to be sealed.*

*g. If the membrane film becomes damaged within the curing period, repair the damaged portions immediately with*

*additional compound.*

### *2. White Polyethylene Sheeting*

*To use this method:*

*a. Cover the top surface and sides of the pavement with polyethylene sheeting. Lap the units at least 18 in (450*

*mm).*

*b. Place the sheeting and weigh it down so that it contacts the surface.*

*c. Extend the sheeting beyond the edges of the slab at least twice the thickness of the pavement.*

*d. Unless otherwise specified, maintain the covering in place for 72 hours after placing the concrete.*

### *3. Burlap, Cotton Fabric, or Other Methods*

*Contractors may cure the pavement with burlap, cotton fabrics, or other materials if the section remains wet for the*

*duration specified by the Engineer.*

### *4. Cold Weather Curing*

*To use this method:*

*a. Remove and replace concrete that freezes before the initial set time at no cost to the Government.*

*b. Use polyethylene or canvas to protect concrete that has set but is exposed to freezing temperatures within 24*

*hours of placement. Ensure that the internal concrete temperature is above freezing for at least 24 hours after*

*placing the concrete.*

*c. Obtain approval from the Engineer to use other protection methods such as hay, straw, or grass, or to change the*

*duration of the protection.]*

### *D. Backfilling*

## Section 441—Miscellaneous Concrete

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Backfill the areas as soon as possible without damaging the work.

### E. Clean-Up

When concrete work is complete, clean each surface. Protect the work from stains or other damage until Final Acceptance.

### 441.4 Measurement

#### A. Concrete Slope Paving

Omitted

#### Miscellaneous Concrete

#### B. Concrete Sidewalks

Concrete sidewalks are measured in square yards (meters) of the specified thickness, complete in place and accepted. The length is the actual measured length along the surface. The width is the Plan width or as directed. Excavation and backfill are not measured separately for payment.

#### C. Concrete Paved Ditches

The area measured for payment is the square yards (meters) of exposed surface area, exclusive of top edges, of the specified thickness placed according to the Plans or as directed. Reinforcing steel, excavation, preparation of subgrade including Type I backfill, forms, and concrete in toe or edge walls are not measured separately for payment.

#### D. Concrete Curbs, Gutter, Median, Pavement, and Combination Curb and Gutter

The following are measured by the linear foot (meter) along the face of the curb:

- Concrete curb and gutter
- Concrete curb
- Concrete header curb

The following are measured by the square yard or by the linear foot, whichever is specified:

- Concrete gutter
- Concrete valley gutter
- Concrete valley gutter with curb
- Concrete median pavement
- Concrete gutter with raised edge

The length used to compute the square yards (meters) or linear foot (meter) is measured along the center line of the gutter. The width is the total width of the gutter including the curb or raised edge. Concrete doweled integral curb includes dowels.

#### E. Concrete Headwalls

Headwalls are measured for payment per Each.

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### F. Concrete Spillways

Concrete spillways regardless of the type specified are measured by the actual number poured complete and accepted.

### G. Concrete Slope Drains

Concrete slope drains are measured in square yards (meters) along the surface, complete and accepted.

### H. Velocity Dissipators

Velocity dissipators are measured in square yards (meters), surface measure, complete and accepted.

### I. Concrete Driveways

Driveway pavement is measured along the surface from the paving edge or back of the curb to where old and new concrete join. The width is the average width constructed.

### Miscellaneous Concrete

### J. Curb Cut Wheelchair Ramps

For new construction, curb cut wheelchair ramps will not be measured. For new construction, linear feet of curb and gutter will include the transitioned curb in front of ramps and square yards of concrete sidewalk will include ramps. No additional payment will be made for curb cut ramps.

For existing sidewalks, curb cut wheelchair ramps are measured as the actual number formed and poured, complete and accepted. No additional payment will be made for sawing existing sidewalk and removal and disposal of removed material for new ramp construction.

### 441.5 Payment

These Items, measured as specified above, will be paid for at the Contract Unit Price per each, per square yard, per linear foot, per cubic yard, or per each.

### Curbs, Gutters, Combination Curb and Gutter, Headers, and Medians

Item No. 441	Concrete curb and gutter, 6 in x 24 in type 2	Per linear foot
Item No. 441	Concrete valley gutter, 6 in	Per square yard

### Headwalls

Item No. 500	Headwall, 18" Concrete	Per each
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**Section 441—Miscellaneous Concrete**

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Driveway Concrete

Item No. 441	Driveway concrete 6 in thick	Per square yard
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## Section 535—Painting Structures

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### 535.1 General Description

This work consists of painting existing steel structures. The work also includes protecting traffic and property.

#### A. Referenced Documents

SSPC Guide 61 (CON), Class 3, 1992 edition

SSPC Guide 71 (DIS), Section 5

SSPC-SP6, “Commercial Blast Cleaning”

SSPC-SP7, “Brush-Off Blast Cleaning”

OSHA Standards 29 CFR 1910 and 29 CFR 1926

Toxicity Characteristic Leaching Procedure (TCLP)

EPA “Uniform Hazardous Waste Manifest”

#### 535.1.01 Submittals

At least 4 weeks before beginning the work, make the following submittals to the Engineer for approval:

#### A. Health and Safety Responsibilities

Provide effective engineering and work practice controls to protect employee health and safety.

1. Comply with all relevant Environmental Protection Agency (EPA), Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Occupational Safety and Health Act (OSHA), and Environmental Protection Division (EPD) Regulations.
2. Certify to the Engineer that personnel involved with lead paint removal operations (including rigging and material handling personnel) have received training and understand the applicable parts of the latest edition of OSHA Standards 29 CFR 1910 and 29 CFR 1926, including any amendments. Have the certification signed by all personnel involved with lead paint removal.
3. Provide test results from an OSHA Certified Laboratory showing blood lead levels of employees that may be exposed to lead during the Project.
4. Provide a medical monitoring schedule to verify acceptable blood lead levels during the Project and after the Project is completed.

#### B. Blast Cleaning Containment System

1. Before beginning work at each bridge, submit design and drawings of the proposed containment system to the Engineer for review and approval. Include tarpaulin data sheets to verify that the material is airtight, and tightly secured at the seams. Do not use burlap or open weave materials.



2. When the proposed containment system will induce large loads on the existing structure, the Engineer may direct the Contractor to submit an analysis of the load that will be added to the existing structure by the containment system and blast waste. Have a licensed Professional Engineer registered in the State of Georgia with bridge experience perform and stamp the load analysis. Ensure that the analysis shows that the system will not induce a load on the bridge that overstresses it or affects the structural integrity of the bridge.
3. Do not allow the containment system or equipment to violate the minimum bridge clearances shown on the Plans, unless otherwise approved by the Engineer.

**C. Emergency Contingency Plan**

Submit to the Engineer for review and approval an emergency contingency plan for cleaning up spills from failure of the containment system, spent material recovery system, or storage containers. Define procedures for spills or releases of waste and indicate the training of workers handling the waste as required by RCRA.

**D. Spent Material Sampling Plan**

Submit in writing to the Engineer for review and approval the proposed method for collecting the spent material. Include a sampling plan that conforms to EPA SW849. This submittal will also include the name of the company(ies) and responsible person(s) that will sample, treat, and haul the spent material.

**E. Material Safety Data Sheets**

Submit Material Safety Data Sheets on the abrasive and paint materials that will be used.

**F. Hazardous Waste Transporter Information**

Provide the name and EPA identification number of each licensed Transporter used for shipping hazardous waste to a treatment, storage, or disposal facility.

**G. Permitted Site Information**

Provide the name and EPA identification number, phone number, and address for each permitted off-site treatment, storage, or disposal facility to which the waste will be shipped.

**H. Accredited Laboratory Information**

Provide the name of the Environmental Lead Laboratory Accreditation Program (ELLAP) accredited laboratory that will perform the TCLP tests.

The Engineer will forward a copy of these submittals to the Office of Materials and Research for review.

**535.2 Materials**

Ensure that materials meet the requirements of the following Specifications:

Material	Section
Abrasives for Blast Cleaning	Note 1*

## Section 535—Painting Structures

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Paint	<u>870</u>
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Note 1\*

Use low dusting mineral abrasives which contain a minimum of ten percent (10%) by weight G-80 steel grit blended homogeneously throughout the blasting abrasive or 100% steel grit. Alternate abrasive mixtures proposed by the

Contractor require approval by the Macon-Bibb County Engineer before use. Abrasives shall contain no more than 100 ppm of any corrosive compound such as sulfate or chloride. Abrasives shall not contain EPA characteristic compounds such as lead, chromium, or arsenic which can be detected by the EPA Toxicity Characteristic Leaching Procedure (TCLP). The mineral abrasive used to blend with steel grit will be listed in the Department's Qualified Products Manual.

### **535.2.01 Omitted**

### **535.3 Construction Requirements**

#### **535.3.01 Personnel**

##### **A. Contractor Certification**

Ensure that no Contractor performs work on this Item who is not certified.

To become certified to remove lead paint, either:

- Be SSPC certified for hazardous paint removal according to the SSPC-QP2 Contractor Certification Program

Have certified structural steel painting supervisors onsite during Project lead paint removal or spent materials activities (collecting, storing, separating, treating, and moving spent materials).

#### **535.3.02 Equipment**

##### **A. Brushes**

Preferably, use brushes with round or oval cross sections. If using flat brushes, ensure that the maximum width is 4 in (100 mm).

For surfaces inaccessible to brushes, apply paint with sheepskin daubers made for painting.

Application of inorganic zinc by brush is prohibited except for small areas and touch up work.

##### **B. Spray Equipment**

If spraying paint, use air, cold airless, or hot circulating airless equipment. Spray equipment is subject to the Engineer's approval.

Use spray equipment that can constantly agitate the paint. Also, use equipment with a device that thoroughly mixes paints in their shipping containers before the paints are removed.

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Water traps are required as follows:

- When using air spray equipment, ensure that the air lines in the system have suitable water traps.
- For cold airless spray equipment, water traps are not required in the air lines; use them if desired.

### C. Rollers

Rollers are subject to the Engineer's approval.

Use rollers suitable to the type of paint applied and the work areas involved. Provide pans for dipping the rollers into the paint.

Follow these restrictions:

- Do not use worn rollers.
- Do not use rollers to apply special protective coatings or paints to piling and swaybracing.
- If a surface is inaccessible to rollers, apply the paint with sheepskin daubers made for painting.

Ensure that the system applicator has the following:

- Wet-film gauge
- Dry-film gauge
- Surface thermometer
- Sling psychrometer
- Abrasive blasting finish gauge

During and after field cleaning and painting, furnish a safety belt and a lift truck, bucket truck, or snooper truck to the Engineer's satisfaction to inspect the cleaning and painting operation.

### E. Protection Equipment

Furnish signs, warning lights, barricades, enclosures, and watchmen as required by the Manual on Uniform Traffic Control Devices or by the Engineer.

#### 535.3.03 Preparation

Refer to Subsection 535.3.05B.1, "weather conditions" before performing any cleaning operations.

#### A. Omitted

#### B. Clean Existing Steel Structures

Clean only as much metal as can be painted before it rusts. If surfaces rust after cleaning, clean them again before painting them.

Blast clean existing steel structures as follows:

1. Construct protection devices. Assume responsibility for damages to vehicles, persons, or property caused by cleaning operations.

Protect the following from blast-cleaning hazards:

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- Portions of the structure (superstructure, substructure, and highway appurtenances) that could be damaged by the blast cleaning
- Existing pedestrian, vehicular, and other traffic on, underneath, or adjacent to the structure Construct protection devices as follows:
  - a. Cover or shield portions of the structure that could be damaged.
  - b. Construct a system that protects traffic from direct blasting and prevents abrasive materials and debris from spreading and creating a traffic hazard.
  - c. If blast cleaning disrupts traffic flow, stop cleaning or clean behind screens.
  - d. If the protection devices are not providing protection, stop the work and correct the problem.

Do not begin work until effective corrections are made.

- e. Before reopening work areas to traffic, remove abrasive material and debris deposited on the pavement, shoulders, or slope paving in the area.
2. Prepare the structures for blast cleaning as follows:
    - a. If the Project Inspector requires, remove railings, nameplates, and other interfering parts from surfaces to be cleaned and painted.
    - b. Straighten bent metal.
    - c. Before blast cleaning a beam or girder, remove dust and debris from the top of the bottom flange.
  3. Remove all coats of paint to clean, bare metal by blast cleaning or other approved means.

The extent of cleaning shall be SSPC-SP6, "Commercial Blast Cleaning," with an anchor pattern between 1.0 and 2.0 mils. Anchor patterns greater than 2.0 mils (0.051 mm) will require that the primer be applied at a thickness of at least 1 mil over the anchor pattern or that the steel be re-blasted unless otherwise approved by the Engineer.

4. After blast cleaning and before painting, prepare the steel surfaces as follows:
  - a. Remove sand, dust, and other foreign matter from the following:
    - Deck
    - Piers
    - Railing
    - Other adjoining parts of the structure
    - Slope paving
  - b. Remove any fins, tears, or slivers from the steel.
  - c. Remove burred or sharp edges that appear on any steel members.

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- d. Have the Engineer inspect each span or unit of work.
  - e. Do not begin painting until the Engineer approves the spans or units of work.
5. Contain the paint chips, abrasive particles, and dust or debris (spent material) caused by cleaning and blasting as follows:
- a. Contain spent material according to the 1992 edition of SSPC Guide 6I (CON), Class 3. The containment materials and support structure may be flexible or rigid.
  - b. Ensure that tarpaulins are airtight and secure at the seams.
  - c. Do not use burlap or open-weave materials.
  - d. Seal seams and joints by taping or overlapping tarps at least 24 in. Overlap the entryway at least 3 ft.
  - e. Use negative pressure and verify it as follows:
    - Verify pressure through the concave nature of the containment materials, taking into account wind effects.
    - Observe air flow using smoke or other visible means inside or outside the containment.
      - f. Filter the air exhausting from the containment with a properly sized dust collector, bag house, or other approved method.
      - g. During abrasive blasting operations, ensure that the cross-draft and downdraft air movements within the containment comply with OSHA Standard 29 CFR 1910.94.
6. Additional blast-cleaning requirements for bridges over waterways:
- a. Ensure that there is no scum on the surface of the water outside a 200 ft (60 m) limit of the bridge. Stretch a floating boom across the waterway at or before this 200 ft (60 m) limit on the downstream and downwind sides of the bridge to contain floating spent material.
  - b. If floating residue is found outside this 200 ft (60 m) limit, the Engineer will consider protection inadequate and will require further containment measures.
  - c. If the wind velocity is high enough to blow the residue outside the 200 ft (60 m) limit, the Engineer will temporarily suspend the blast cleaning.
  - d. Provide a flotation device in the water underneath the area being blast cleaned to collect the spent material.
  - e. If the stream is too shallow for a barge, erect a temporary platform or tarp arrangement to collect the spent material.
7. Alternate Containment System

If desired, propose an alternate method for containing the dust and spent materials from blast cleaning the structural steel.

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The Engineer may reject a proposed alternate method that does not satisfy the Engineer's concerns for the safe removal and containment of lead-based paint from bridge structures.

Submit the proposal for evaluation and approval as follows:

- a. Submit a detailed, written proposal describing the alternate containment and blasting method.
  - b. Include in the description specific information on materials and equipment, noise levels, and worker safety and health.
  - c. Supply references of other locations where the alternate method has been used.
  - d. The Engineer will review the information submitted and may reject the proposal or issue a conditional approval.
  - e. If the Engineer grants conditional approval, demonstrate the alternate method for containment and blast cleaning on a trial basis.
    - 1) The Engineer will evaluate the effectiveness of dust and spent material containment, worker safety and health concerns, and noise levels.
    - 2) If the Engineer finds the alternate method unacceptable, the Engineer may reject it and require work according to this Specification.
    - 3) If the Engineer approves the alternate method, the Contractor will receive no additional payment above the established Contract Unit Price.
8. Handling Spent Materials

Handle spent materials according to the following requirements:

- a. Collect the spent material daily and store it in sealed waste disposal containers.
- b. Use waste containers that are approved by the Engineer and located where they will not cause a potential hazard.
- c. Store waste containers in a temporary, fenced, secured area that is not located in a storm water runoff course, in standing water, nor on Engineer property. Ensure compliance with the requirements of EPA 40 CFR 264.14 and 40 CFR 264.18.
- d. Label waste containers in compliance with hazardous waste laws.
- e. Omitted
- f. Test the material using certified independent laboratory in accordance with the Toxicity Characteristic Leaching Procedure (TCLP).
- g. Collection, storage, sampling, and testing shall be performed in accordance with EPA RCRA Regulations (40 CFR 240-299).
- h. Forward a copy of all TCLP results to the Engineer.

- i. If the TCLP toxicity test results do not classify the spent materials as a hazardous waste, uniformly blend twenty percent Portland cement with the spent materials and solidify the mixture before disposing of it at a licensed solid waste landfill. The cost of treatment and disposal of non-hazardous spent material is considered incidental to the pay item.
  - j. If the TCLP test results classify the material as a hazardous waste, treat the material to the Land Disposal Restriction standard of 0.75mg/l. The waste shall not be disposed of until authorized by the Engineer.
    - 1) If the waste is to be treated on-site, submit a waste analysis plan to the regional EPA office in accordance with 40 CFR 264.13 within 30 days of receipt of the TCLP results.
    - 2) If the waste is to be treated off-site, submit TCLP results to the EPA permitted hazardous waste treatment facility.
  - k. Forward a copy of all manifests and pertinent documents to the Engineer and to OMR.
9. Sampling for Lead Paint Residue
- a. Use the sampling plan listed below or a similar plan that conforms to *EPA SW 846, Chapter 9 Test Methods for Evaluating Solid Waste Physical/Chemical Methods*.  
Ensure the plan includes the following:
    - 1) Who will be responsible for the sampling
    - 2) How often samples will be taken
    - 3) How the samples will be obtained
    - 4) Where the samples will be taken
    - 5) How the samples will be handled
    - 6) How the sample results will be tied back to the waste from which it was sampled.
  - b. Inform the Project Personnel and Independent Assurance Engineer as to when (date and time) the samples will be taken. The Engineer will monitor the sampling procedure and the Project Personnel will enter all pertinent information in a logbook. Information to be recorded is as follows:
    - 1) Project and Contract ID numbers
    - 2) Sampling points
    - 3) Field contact personnel
    - 4) Producer of waste
    - 5) Type of process producing the waste

- 6) Type of waste
  - 7) Total number of samples
  - 8) Number of drums each sample will cover
  - 9) Which bridge location and the drum number i.e. 1-10, 11-18 that the sample will cover.
    - a) Label all of the drums on the project. Ensure that the labels are weatherproof and include the following:
      - The Date
      - The Project Number
      - The Contract ID Number
      - The Bridge Location
- Assign drums a series of consecutive numbers, i.e.,1-40.
    - c. Take one grab sample (using random sampling technique) from a drum for each bridge location. Use a thieving device to secure samples from each of the drums. The minimum sample size is 0.66 lb which is about a cupful.
    - d. Samples may be taken by the paint Contractor or his/her consultant who will treat the waste.
      - 1) Send the samples to a certified private testing lab.
      - 2) Attach a Sampling Analysis Request (sample card) to the samples which includes:
        - a) The Date
        - b) Project Number
        - c) Contract ID number
        - d) Bridge Location
        - e) Name of collector
        - f) Place of collection
        - g) Number of drums from Bridge each sample will cover, and
        - h) Drum numbers, i.e. 1-10, 11-18 that sample will cover.
      - 3) Include this information on the test report and the manifest so that the waste on the manifest can be keyed to the results on the TCLP report.
      - 4) Ensure that a chain of custody form accompanies the sample and is returned with the test results.
    - e. Test the samples for EPA Method 1311, Toxicity Characteristic Leaching Procedure (TCLP).



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- f. Test one (1) sample for each bridge location.
  - 1) If the results are 5 mg/l or greater leachable lead, the waste is to be declared hazardous and no further testing is needed until the waste has been treated. After treatment, the waste shall be re-sampled and retested in accordance with an approved sampling plan and shall be below 0.75 mg/l before disposal.
  - 2) If the results are below 5mg/l, the waste is to be declared non-hazardous, then the contractor or his/her consultant shall uniformly blend twenty percent Portland cement with the spent material and solidify the mixture before disposing of it at a licensed solid waste landfill.
- g. Additional samples must be acquired according to EPA SW 846 and SSPC-Guide 7 Section 5.6.5.
- h. Mail the Test reports and manifests to the Engineer's office.

If the TCLP toxicity test results classify the spent materials as a hazardous waste, treat the waste either on-site or off-site to the Land Disposal Restriction Standard of 0.75 mg/l. Do not dispose of the waste until authorized by the Engineer. Hazardous waste material may be treated off-site if the treatment is performed by a licensed hazardous waste treatment facility in accordance with EPA and EPD guidelines. Forward a copy of all manifests and other pertinent documents to the Engineer and to OMR. These documents will be maintained in the project file for three years.

If after treatment, the spent material is classified as a hazardous waste by the TCLP test, retreat it until the Universal Treatment Standard is met.

10. Handle hazardous waste as follows:

- a. The Contractor is responsible for complying with the hazardous waste laws when performing the Work. Obtain a separate United States Environmental Protection Agency, Generator I.D. Number for each project where the spent material is hazardous waste according to the Toxicity Characteristic Leaching Procedure (TCLP) results.

Obtain the generator I.D. number from the Georgia Environmental Protection Division, Hazardous Waste Management, (404) 656-2833.

Obtain the Generator I.D. Number within 30 days of receiving the TCLP results and provide copies of the number to the Macon-Bibb County Engineer.

- b. Dispose of hazardous spent material only at a licensed hazardous waste disposal facility.
- c. If the disposal facility requires it, send a sample of spent material for confirmation testing before delivering the shipment.
- d. Transport the waste to the facility using EPA-approved licensed waste haulers.
- e. Document each truckload of hazardous waste using an EPA "Uniform Hazardous Waste Manifest."

f. According to EPA and EPD rules, provide GDOT and the Georgia EPD notification and certification of treated hazardous spent abrasives. Include the following:

- Name and address of facility receiving the shipment Description of the waste as initially generated, including the applicable EPA Hazardous Waste Number(s) and treatability group(s)
- Treatment standards applicable to the waste at the initial generation point
- Signature of an authorized Contractor representative on the certification

### C. Omitted

### D. Omitted

### 535.3.04 Omitted

### 535.3.05 Construction

#### A. Provide Protection

Protect the structure, adjoining property, and the public from the dangers and damages of cleaning and painting.

Protect the following:

- Pedestrian, vehicular, and marine traffic on or underneath the structures being painted
- Structures
- Slope paving

Clean slope paving stained during painting to the Engineer's satisfaction.

#### B. Meet General Painting Requirements

Follow these requirements when painting new and existing steel structures:

##### 1. Weather Conditions

Cleaning or Painting shall not take place during windy or gusty conditions unless the contractor can demonstrate to the satisfaction of the Engineer that containment is sufficient to prevent the escape of paint overspray or spent material. If any paint overspray or spent material is detected outside containment areas, cease all operations until clean up has been completed. Do not recommence cleaning or painting operations until additional measures have been taken to prevent any future escape of spent material and/or paint overspray.

When the Plans specify System VI (waterborne), ensure that the minimum air and surface temperature is 50 °F (10 °C). Comply with the other weather requirements listed below.

When the Plans specify System VII, ensure that the minimum air and surface temperatures are above 35 °F (2 °C) and the relative humidity is greater than 50% when applying the inorganic zinc primer.

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Apply System VII waterborne intermediate and top coats only when the temperatures of both the air and surface are above 50 °F (10 °C).

For Systems IV and V (alkyd), apply paint only when the air and surface temperatures are both above 40 °F (4 °C).

### Weather Requirements for Painting All Systems

Maximum surface temperature	140 °F (60 °C)
Relative humidity	Below 85%
Minimum surface temperature	5 °F (3 °C) above dew point

Follow these weather restrictions:

- Do not apply paint to surfaces that are damp or otherwise unsatisfactory as determined by the Engineer.
- Do not paint in open yards or on erected structures when the metal is hot enough to cause the paint to blister or produce a porous film.
- Do not paint metal hot enough to cause oil separation in the alkyd paint.
- Do not paint metal when freezing weather 32 °F (0 °C) is forecast or expected before the paint can dry.
- Do not store at temperatures below 32 °F (0 °C) or above 100 °F (38 °C). When outdoor temperatures exceed these limits, paint shall be stored in an appropriate indoor location.

#### 2. Oxidation

If a prime coat on structural steel fades or chalks because of oxidation, thoroughly remove the oxidation by brushing or by washing with water until the sound prime coat is visible.

#### 3. Paint Thinning

Do not thin or dilute paints.

#### 4. Application Methods

Thoroughly mix paints in their shipping containers using mechanical devices before removing the paint.

For inorganic zinc primers, add the powder component to the liquid component with thorough stirring, and continue stirring until the powder is well dispersed. Strain the mixture through a 30-60 mesh sieve to remove large particles. Use pressure pots equipped with a mechanical agitator, which will remain in motion throughout the application.

Ensure that the paint formulation matches the application method (brush, roller, airless spray, or air spray).

Apply paint neatly by brushing, spraying, or rolling.

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When using brushes or rollers, apply the paint as follows:

- a. Produce an even coating covering the metal or the previous coat.
- b. Work the paint into corners and crevices.
- c. Keep enough paint on rollers and overlap the applications to avoid unsightly or mottled areas.

Use the paint numbers shown in the Table of Application Methods, below.

Table of Application Methods			
Brush	Roller	Airless Spray Hydraulic	Air Spray
Ordinary Exposure Green System IV (Lead Free Alkyd)			
1A	1A	1A	X
1A	1A	1A	X
2A	2A	2A	X
3B	3B	3B	X
X	X	X	X
Table of Application Methods			
Brush	Roller	Airless Spray Hydraulic	Air Spray
Heavy Exposure Green System V (Lead Free Alkyd)			
1A	1A	1A	X
1A	1A	1A	X
1A	1A	1A	X
2A	2A	2A	X
3B	3B	3B	X
Ordinary Exposure Green System VI (Waterborne)			
1W	1W	1W	1W

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1W	1W	1W	1W
2W	2W	2W	2W
3W	3W	3W	3W
Ordinary exposure Green System VII (Zinc Primer)			
X	X	Inorganic Zinc Primer	X
2W	2W	2W	2W
3W	3W	3W	3W

### 5. Paint Systems and Dry Film Thickness

Apply the minimum required dry film thickness and the additional coats according to the paint system required on the Plans.

Table of Paint Systems and Minimum Required Dry Film Thickness		
No. of Coats	Color of Coats	Thickness, mils (mm)
Ordinary Exposure Green System IV (Lead Free Alkyd)		
Primer	Red	2.0 (0.051) to 5.0 (0.127)
Touch-Up	Red	*
2nd Coat	Buff	2.0 (0.051) to 5.0 (0.127)
3rd Coat	Green	1.0 (0.025) to 3.0 (0.076)
4th Coat	None	X
Heavy Exposure Green System V (Lead Free Alkyd)		
Primer	Red(T)	2.0 (0.051) to 5.0 (0.127)
Touch-Up	Red	*
2nd Coat	Red	2.0 (0.051) to 5.0 (0.127)
3rd Coat	Buff	1.5 (0.038) to 5.0 (0.127)

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Table of Paint Systems and Minimum Required Dry Film Thickness		
No. of Coats	Color of Coats	Thickness, mils (mm)
4th Coat	Green	1.0 (0.025) to 3.0 (0.076)
Ordinary Exposure Green System VI (Waterborne)		
Primer	Brown	3.0 (0.076) to 5.0 (0.127)
Touch-Up	Brown	*
2nd Coat	Buff or White	3.0 (0.076) to 5.0 (0.127)
3rd Coat	Green	3.0 (0.076) to 5.0 (0.127)
4th Coat	None	X
Ordinary Exposure Green System VII (Zinc Primer)		
Primer	Gray	3.0 (0.076) to 5.0 (0.127)
2nd Coat	Buff or White	2.0 (.051) to 5.0 (0.127)
3rd Coat	Green	2.0 (0.051) to 5.0 (0.127)
4th Coat	None	X
* = 2.0 (0.051) for touch-up coats (T) = Tinted		

### 6. Proper Drying

Ensure that each coat is thoroughly dry and cured before applying the next coat. Allow at least 24 hours between coats.

If weather conditions and paint type require, allow longer periods between coats.

### 7. Cracks and Cavities

Before applying the second field coat, fill small cracks and cavities that are not sealed watertight by the first field coat using the following

Plan-Required Paint System	Fill Mixture

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IV or V	Pasty mixture of zinc hydroxy phosphite and linseed oil
VI	Pasty mixture recommended and supplied by the manufacturer
VII	Pasty mixture recommended and supplied by the manufacturer

### C. Omitted

### D. Paint Existing Steel Structures

Paint existing steel structures as follows:

1. Prevent paint overspray by using containments.
2. The weather conditions specified for new steel structures described in Subsection 535.3.05.B also apply to existing steel structures.
3. Apply the correct colors and number of coats as follows:

Only steel which has undergone complete removal of all coats and which has a surface cleanliness conforming to SSPC SP-6 may be coated with System VI.

Give this steel one full prime coat and two weather coats, all of the color and type required by the Special Provisions or Plans. If succeeding coats are of the same type and color, tint one of the underlying coats as required by the Specifications.

4. The drying requirements of Subsection 535.3.05.B.6 specified for new steel structures shall apply to existing steel structures.
5. The paint thinning requirements of Subsection 535.3.05.B.3 specified for new steel structures shall apply to existing steel structures.
6. Painting Of Surfaces:
  - a. Methods of Application: The requirements of Subsection 535.3.05.B.4 as specified for new steel structures shall apply to existing steel structures.
  - b. Cracks And Cavities: The requirements of Subsection 535.3.05.B.7 as specified for new steel structures shall apply to existing steel structures.
  - c. Paint Thickness: The minimum required dry film thickness as specified in Subsection 535.3.05.B.5 and the

additional coats specified in Subsection 535.3.05.B.5 for new steel structures shall apply to existing steel structures. However, when new paint is applied over existing sound paint, the required wet film thickness of the new coats shall be that required by the Special Provisions or Plans.

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7. Apply the minimum required dry film thickness and the additional coats specified in the Table of Paint Systems and Minimum Required Dry Film Thickness.

However, when applying new paint over existing sound paint, comply with the required wet film thickness specified by the Special Provisions or Plans for new coats.

8. After completing the painting, replace the railings, name plates, and other interfering parts removed (as described in Subsection 535.3.03.B, “Clean Existing Steel Structures” step 2.a) to the Engineer’s satisfaction. E. Paint Steel H-Piling, Metal Shell Piling, and Steel Swaybracing Paint this material as follows:

1. Weather Conditions

Except as specified below, apply paint in the weather conditions specified in Subsection 535.3.05.B.1, “Weather Conditions.”

- a. Painting in open yards or on erected structures shall not be done when the metal is sufficiently hot to cause the paint to blister or produce a porous film.
- b. Metal shall not be painted when freezing weather [ 32 °F (0 °C) ] is forecast or expected in the time that would occur before the paint has dried.

2. Thinning Paint

Do not thin or dilute pile paints.

3. Number of Coats and Color

Unless the Plans require a No. 1P or 2P system, described in Subsection 870.2.05.A.1, “Paint for Steel Piling and Swaybracing,” paint steel H-piling, metal shell piling, and steel swaybracing with a System VII paint system.

Apply a No. 1P system as follows:

- a. When using a No. 1P system formulated as a first application primer and a separate finish coat, ensure that containers are clearly labeled as primer or finish coat.
- b. Apply the primer first.
- c. Apply successive coats using either primer or finish coat.
- d. Ensure that the final coat is a finish coat

4. Method of Application

Apply the black paints noted in Subsection 535.3.05.E.3, “Number of Coats and Color” using either brushes or sprayers.

When using a brush, apply the paint as follows:

- a. Apply a thick application of paint to be plastered or troweled on the steel surfaces.



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- b. Brush out the paint only as required to obtain uniform thickness; do not attempt to brush it out neatly.
- c. Work the paint into corners and crevices.

### 5. Application Rate

For each coat, apply at least 1 gal of paint type per 60 ft<sup>2</sup>. (0.7 L/m<sup>2</sup>). Ensure that the total dry-film thickness of paint coats is as specified in Subsection 535.3.05.E.6, "Thickness of Paint," below.

### 6. Thickness of Paint

Ensure that the final, dry-film thickness of the completed work is at least 25 mils (0.635 mm).

Apply additional coats to achieve the minimum dry-film thickness at no expense to the Government.

### 7. Extent of Paint

Paint to the following extent:

- Coat exposed piling with a System VII paint system unless a No. 1P or No. 2P system is specified on the Plans.
- Coat piling in the stream bed and within 10 ft (3 m) of the top of the stream bank with the System VII from 5 ft (1.5 m) below the stream bed to the bottom of the concrete cap.
- Coat end bent piles 2 ft below the bottom of the cap or concrete encased as defined in Subsection 520.3.05.O, "Coat and Paint Piling."
- For piling that will be encased according to Section 547, paint the piling with System VII to the extent specified in Subsection 520.3.05.O, "Coat and Paint Piling."
- Before driving, coat test piles located in permanent surface water with a System VII according to Subsection 520.3.05.O, "Coat and Paint Piling."

Paint enough of the test pile to ensure that the coated portion extends 5 ft (1.5 m) below the stream bed or bottom.

### 8. Drying Requirements

Ensure that each coat is thoroughly dry before the next coat is applied.

### F. Apply Special Protective Coatings to Steel Piling, Steel Swaybracing, and Concrete Piling

Unless the Plans require No. 1P or 2P system, apply a System VII coating. Apply the coating to the extent specified in Subsection 520.3.05.O, "Coat and Paint Piling."

Ensure that coverage, wet- and dry-film thicknesses, temperature considerations, primer use, and drying and curing time comply with the manufacturer's recommendations.

Apply the special protective coating as follows:

1. When the structure will be welded, do not apply the material until the weld is placed and cleaned.
2. Apply the material in at least two coats by brushing.

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3. Apply the second coat at right angles to the first coat.
4. Use the elapsed time between coats recommended by the manufacturer.
5. Ensure that the finished film has no holidays and pinholes and completely covers the underlying surface.
6. After applying the coating material, recoat damaged areas where the protection is ineffective as determined by the Engineer.
7. Where swaybracing members will be welded to piles and painted in advance, burn off the coating at the weld location and proceed as follows:
  - a. Thoroughly clean the burned area by scraping and power-operated wire brushing before welding.
  - b. After making and cleaning the weld, recoat the area.

### **A. Correct Defective Work**

If applied paint does not meet the requirements of this Specification, remove the paint or correct it using SSPC-approved means.

Remove paint that is applied to improperly cleaned surfaces. Clean the surfaces and repaint them to the Engineer's satisfaction.

### **B. Meet the Required Total Dry-Film Thickness**

If the minimum required total dry-film thickness specified for the paint system is not reached after applying the required number of coats and colors, apply additional coats at no expense to the Government until the required thickness is obtained.

The Government considers the applied zinc primer deficient in thickness for measured dry thickness values less than 3 mils. If more than four deficient thickness values (one measurement per 25 ft.<sup>2</sup> of surface area) are found in any 200 ft<sup>2</sup> of continuous metal section, blast clean the entire section to a SSPC-SP6, Commercial Blast condition. Repaint the section with inorganic primer to achieve a dry film coating thickness of 3.0 to 5.0 mils.

Repair primed areas having excessive dry film coating thickness, coating "dry spray", visible coating "mudcracking", visible surface hackles, handling abrasions, and missed paint in bolt holes. Repair in accordance with the written recommendations of the paint manufacturer. Obtain the Engineer's approval for all repair recommendations. Include current product data and application instruction sheets with the repair recommendations.

### **535.3.07 Contractor Warranty and Maintenance General Provisions 101 through 150.**

#### **535.4 Measurement**

The cost of painting new steel structures shall be included in the Contract Price for structural steel. No separate payment will be made.

## Section 535—Painting Structures

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Cleaning and painting existing steel bridge structures will be measured and paid for at the Contract Unit Price for “Painting Existing Steel Structure Station or Bridge I.D. No. 021-0170-0.”

This includes payment for the following:

- Equipment (including a “flotation device” or temporary platform on waterway bridges)
- Work platform
- Bucket truck or snooper truck with safety belt
- TCLP testing
- Materials and work necessary to remove lead-based paint and contain the spent materials
- Collection and storage of spent materials, water, and slurry generated by abrasive blasting

### 535.4.01 Limits

#### A. Spent Materials

Treatment of hazardous waste and subsequent disposal shall be paid for under a force account basis. The Engineer will reimburse the Contractor based upon invoices from the licensed hauler and disposal facility. An additional amount equal to 3% of the total invoices will be paid as administrative costs incurred by the Contractor.

The costs of collecting spent material, furnishing the containers, loading the material into containers, treating the material onsite, and loading the containers into the licensed hauling unit will not be paid for separately. These costs are considered incidental to the pay item.

The disposal of other spent materials collected is incidental to the Pay Item “Painting Existing Steel Structures.”

#### B. Piling and Steel Swaybracing

The cost of applying special protective coatings or paint to piling shall be included in the Contract Price for piling. No separate payment will be made.

The cost of applying special protective coatings or paint to steel swaybracing shall be included in the Contract Price for structural steel. No separate payment will be made.

### 535.5 Payment

Payment is full compensation for the costs, direct and indirect, of complying with the requirements of this Specification.

Payment will be made under:

Item No. 535	Painting existing steel structure, Bridge I.D. No. 021-0170-0	Per lump sum
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## Section 550—Storm Drain Pipe, Pipe-Arch Culverts, and Side Drain Pipe

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### 550.1 General Description

This work includes furnishing and installing the following:

- Storm drain pipe
- Pipe-arch culverts
- Side drain pipe flared end sections
- Tapered pipe inlets

Install structures according to the Specifications and the details shown on the Plans, or as directed by the Engineer.

Use the type of pipe designated on the Plans, or acceptable alternate types when applicable.

### 550.2 Preparation

Before installing pipe and pipe-arches, shape the foundation material as shown on the Plans.

#### —Storm Drain Pipe, Pipe

### 550.3 Construction

#### A. Drainage

Provide necessary temporary drainage. Periodically remove any debris or silt that constricts the pipe flow to maintain drainage throughout the life of the Contract.

#### B. Damage

Before allowing traffic over a culvert, protect the structure by providing sufficient depth and width of compacted backfill. Repair damage or displacement from traffic or erosion that occurs after installing and backfilling at no additional cost to the Government.

#### C. Installation

##### 1. Concrete Pipe

Lay flat-bottom and circular sections in a prepared trench with the socket ends pointing upstream. To join sections, use any of the following joint types:

- Mortar
- Bituminous plastic cement
- Rubber-type gasket
- O-ringed gasket
- Preformed plastic gasket

## Section 550 – Storm Drain Pipe

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If using mortar and bituminous plastic cement joints:

- a. Fill the annular space with the joint material and wipe the inside of each joint smooth.
  - b. Construct mortar joints in the same manner, but thoroughly wet the annular space before filling it with joint material.
  - c. After the initial set, protect the outside mortar from air and sun with thoroughly wet earth or burlap cover. Install rubber-type, O-ring, and preformed plastic gasket joints according to the manufacturer's recommendations.
2. Omitted
  3. Corrugated Aluminum or Steel Pipe and Pipe-Arches

Lay pipe sections in a prepared trench, with outside laps of circumferential joints pointing upstream and longitudinal joints at the sides. Join the sections with coupling bands, fastened by two or more bolts. Keep no more than 2 in (50 mm) of space between adjoining sections.

Before backfilling the structure:

- a. Repair exposed base metal in metal coating according to [Section 645](#).
  - b. Recoat exposed base metal in bituminous coating with asphalt.
4. Smooth-Lined Corrugated Polyethylene Pipe

Install smooth-lined corrugated polyethylene pipe according to ASTM D 2321. Use fitting and couplings that comply with the joint performance criteria of AASHTO Standard Specifications for Highway Bridges, Division II. Ensure that all joints are "soiltight" as stated in the AASHTO bridge specifications.

5. Specials (Wyes, Tees, and Bends)

Install wyes, tees, and bends as shown on the Plans or as directed.

6. Tapered Pipe Inlets

Locate and install tapered pipe inlet end sections as shown on the Plans or as directed.

7. Elongation

Elongate metal pipe as shown on the Plans. Order the elongation of the vertical axis of the pipe to be done in the shop.

Have the manufacturer ship metal pipe with wire ties in the pipe ends. Remove wire-ties immediately after completing the fill.

8. Flared End Sections

Use flared end sections on the inlet, outlet, or on both ends of storm drain pipe, according to Plan details.

9. Polyvinyl Chloride (PV) Profile Wall Drain Pipe

## **Section 550 – Storm Drain Pipe**

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Install polyvinyl chloride (PVC) profile wall pipe according to ASTM D 2321. Use fittings and couplings that comply with the joint performance criteria of AASHTO Standard Specifications for Highway Bridges, Division II. Ensure that all joints are “soiltight” as stated in the AASHTO bridge specifications.

### **550.3.06 Quality Acceptance**

Clean pipes and pipe-arch culverts before final acceptance of the Work.

The Engineer may conduct video surveillance on storm drain (cross drain and longitudinal drain) installations after all activities are complete that may damage the pipe, but before the placement of the base and paving when applicable. If video surveillance shows problems such as pipe deformation, cracking, or joint separation, the Contractor shall repair or replace these pipes at no cost to the Government.

Use a nine-point mandrel to test a minimum of 25% of the installed length of smooth-lined corrugated polyethylene or PVC profile wall drain pipe for deformation (pieces will be selected by the Engineer). Use a mandrel that has an effective diameter equal to 95% of the base inside diameter. Provide the Engineer with a proving ring to verify the mandrel size. Mandrel testing shall not be paid for separately.

Ensure that smooth-lined corrugated polyethylene or PVC profile wall drain pipe installations have a maximum of 5% deflection when checked after completing all construction activities that may damage the pipe, but before placing the base and paving when applicable. If mandrel testing reveals problems, the Engineer may require that up to 100% of the storm drain installations be checked for deformation. Remove and replace pipe with over 5% deflection at no cost to the Government.

### **550.3.07 Omitted**

## **550.4 Measurement**

### **A. Excavation and Backfill**

Excavation and Backfill for Storm Drainage Pipe Installation shall not be measured separately for payment.

### **B. Flat Bottom and Circular Pipe (All Types)**

The overall length of pipe installed, excluding tapered inlets, is measured in linear feet (meters), along the central axis of the diameter of the pipe. Wyes, tees, and bends are included in this measurement.

### **C. Pipe-Arches**

The overall length of pipe-arch installed is measured in linear feet (meters), along the bottom center line of the pipe.

### **D. Multiple Installations**

In multiple installations, each single line of culvert structure is measured separately.

### **E. Tapered Pipe Inlets**

Tapered pipe inlet sections are measured as a unit; do not include them in the overall length of the pipe.

### **F. Flared-End Sections**

## Section 550 – Storm Drain Pipe

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Flared-end sections are measured separately by the unit and not included in the overall pipe length. **G. Smooth-Flow Pipe**

Smooth-flow pipe is measured by the linear foot along the pipe invert.

### 550.4.01 Limits

Excavation and normal backfill are not measured for payment.

### 550.5 Payment

Pipe installations complete in place and accepted will be paid for at the Contract Pipe for each item.

This payment is full compensation for excavating, furnishing, and hauling materials; installing, cutting pipe where necessary; repairing or replacing damaged sections; making necessary connections; strutting, elongating, providing temporary drainage; joining an extension to an existing structure where required; and removing, disposing of, or using excavated material as directed by the Engineer.

#### 1. Smooth Flow Pipe

The quantity of each diameter and steel thickness of smooth flow pipe as measured will be paid for at the Contract Unit Price per linear foot (meter) bid for the various sizes. Payment is full compensation for furnishing labor, materials, tools, O-ring mechanical joints, equipment, and incidentals to complete this Item, including removing and disposing excavation material.

#### 2. Flared-End Sections

Flared-end sections, measured as specified above, will be paid for at the Contract Unit Price for each section of the specified size.

Payment will also include sawing, removing, and replacing existing pavement removed to install a new drainage structure.

Payment will be made under:

Item No. 550	Storm drain pipe, RCP, 18 in	Per linear foot
Item No. 550	Side drain pipe, BCCMP, 18 in	Per linear foot
Item No. 550	Safety End Section, 18 in, Storm Drain Pipe	Per each
Item No. 550	Safety End Section, 18 in, Side Drain Pipe	Per each

## Section 603—Rip Rap

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### 603.1 General Description

This work includes placing protective coverings of sand-cement bag rip rap or stone rip rap.

When required, this work includes placing crushed stone filter material or plastic filter fabric beneath stone rip rap on:

- Fill slopes
- Cut slopes
- End rolls
- Shoulders
- Ditches
- Stream banks
- Channel banks

#### A. Bags for Sand-Cement Bag Rip Rap

Use cotton, burlap, or fiber reinforced paper bags that can contain the sand-cement mixture without leaking during handling and placing. Do not use bags that previously held sugar or other material that will adversely affect the sandcement mixture.

Ensure that the capacity is at least 0.75 ft<sup>3</sup> (0.02 m<sup>3</sup>) but not greater than 2 ft<sup>3</sup> (0.5 m<sup>3</sup>).

#### B. Stone Dumped Rip Rap

Stone dumped rip rap is designated on the Plans.

**603.2.01 Delivery, Storage, and Handling** General Provisions 101 through 150.

### 603.3 Construction Requirements

#### 603.3.05 Construction

Construct this Work according to the following requirements:

##### A. Preparing the Foundations

Prepare the ground surface where the rip rap will be placed to conform with the correct lines and grades before beginning the placement.

1. When filling depressions, compact the new material with hand or mechanical tampers.

Dispose of excess material by spreading it neatly within the right-of-way as an incidental part of the work.

2. Unless otherwise shown or provided below, begin placing the rip rap in a toe ditch constructed in original ground around the toe of the fill or the cut slope.



## Section 603—Rip Rap

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Ensure that the toe ditch is 2 ft (600 mm) deep in original ground and the side next to the fill or cut has the same slope.

3. After placing the rip rap, backfill the toe ditch and spread the excess dirt neatly within the right-of-way as an incidental part of the work.
4. When beginning rip rap in water or below normal water level, substitute an apron of rip rap for the toe ditch.

Ensure that the width and thickness of this apron is as shown on the Plans or determined by the Engineer.

### B. Placing Stone Rip Rap

Place rip rap to the limits shown on the Plans or as directed by the Engineer. Place and classify rip rap as follows:

1. Stone Plain Rip Rap

Dump and handle stone plain rip rap into place to form a compact layer to the design thickness.

Ensure that the thickness tolerance for the course is plus 12 in (300 mm) with no under-tolerance. If the Plans do not show a thickness, place stone rip rap to at least 12 in (300 mm) thick, but no greater than 2 ft (600 mm) thick.

2. Stone Dumped Rip Rap

Dump stone dumped rip rap into place to form a uniform surface as thick as specified in the Plans.

- a. Ensure that the thickness tolerance for the course is minus 6 in (150 mm) and plus 12 in (300 mm). If the Plans or Proposal do not specify a thickness, place the course to at least 2 ft (600 mm) thick.
- b. Recycled concrete that meets the requirements of Subsection 805.2.01 may be used instead of stone when shown on the Plans or approved by the Engineer.

Use recycled concrete only when materials do not contain steel after processing.

**NOTE: Do not use recycled concrete in aesthetically sensitive areas.**

3. Stone Grouted Rip Rap

Place stone grouted rip rap according to specifications for stone plain rip rap and these guidelines: a. Prevent earth from filling the spaces between the stones.

- b. After placing the stone, fill the spaces between them with 1:3 grout composed of Portland cement and sand mixed thoroughly with enough water to make a thick, creamy consistency.
- c. Place the grout beginning at the toe. Finish it by sweeping with a stiff bristle broom.
- d. After grouting, cover the rip rap and keep it wet for 5 days, or cover and keep wet for 24 hours and then coat with white pigmented membrane curing compound.

### C. Placing Filter

## Section 603—Rip Rap

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Place woven plastic filter fabric under all rip rap. Follow these requirements for placing the filter fabric:

1. Prepare the surface to receive the fabric until it is smooth and free from obstructions, depressions, and debris.
2. Place the fabric with the long dimension running up the slope. Minimize the number of overlaps.
3. Place the strips to provide a width of at least 1 ft (300 mm) of overlap for each joint.
4. Anchor the filter fabric in place with securing pins of the type recommended by the fabric manufacturer. Place the pins on or within 3 in (75 mm) of the centerline of the overlap.
5. Place the fabric so that the upstream strip will overlap the downstream strip.
6. Loosely place the fabric to prevent stretching and tearing during stone placement.

Do not drop the stones more than 3 ft (1 m) during construction.

7. Always protect the fabric during construction from clogging due to clay, silts, chemicals, or other contaminants.
8. Remove contaminated fabric or fabric damaged during installation or rip rap placement. Replace with uncontaminated or undamaged fabric at no expense to the Government.

### D. Placing Sand-Cement Bag Rip Rap

Place rip rap to the limits shown on the Plans or as directed by the Engineer.

1. Proportioning Materials

Mix sand and Portland cement at the maximum ratio of 5:1 by weight.

- a. Obtain a minimum compressive strength of 500 psi (3 MPa) in 7 days.
- b. For sand-cement bag rip rap, use enough water to make up the optimum moisture content of the aggregate and cement as determined by AASHTO T 134.
- c. When sand-cement rip rap is to be prebagged, mix the sand cement dry. After placing each course, wet the bags until the bags are wet enough for proper cement hydration.

2. Placement

Before placing sand-cement bag rip rap, fill the bags full, but allow room to tie the bags.

- a. Place the bagged rip rap by hand with the tied ends facing the same direction. Produce close, broken joints.
- b. Place header courses when directed by the Engineer or required by the Plans.
- c. After placing the bags, ram or pack them against one another to produce the required thickness and form a consolidated mass.
- d. Do not allow the top of each bag to vary more than 3 in (75 mm) above or below the required plane.

## Section 603—Rip Rap

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### E. Placing Stone Blanket Protection

Ensure that the stone blanket protection meets the materials Specifications for stone filter blanket as specified in Subsection 603.2, "Materials," except stone size No. 357 will be allowed instead of size No. 467.

Place stone blanket protection to the limits shown on the Plans, or as directed by the Engineer.

Uniformly place this material to the thickness shown on the Plans and to a thickness tolerance of 0.5 in ( $\pm$  15 mm).

Do not use stone blanket protection on slopes steeper than two horizontal to one vertical or in areas highly susceptible to erosion. Do not use plastic filter fabrics with stone blanket protection.

### 603.4 Measurement

This work is measured for payment in square yards (meters) of accepted material of the specified thickness. Area measurements are made parallel to the surface on which the material is placed. Plastic filter fabric will be measured as the area of rip rap placed and accepted. No separate measurement will be made for fabric overlap joints, seams, or vertical sections at toe of slopes. No separate measurement is made for grout or cushioning sand.

Plan dimensions are figured by the use of filled bags 12 by 18 by 6 in. (300 by 450 by 150 mm) thick.

When filled bags are less than Plan dimensions or are of varying lengths or width, Plan square yards (meters) will be used to determine pay quantities, if overall dimensions are equal to or greater than those shown on the Plans.

### 603.5 Payment

This work will be paid for at the Contract Price per square yard (meter) of material complete in place.

Payment will be made under:

Item No. 603	Stone dumped rip rap, Type 1, 24 in thick	Per square yard
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# Section 611—Adjusting to Grade of Miscellaneous Roadway Structures

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## 611.1 General Description

This work includes relaying, reconstructing, resetting, adjusting to grade, capping minor structures, resetting guard rail, or adjusting other miscellaneous roadway structures as specified in the Proposal or on the Plans.

### 611.3.05 Construction

#### A. Miscellaneous Roadway Items

Follow these procedures to construct miscellaneous roadway items:

1. Remove existing structures to be rebuilt according to [Section 610](#).
2. Clean the material salvaged for use in the rebuilt structure and stockpile it in convenient places. Protect it from damage until it is used.
3. Dispose of the portions of structures not suitable for reuse as provided in [Section 610](#). Replace them with suitable new material.
4. Relay or rebuild the structures according to the Specifications for new structures of the same type.
5. Adjust to the required grade miscellaneous structures specified in the Proposal or on the Plans by raising or lowering the upper portion of the fixture, including sleeve extensions, adjustable manhole rings, gaskets, mastic, mortar, masonry, and other material.
6. Furnish materials such as mortar, sand-cement grout, sand cushion, bituminous filler, brick, castings, and other materials to excavate, trench, prepare earth foundation, backfill, and other work necessary to complete the Item.

#### B. Capping an Existing Structure

When capping an existing structure requires removing adjacent existing pavement, sidewalk, curb, gutter, or other improvement not otherwise affected by the work, follow these guidelines:

1. Remove the improvements to expose only the portion of the structure to be modified.
2. Replace the removed improvements to the Engineer's satisfaction without additional compensation.
3. Remove enough existing masonry to lower the top elevation to a point not less than the thickness of the cap plus 3 ft (1 m) below subgrade elevation, unless otherwise indicated.
4. Cap the remaining portion of the structure with a fitted reinforced concrete cover constructed to the general details shown on the Plans.

Grates, rings, plates, covers, hoods, or other castings or fittings removed while capping and not re-used become the property of the Government unless otherwise indicated on the Plans.

## Section 611 — Adjusting to Grade of Miscellaneous Roadway Structures

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### C. Resetting Guard Rail

When resetting the guard rail is specified in the Proposal:

1. Reset guard rail removed according to Section 610 where the Plan indicates and to the required post spacing.
2. Furnish materials, including additional hardware, offset blocks, and posts.
3. Replace posts that do not conform to the Plans.
4. Follow the applicable provisions of Section 641.

### D. Raising Manholes

When raising manholes:

1. Adjustments may be made by using adjustable extension rings that do not require removing the existing manhole frame.
2. Ensure that the extension device locks to the existing frame and permits height and diameter adjustment. The adjustable extension ring to be used shall have the Engineer's prior approval.
3. Choose an extension ring compatible with the existing casting and cover. Ensure that the adjustment range conforms to the finished pavement surface.
  - a. Use an adjustable extension ring made of materials that meet the requirements of Subsection 854.2.01 or are manufactured from ASTM A 36/A 36M steel and approved by the Engineer.
  - b. Ensure that the extension ring and cover are machine ground to reduce contact irregularity. Ensure that the grates are rattleproof.
  - c. Obtain the Engineer's approval for the type of adjustable extension ring used.

### E. Omitted

#### 611.4 Measurement

Relaying, reconstructing, or adjusting to grade, capping minor structures, resetting guard rail, or adjusting other miscellaneous roadway structures is measured to determine the unit or units of each type completed and accepted.

Manhole tops to be raised or lowered 2 ft (600 mm) or less are considered "Adjust to Grade."

Remove manholes to be raised more than 6 ft (1.8 m) as clearing and grubbing, and construct a new manhole in its place according to Section 668.

#### 611.5 Payment

Relaying, reconstructing, resetting, adjusting to grade, capping minor structures, resetting guard rail, or adjusting other miscellaneous roadway structures will be paid for at the Contract Unit price. Payment is full

## Section 611 — Adjusting to Grade of Miscellaneous Roadway Structures

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compensation for relaying, resetting, reconstructing, or adjusting to grade the structures as specified in this Specification.

Excavation and backfill necessary for capping is considered incidental to the Item and is not paid for separately.

Tapping a new pipeline into an existing structure is not considered reconstruction of the existing structure.

Payment will be made under:

Item No. 611	Adjust sanitary sewer manhole to grade	Per each
Item No. 611	Adjust water meter box to grade	Per each

## Section 641—Guardrail

---

### 641.1 General Description

This work includes furnishing and erecting guardrail and appurtenances according to the Specifications. Conform with the lines, grades, and locations shown on the Plans or as directed.

Place W-beam, T-beam, or “T” beam with modified offset block as shown on the Plans and in the Proposal. Unless designated otherwise, references to guardrail shall mean W-beam.

Unless provided for in the Plans, this work also includes:

- Grading to provide the “T” distance shown on the standard behind the guardrail
- Grading to construct shoulder flares for approved guardrail anchorage systems and widened shoulders along guard rail runs according to Section 205 and Section 208
- Furnishing and setting additional posts (all lengths) together with the necessary offset blocks and hardware (when specified in the Plans or in the Proposal)

#### 641.1.02 Related References

**A. Standard Specifications** Section 205—Roadway Excavation

Section 208—Embankments

Section 645—Repair of Galvanized Coatings

Section 700—Grassing

Section 859—Guard Rail Components

Section 870—Paint

### 641.2 Materials

#### A. Steel Guardrail

Use steel guard rail and steel posts unless specified otherwise on the Plans or in the Proposal.

#### B. Guardrail Auxiliary Items

Ensure that the guardrail includes auxiliary materials and Work to make connections and other guardrail or structures required to complete the construction indicated on the Plans.

#### C. Offset Blocks

Except at locations approved by the Engineer, use plastic offset blocks according to Subsection 859.2.05 “Plastic Offset Blocks” for “W” beam guardrail installation. Offset blocks for “T” beam guardrail installations shall be plastic, or modified steel offset blocks per the Standard Plans including Construction Details and Section 859. When approved by the Engineer, use treated wood offset blocks according to Subsection 859.2.04, “Wood

## Section 641—Guardrail

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Guard Rail Posts and Offset Blocks. only in isolated areas of “W” beam or “T” beam guardrail installations, where standard size blocks would not provide a satisfactory fit.

Wood offset blocks and/or wood posts may be specified within the limits of an approved anchorage terminal. Use only one type of offset block within continuous runs of guardrail except in transitions or where specified in the Plan details.

Ensure that materials meet the requirements of these Specifications:

Material	Section
Guardrail Elements and Fittings	<u>859.2.01</u>
Cable End Anchor Assembly	<u>859.2.02</u>
Steel Post and Offset Blocks	<u>859.2.03</u>
Wood Post and Offset Blocks	<u>859.2.04</u>
Plastic Offset Blocks	<u>859.2.05</u>
Galvanized Repair Compound	<u>870.2.05</u>

### 641.3 Construction Requirements

#### 641.3.01 Omitted

#### 641.3.02 Omitted

#### 641.3.03 Omitted

#### 641.3.04 Fabrication

##### A. Guard Rail Anchorages, Mounting Devices, and Brackets

Fabricate and install guardrail anchorages, mounting devices, brackets, and other appurtenances according to the Plan details or as approved by the Engineer.

##### 641.3.05 Construction A. Erection of Posts

1. Wood guardrail posts shall not be used at any location except as required for guardrail anchorage.
2. Set the posts in post holes or drive them vertically at the positions, depth, spacing, and alignment shown on the Plans.
3. Install posts for guard rail on bridges or other structures as detailed on the Plans.



## Section 641—Guardrail

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4. Backfill post holes to the ground line with approved material tamped in place in layers of not more than 4 in (100 mm) thick.
5. If posts are driven, protect the tops of the posts with a suitable driving mat or cap. Remove and replace posts damaged during driving, at no additional cost.
6. Backfill the post holes that are drilled in rock as indicated on the Plans or directed by the Engineer.
7. Remove and reset posts that are out of alignment or too low in grade. Do not cut off posts that are too high; drive them to the proper elevation. Do not deviate more than 1/4 in (6 mm) vertical and horizontal post alignment.
8. Fit the posts with an offset block according to this Specification and Plan details.
9. Set additional posts and appurtenances, when required, according to the requirements of this Section and the Plan details.
10. When necessary to place posts in existing pavement, slope paving, etc., exercise extreme care in the cutting process, protect the adjacent areas, and remove all loose material. Cut holes in the existing paved area by drilling or sawing.

Replace the pavement material in kind to the full depth of the original pavement, as directed, after the post is installed.

### **B. Erection of Rail**

Erect the rails to attain a smooth, continuous rail line that conforms to the line and grade of the highway.

Determine the height of the rail from the dimensions shown on the Plans. Use bolts long enough to extend at least 1/4 in (6 mm) beyond the nuts after they are firmly tightened.

Install reflectorized washers on guardrail and anchorages. Where double faced guardrail is located on the inside shoulder of medians, install reflectorized washers only on the side which is nearest to traffic. Install reflectorized washers according to this Specification and Plan details.

### **C. Damaged Spelter Coating**

Repair damaged spelter coating according to the requirements of [Section 645](#).

### **D. Guardrail Anchorages**

Guardrail Anchorage Type 12 shall be any guardrail terminal, designed for use with "W" beam guardrail installations, which has been approved by the FHWA as meeting the requirements of the National Cooperative Highway Research Report 350, Test Level 3 (NCHRP-350, TL-3). Where the anchorage is connected to "T" beam guardrail installations, a transition is required as shown in the Standard details.

Construct Type 12 anchorages according to the manufacturer's requirements except for the grading which will be as shown in the Plans and as directed by the Engineer. Obtain copies of the manufacturer's details and installation instructions and provide copies of the same to the Engineer prior to the installation of the unit. Provide a FHWA letter of approval for NCHRP-350, TL-3 compliance of the terminal to be used as Type 12 anchorage.

## **Section 641—Guardrail**

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Yellow and black nose striping, as shown on the Plans will be required on all Type 12 anchorages.

### **641.3.06 Omitted**

### **641.3.07 Omitted**

## **641.4 Measurement**

### **A. Guardrail**

Guardrail of the type specified is measured in linear feet (meters), including terminal sections when installed. Measurement does not include guardrail anchorage assembly.

When double faced guardrail of the type specified is installed, the single guardrail on each side of the posts is not measured separately. Each single rail is a component part of the double faced guardrail installation.

### **B. Guardrail Anchorage Assembly**

This Item is measured by the number of each type installed according to the details shown on the Plans.

### **C. Guardrail Posts**

All lengths of guardrail posts when shown in the Plans or Proposal as a separate payment Item are measured by the Unit.

### **641.4.01 Omitted**

## **641.5 Payment**

Guardrail, of the type specified, complete in place including posts, offset blocks, and hardware will be paid for at the Contract Price per linear foot (meter).

Guardrail anchorage assembly will be paid for at the Contract Price per each assembly, complete in place.

All lengths of guardrail posts when shown in the Contract documents as a separate Pay Item will be paid for at the Contract Unit Price. Payment is full compensation for furnishing the posts, offset block, hardware, and Work to complete the Item.

For Projects that do not include grading as a Pay Item, payment for guardrail and guardrail anchorage systems on shoulders includes:

- Embankment material for shoulders as shown on the Standard Details or Plans
- 
- Compacting embankment material for shoulders to the approximate density of the surrounding soils
- Removing existing vegetation and obstructions before placing the embankment

Grassing the reconstructed area according to Section 700

Payment will not be increased or decreased when wood offset blocks are added to or substituted for steel or plastic offset blocks.

Payment will be made under:

**Section 641—Guardrail**

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Item No. 641	Guardrail, type W, incl posts	Per linear foot
Item No. 641	Guardrail anchorage, type 6	Per each
Item No. 641	Guardrail anchorage, type 12	Per each

## Section 652—Painting Traffic Stripe

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### 652.1 General Description

This work includes furnishing and applying reflectorized traffic line paint according to the Plans and these Specifications.

This Item also includes applying words and symbols according to Plan details, Specifications, and the current Manual on Uniform Traffic Control Devices.

#### 652.1.01 Definitions

Painted Stripes: Solid or broken (skip) lines. The location and color are designated on the Plans.

Skip Traffic Stripes: Painted segments between unpainted gaps as specified on the Plans. The location and color are designated on the Plans.

#### 652.1.02 Related References

##### A. Standard Specifications

Section 656—Removal of Pavement Markings

Section 870—Paint

##### B. Referenced Documents

[QPL 46](#)

AASHTO M 247

#### 652.1.03 Omitted

### 652.2 Materials

Ensure that materials for painting traffic stripe, words, and symbols meet the following requirements:

Material	Section
Traffic Line Paint 5A and 5B	<a href="#">870.2.02.A.2</a> and <a href="#">870.2.02.A.3</a>
Glass Beads for Use in Luminous Traffic Lines	AASHTO M 247 Type 1*

\*In addition, meet the following requirements for glass beads:

- Maximum quantity of angular particles is less than 1% by weight
- Maximum quantity of particles with milkiness, scoring, or scratching is less than 2% by weight
- Glass beads do not impart any noticeable hue to the paint film
- Glass beads conforming to the following alternate gradation may be used provided that all other requirements of AASHTO M 247 and this Specification are met.

## Section 652— Painted Traffic Stripe

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Alternate Gradation	
Sieve Size	Percent Passing
No. 16 (1.190 mm)	99 - 100
No. 20 (0.850 mm)	75 - 95
No. 30 (0.600 mm)	55 – 85
No. 50 (0.300 mm)	10 – 35
No. 100 (0.150 mm)	0 - 5

### 652.2.01 Omitted

## 652.3 Construction Requirements

### 652.3.01 Omitted

### 652.3.02 Equipment

#### A. Traveling Traffic Stripe Painter

Use a traffic stripe painter that can travel at a predetermined speed both uphill and downhill, applying paint uniformly. Ensure that the painter feeds paint under pressure through nozzles spraying directly onto the pavement.

Use a paint machine equipped with the following:

1. Three adjacent spray nozzles capable of simultaneously applying separate stripes, either solid or skip, in any pattern.
2. Nozzles equipped with the following:
  - Cutoff valves for automatically applying broken or skip lines
  - A mechanical bead dispenser that operates simultaneously with the spray nozzle to uniformly distribute beads at the specified rate
  - Line-guides consisting of metallic shrouds or air blasts
3. Tanks with mechanical agitators
4. Small, portable applicators or other special equipment as needed

#### B. Hand Painting Equipment

Use brushes, templates, and guides when hand painting.

## Section 652— Painted Traffic Stripe

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### C. Cleaning Equipment

Use brushes, brooms, scrapers, grinders, high-pressure water jets, or air blasters to remove dirt, dust, grease, oil, and other foreign matter from painting surfaces without damaging the underlying pavement.

#### 652.3.03 Preparation

Locate approved paint manufacturers on [QPL 46](#).

Before starting each day's work, thoroughly clean paint machine tanks, connections, and spray nozzles, using the appropriate solvent.

Thoroughly mix traffic stripe paint in the shipping container before putting it into machine tanks.

Before painting, thoroughly clean pavement surfaces of dust, dirt, grease, oil, and all other foreign matter.

#### 652.3.04 Omitted

#### 652.3.05 Construction

##### A. Alignment

Ensure that the traffic stripe is the specified length, width, and placement. On sections where no previously applied markings are present, ensure accurate stripe location by establishing control points at spaced intervals. The Engineer will approve control points. **B. Application**

Apply traffic stripe paint by machine. If areas or markings are not adaptable to machine application, use hand equipment.

##### 1. Application Rate

All work will be subject to application rate checks for both paint and beads.

Apply 5 in (125 mm) wide traffic stripe at the following minimum rates:

- a. Solid Traffic Stripe Paint: At least 25 gal/mile (58.8 L/km)
- b. Skip Traffic Stripe Paint: At least 6.3 gal/mile (14.8 L/km)

**NOTE: Change minimum rate proportionately for varying stripe widths.**

##### 2. Thickness

Maintain a 15 mils (0.38 mm) minimum wet film thickness for all painted areas.

##### 3. Do not apply paint to areas of pavement when:

- |     |   |  |
|-----|---|--|
| The | • | surface is moist or covered with foreign matter. |
|     | • |  |
| Air | • | temperature in the shade is below 40 °F (5 °C)   |

Wind causes dust to land on prepared areas or blows paint and beads around during application.

4. Apply a layer of glass beads immediately after laying the paint. Apply beads at a minimum rate of 6 lbs to each gallon (700 grams to each liter) of paint.

## Section 652— Painted Traffic Stripe

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### C. Protective Measures

Protect newly applied paint as follows:

1. Traffic

Control and protect traffic with warning and directional signs during painting. Set up warning signs before beginning each operation and place signs well ahead of the painting equipment. When necessary, use a pilot car to protect both the traffic and the painting operation.

2. Fresh Paint

Protect the freshly painted stripe using cones or drums. Repair stripe damage or pavement smudges caused by traffic.

### D. Appearance and Tolerance of Variance

Continually deviating from stated dimensions is cause for stopping the work and removing the nonconforming stripe. (See [Section 656](#).) Adhere to the following measurements:

1. Width

Do not lay stripe less than the specified width. Do not lay stripe more than 1/2 in (13 mm) over the specified width.

2. Length

Ensure that the 10 ft (3 m) painted skip stripe and the 30 ft (10 m) gap between painted segments vary no more than  $\pm 1$  ft (300 mm) each.

3. Alignment

- a. Ensure that the stripe does not deviate from the intended alignment by more than 1 in (25 mm) on tangents or curves of 1 degree or less.
- b. Ensure that the stripe does not deviate by more than 2 in (50 mm) on curves exceeding 1 degree.

#### 652.3.06 Quality Acceptance

Ensure that stripes and segments of stripes are clean-cut and uniform. Markings that do not appear uniform or satisfactory, either during the day or night, or do not meet Specifications, will be corrected at the Contractor's expense. Work will be subject to application rate checks for both paint and beads.

The following will be accepted:

- Sections of painted stripe, words, and symbols that have dried so that paint will not be picked up or marred by vehicle tires
- Sections placed according to the Plans and Specifications

The Contractor will be relieved of responsibility for maintenance on accepted sections.

### A. Correction of Alignment

## Section 652— Painted Traffic Stripe

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When correcting a deviation that exceeds the permissible tolerance in alignment, do the following:

1. Remove the affected portion of stripe, plus an additional 25 ft (8 m) in each direction.
2. Paint a new stripe according to these Specifications.

Remove the stripe according to [Section 656](#).

### B. Removal of Excess Paint

Remove misted, dripped, or spattered paint to the Engineer's satisfaction. Do not damage the underlying pavement during removal.

Refer to the applicable portions of [Section 656](#).

### 652.3.07 Omitted

### 652.4 Measurement

When traffic stripe is paid for by the square yard (meter), the number of square yards (meters) painted is measured and the space between stripes is included in the overall measurement.

Linear measurements are made on the painted surface by an electronic measuring device attached to a vehicle. On curves, chord measurements, not exceeding 100 linear feet (30 linear meters), are used.

Traffic stripe and markings, complete in place, are measured and accepted for payment as follows:

#### A. Solid Traffic Stripe

Solid traffic stripe is measured by the linear foot (meter), linear mile (kilometer), or square yard (meter). Breaks or omissions in solid lines or stripes at street or road intersections are not measured.

#### B. Skip Traffic Stripe

Skip traffic stripe is measured by the gross linear foot (meter) or gross linear mile (kilometer). Unpainted spaces between the stripes are included in the overall measurements if the Plan ratio of 1 to 3 remains uninterrupted. Measurement begins and ends on a stripe.

#### C. Pavement Markings

Markings are words and symbols completed according to Plan dimensions. Markings are measured by the unit.

### 652.4.01 Omitted

### 652.5 Payment

Payment will be full compensation for the work under this Section, including the following:

- Cleaning and preparing surfaces
- Furnishing materials, including paints, beads, and thinners
- Applying, curing, and protecting paints
- Protecting traffic, including providing and placing necessary warning signs



**Section 652— Painted Traffic Stripe**

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Furnishing tools, machines, and other equipment necessary to complete the Item Payment will be made under:

Item No. 652	Solid traffic stripe, 5 in, yellow	Lump Sum
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## Section 653—Thermoplastic Traffic Stripe

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### 653.1 General Description

This work includes furnishing and applying thermoplastic reflectorized pavement marking compound. Ensure that markings conform to Plan details and locations, these Specifications, and the Manual on Uniform Traffic Control Devices.

Thermoplastic traffic stripe consists of solid or broken (skip) lines, words, and symbols according to Plan color, type, and location.

#### 653.1.01 Definitions

**Thermoplastic Marking Compound:** A compound extruded or mechanically sprayed on the pavement that cools to pavement temperature. When combined with glass spheres it produces a reflectorized pavement marking.

**Short Lines:** Crosswalks, stop bars, arrows, symbols, and crosshatching. Extrude short lines rather than spraying them on. Unless otherwise specified, spray all other lines.

#### 653.1.02 Related References

##### A. Standard Specifications

[Section 652—Painting Traffic Stripe](#)

##### B. Referenced Documents

[QPL 46](#)

Federal Test Method Standard 141, Method 4252

ASTM D 1155

ASTM D 620 ASTM D 570 ASTM D 256

ASTM D 2240

ASTM E 28

ASTM 121

#### 653.1.03 Submittals

Ensure that the producers of the thermoplastic compound and glass spheres furnish to the Engineer copies of certified test reports showing results of all tests specified in this Section. Also ensure that producers certify that the materials meet the other requirements of this Section by submitting copies of certification at the time of sampling. Final Acceptance, however, will be based on satisfactory test results from samples obtained by the Engineer before delivery.

### 653.2 Materials

#### A. General Characteristics of Thermoplastic

## Section 652— Painted Traffic Stripe

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### 1. Deterioration

Use thermoplastic material with the following characteristics: a. Does not deteriorate upon contact with:

- Pavement • materials
- Petroleum • droppings from traffic

Chemicals, such as sodium chloride or calcium chloride, used to prevent formation of ice on roadways or streets

- b. Does not scorch, discolor, or deteriorate if kept at the manufacturer's recommended application temperature, or at least 375 °F (190 °C), for up to 4 hours.
- c. Has a temperature versus viscosity characteristic that remains constant from batch to batch through four reheatings.

### Thermoplastic Traffic Stripe

### 2. Fumes

Use material that in the plastic state does not give off fumes that are toxic or harmful to persons or property.

### B. Detailed Characteristics of Thermoplastic

#### 1. Material Composition

Use material binder with the following characteristics:

- A mixture of synthetic resins, with at least one resin that is solid at room temperature, and high boiling point plasticizers
- A total binder content of 18 percent to 35 percent by weight
- A pigmented binder that is well-dispersed and free of dirt, foreign objects, or ingredients that cause bleeding, staining, or discoloration

The binder shall be Type A—alkyd. Ensure that at least 33% of the binder composition or at least 8% by weight of the entire material formulation is a maleic-modified glycerol ester of resin. Ensure that the finished thermoplastic pavement marking material is not adversely altered by contact with oily pavement materials or by contact from oil dropping onto the pavement surface from traffic. Ensure that the filler has the following characteristics:

- White calcium carbonate or equivalent
- Compressive strength of 5,000 psi (34.5 MPa)

#### 2. Suitability for Markings

Use thermoplastic material that is especially compounded for traffic markings and has the following characteristics:

- Prevents markings from smearing or spreading under normal traffic conditions at temperatures below 120 °F (49 °C)
- Gives a uniform cross section, with pigment evenly dispersed throughout the material
- Has a uniform material density and character throughout its thickness
- Allows the stripe to maintain its original dimensions and placement

## Section 652— Painted Traffic Stripe

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- Ensures that the exposed surface is free from tack and is not slippery when wet
- Does not lift from the pavement in freezing weather
- Has cold ductility properties that permit normal movement with the road surface without chipping or cracking

### 3. Drying Time

When applied at a temperature range of 400 °F to 425 °F (204 °C – 218 °C) and a thickness of 1/8 in. to 3/16 in. (3 mm to 5 mm), the material shall set to bear traffic in a maximum of 2 minutes when the air temperature is 50 °F ± 3 °F (10 °C ± 2 °C) and shall set to bear traffic in a maximum of 10 minutes when the air temperature is 90 °F ± 3 °F (32 °C ± 2 °C).

### 4. Reflectorization

Ensure that during manufacturing, reflectorizing glass spheres were mixed into the compound to the following specifications:

- At least 16 percent by weight using glass spheres with a minimum refractive index of 1.65
- At least 25 percent by weight using glass spheres with a minimum refractive index of 1.50

## C. Physical Requirements of Thermoplastic

### 1. Color

Confirm the color of thermoplastic as follows:

a. White thermoplastic material contains at least 8 percent by weight titanium dioxide that meets the requirements of ASTM D 476, Type II, Rutile. The white thermoplastic material shall be pure white and free from dirt or tint.

The material, when compared to the magnesium oxide standard using a standard color spectrophotometer according to ASTM D 4960, shall meet the following:

Scale	Definition	Magnesium Oxide Standard	Sample
Rd	Reflectance	100	75 min.

### Thermoplastic Traffic Stripe

a	Redness-Greenness	0	-5 to + 5
b	Yellowness-Blueness	0	-10 to + 10

Compare yellow material to match Federal Test Standard Number 595, Color 13538.

### 2. Color Retention

Use thermoplastic stripe tested for color retention as follows:

## Section 652— Painted Traffic Stripe

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- a. Test specimens prepared from samples submitted according to ASTM D 620 by the Government Inspector.
- b. Use an ultraviolet light source as specified in the test procedure, or use a 275 watt sunlamp with a built-in reflector.
- c. Ensure that after 100 hours of exposure to the light source, the test specimens show no color change when compared to an unexposed specimen.

### 3. Water Absorption

Ensure that materials have no more than 0.5 percent by weight of retained water when tested by ASTM D 570, procedure (a).

### 4. Softening Point

Ensure that materials have a softening point of at least 175 °F (79 °C) as determined by ASTM E 28.

### 5. Specific Gravity

Ensure that the specific gravity of the thermoplastic compound at 77 °F (25 °C) is between 1.9 to 2.5.

### 6. Impact Resistance

Use material with an impact resistance of at least 10 in-lbs at 77 °F (1.13 N·m at 25 °C), tested as follows: a. Heat for 4 hours at 400 °F (204 °C).

- b. Cast into bars of 1 in<sup>2</sup> (625 mm<sup>2</sup>) cross sectional area, 3 in (75 mm) long.
- c. Place with 1 in (25 mm) extending above the vise in a cantilever beam (Izod type) tester using the 25 in-lbs (2.82 N·m) scale. This instrument is described in ASTM D 256.

### 7. Indentation Resistance

Measure the hardness by a Shore Durometer, Type A2, as described in ASTM D 2240. Maintain the temperature of the Durometer, 4.4 lb. (2 kg) load and the specimen at 115 °F (45 °C). Apply the Durometer and 4.4 lb. (2 kg) load to the specimen and the reading shall be between 50 to 75 units, after 15 seconds.

### 8. Low Temperature Stress Resistance

#### a. Furnish sample test blocks as follows:

- 1) Coat the samples using the same method as the planned installation of the compound.
- 2) Coat the samples with at least 32 in<sup>2</sup> (206 mm<sup>2</sup>) of the compound.

#### b. Have the samples tested as follows:

- 1) Immerse a sample in cold water for one hour.
- 2) Immediately place the sample in a freezer chest or other insulated cold compartment and maintain at a temperature of -20 °F (-29 °C) for 24 hours.
- 3) After 24 hours, remove the sample and bring it to normal room temperature.

## Section 652— Painted Traffic Stripe

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Following the test, confirm that the sample does not crack, flake, or fail to adhere to the substrate.

### 9. Reheating

Ensure that the compound does not break down, deteriorate, scorch, or discolor if held for 6 hours at the plastic temperature of 425 °F (218 °C); or if reheated up to the plastic temperature 4 times.

### 10. Abrasion Resistance

Have the material tested for abrasion resistance as follows:

- a. Ensure that the maximum loss of the material does not exceed 0.4 grams when subjected to 200 revolutions on a Taber Abraser at 77 °F (25 °C), using H-22 Calibrade wheels that are weighted to 500 grams.
- b. Keep the wearing surface wet with distilled water throughout the test.

## Thermoplastic Traffic Stripe

c. Prepare the panel by forming a representative lot of material at a thickness of 0.125 in. (3.18 mm) on a 4 in (100 mm) square steel plate with a thickness of  $0.050 \pm 0.001$  in ( $1.27 \text{ mm} \pm 0.03 \text{ mm}$ ), on which a primer has been previously applied. 11. Yellowness Index

The white thermoplastic material shall not exceed a yellowness index of 0.12 according to AASHTO T 250.

### 12. Flowability

After heating the thermoplastic material for  $240 \pm 5$  minutes at  $425 \text{ °F} \pm 3 \text{ °F}$  ( $218 \text{ °C} \pm 2 \text{ °C}$ ) and testing the flowability, ensure that the white thermoplastic has a maximum of 21 percent residue according to AASHTO T 250.

### 13. Flowability-Extended Heating

After heating the thermoplastic material for  $8.0 \pm 0.5$  hours at  $425 \text{ °F} \pm 3 \text{ °F}$  ( $218 \text{ °C} \pm 2 \text{ °C}$ ), while stirring the last 6 hours and testing for flowability, ensure that the thermoplastic has a maximum percent residue of 28 according to AASHTO T 250.

### 14. Storage Life

The material shall meet the requirements of this specification for 1 year. Ensure that the thermoplastic melts uniformly with no evidence of skins or unmelted particles during the 1-year period.

## D. Physical Requirements of Glass Spheres

### 1. Premixed Glass Spheres

Ensure that the compound has been manufactured with glass spheres in the proportion specified in

Subsection 653.2.B.4, —Reflectorization. The glass spheres contained in the material shall meet the following requirements:

- a. Index of Refraction. Determine the index of refraction of the premixed glass spheres by the liquid immersion method at 77 °F (25 °C).

**Section 652— Painted Traffic Stripe**

b. Roundness. Ensure that the minimum percentages of premixed glass spheres are true spheres according to the following table:

<b>Percent of Premixed Glass Spheres That are True Spheres (when tested according to ASTM D 1155)</b>		
<b>Minimum Index of Refraction</b>	<b>Percent of Overall Beads</b>	<b>Percent of Beads Retained on any Sieve</b>
1.65	At least 75%	At least 70%
1.50	At least 70%	At least 60%

c. Imperfections. Ensure that no more than 5 percent of the spheres show air inclusions, bubbles, lap lines, chill wrinkles, or other imperfections when viewed through a 60-power microscope in the refractive index liquid.

d. Foreign Matter. Ensure that the quantity of foreign matter does not exceed 1 percent.

e. Gradation. Have the beads tested using ASTM: D 1214 to ensure they have the following gradations:

<b>U.S. Sieve Standard Sieve Size</b>	<b>Percent Passing</b>
No. 16 (1.18 mm)	100
No. 30 (600 μm*)	60 to 90
No. 50 (300 μm)	15 to 40
No. 80 (180 μm)	0 to 10
No. 100 (150 μm)	0 to 5
*μ = micro meter	

f. Chemical Resistance. Use material manufactured with glass spheres that withstand immersion in water and acids without corroding or etching, and withstand sulfides without darkening or decomposing.

Have the chemical resistance tested by placing a 3 g to 5 g sample in each of three glass beakers or porcelain dishes and immersing as follows:

- Cover the first with distilled water.

Cover the       • second with a 3N solution of sulfuric acid.

Cover the       • third with a solution of 50 percent sodium sulfide, 48 percent distilled water, and 2 percent Aerosol 1B or similar wetting agent.

## Section 652— Painted Traffic Stripe

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Ensure that after one hour no darkening, hazing, or other evidence of instability is evident when examined microscopically.

### 2. Drop-On Glass Spheres

Ensure that these spheres meet the requirements of Subsection 652.2.

### E. Requirements of Sealing Primer

Place the particular type of two-part epoxy binder-sealer at the application rate as recommended in writing by the thermoplastic material manufacturer.

#### 653.2.01 Delivery, Storage, and Handling

Use material delivered in 50 lb (22.7 kg) unit cardboard containers or bags strong enough for normal handling during shipment and on-the-job transportation without loss of material.

Ensure that each unit container is clearly marked to indicate the following:

- Color of the material
- Process batch number or similar manufacturer's identification
- Manufacturer's name
- Address of the plant

Date of manufacture

### 653.3 Construction Requirements

#### 653.3.01 Personnel

General Provisions 101 through 150.

#### 653.3.02 Equipment

Depending on the marking required, use hand equipment or truck-mounted application units on roadway installations.

### A. Spray Application Machine

Ensure that each spray application machine is equipped with the following features:

- Parts continuously mix and agitate the material.
- Truck-mounted units for lane, edge, and center lines can operate at a minimum of 5 mph (8 kph) while installing striping.
- Conveying parts between the main material reservoir and the shaping die or gun prevent accumulation and clogging.
- Parts that contact the material are easily accessible and exposable for cleaning and maintenance.
- Mixing and conveying parts, including the shaping die or gun, maintain the material at the plastic temperature with heat transfer oil or electrical element controlled heat. Do not use an external source of direct heat.
- Parts provide continuously uniform stripe dimensions.



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- Applicator cleanly and squarely cuts off stripe ends and applies skip lines. Do not use pans, aprons, or similar appliances that the die overruns.
- Parts produce varying widths of traffic markings.
- Applicator is mobile and maneuverable enough to follow straight lines and make normal curves in a true arc.

### **B. Automatic Bead Dispenser**

Apply glass spheres to the surface of the completed stripe using a dispenser attached to the striping machine to automatically dispense the beads instantaneously upon the installed line. Synchronize the glass sphere dispenser cutoff with the automatic cutoff of the thermoplastic material.

### **Thermoplastic Traffic Stripe**

#### **C. Special Kettles**

Use special kettles for melting and heating the thermoplastic material. Kettles equipped with automatic thermostatic control devices provide positive temperature control and prevent overheating. Ensure that the applicator and kettles are equipped and arranged according to the requirements of the National Fire Underwriters.

#### **D. Hand Equipment**

Use hand equipment for projects with small quantities of lane lines, edge lines, and center lines, or for conditions that require the equipment. Use hand equipment approved by the Engineer.

Ensure that hand equipment can hold 150 lbs (68 kg) of molten material and is maneuverable to install crosswalks, arrows, legends, lane, edge, and center lines.

#### **E. Auxiliary Vehicles**

Supply the necessary auxiliary vehicles for the operation.

#### **653.3.03 Omitted**

#### **653.3.04 Omitted**

#### **653.3.05 Construction**

##### **A. General Application**

Thoroughly clean pavement areas to be striped. Use hand brooms, rotary brooms, air blasts, scrapers, or other approved methods that leave the pavement surface clean and undamaged. Take care to remove all vegetation and road film from the striping area. All new Portland Cement Concrete pavement surfaces shall be mechanically wire brushed or abrasive cleaned to remove all laitance and curing compound before being striped.

Lay stripe with continuous uniform dimensions.

Apply the type of stripe at each location according to the Plans, using one of the following methods:

- Spray techniques

## Section 652— Painted Traffic Stripe

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- Extrusion methods wherein one side of the shaping die is the pavement, and the other three sides are contained by or are part of the suitable equipment to heat and control the flow of material.
  1. Temperature

Apply thermoplastic traffic stripe only when the pavement temperature in the shade is above 40 °F (4 °C).

To ensure optimum adhesion, install the thermoplastic material in a melted state at the manufacturer's recommended temperature but not at less than 375 °F (190 °C).

2. Moisture

Do not apply when the surface is moist. When directed by the Engineer, perform a moisture test on the Portland cement concrete pavement surface. Perform the test as follows:

- a. Place approximately 1 yd<sup>2</sup> (1m<sup>2</sup>) of roofing felt on the pavement surface.
- b. Pour approximately 1/2 gallon (2 L) of molten thermoplastic onto the roofing felt.
- c. After 2 minutes, lift the roofing felt and inspect to see if moisture is present on the pavement surface or underside of the roofing felt.
- d. If moisture is present, do not proceed with the striping operation until the surface has dried sufficiently to be moisture free.

3. Binder-Sealer

To ensure optimum adhesion, apply a binder-sealer material before installing the thermoplastic in each of the following cases:

- Extruded thermoplastic
- Where directed by the Engineer for sprayed thermoplastic
- Old asphaltic concrete pavements with exposed aggregates
- Portland cement concrete pavements as directed by the Engineer

Ensure that the binder-sealer material forms a continuous film that mechanically adheres to the pavement and dries rapidly. Use a binder-sealer currently in use and recommended by the thermoplastic material manufacturer according to [QPL 46](#).

To ensure optimum adhesion, apply a two-part epoxy binder-sealer on all Portland cement concrete pavements for either sprayed or extruded thermoplastic material.

Apply the epoxy binder-sealer immediately in advance of, but concurrent with, the application of the thermoplastic material. Apply in a continuous film over the pavement surface.

4. Bonding to Old Stripe

The old stripe may be renewed by overlaying with new material. Ensure the new material bonds to the old line without splitting or cracking.

5. Offset from Construction Joints

Off-set longitudinal lines at least 2 in (50 mm) from construction joints of Portland cement concrete pavements.

**Section 652— Painted Traffic Stripe**

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6. Crosswalks, Stop Bars, and Symbols

Make crosswalks, stop bars, and symbols at least 3/32 in (2.4 mm) thick at the edges and no more than 3/16 in (4.8 mm) thick at the center.

7. Film Thickness

a. Maintain the following minimum average film thicknesses on all open graded asphalt concrete friction courses:

- 0.120 in (3.0 mm)\* for lane lines
- 0.090 in (2.3 mm)\* for edge lines
- 0.150 in (3.8 mm)\* for gore area lines

b. Maintain the following minimum average film thicknesses on all other pavement types:

- 0.090 in (2.3 mm)\* for lane lines
- 0.060 in (1.5 mm)\* for edge lines
- 0.120 in (3.0 mm)\* for gore area lines

(See below for \* reference.)

Compute the minimums by the amount of material used each day, as follows:

<b>(For 5 in wide stripe)</b>	
* Average Film Thickness (in) =	$[(\text{lbs used}) (\text{total linear feet})] \times 0.236$
<b>(For 125 mm wide stripe)</b>	
* Average Film Thickness (mm) =	$[(\text{kg used}) (\text{total linear meters})] \times 4.0$
<b>(For 10 in wide stripe)</b>	
* Average Film Thickness (in) =	$[(\text{lbs used}) (\text{total linear feet})] \times 0.118$
<b>(For 250 mm wide stripe)</b>	
* Average Film Thickness (mm) =	$[(\text{kg used}) (\text{total linear meters})] \times 2.0$

8. Glass Spheres

- a. Apply glass spheres to installed stripe surface at a minimum rate of 14 lbs of spheres to each 100 square feet ((700 g/m<sup>2</sup>) of thermoplastic material.
- b. Apply the glass sphere top-coating with a pressure-type gun specifically designed for applying glass spheres that will embed at least one-half of the sphere’s diameter into the thermoplastic immediately after the material has been applied to the pavement.

**B. Removing Existing Stripe**

Remove existing stripe according to [Section 656](#).

## Section 652— Painted Traffic Stripe

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Remove 100 percent of existing traffic stripe from:

- Portland cement concrete pavement where the new stripe will be placed at the same location as the existing marking
- Pavement where the new stripe will be placed at a different location from the existing markings

### C. Tolerance and Appearance

No traffic stripe shall be less than the specified width and shall not exceed the specified width by more than 1/2 in (13mm). The length of the 10 ft (3 m) segment for skip stripe and the 30 ft (9 m) gap between segments may vary plus or minus 1 ft (300 mm). The alignment of the stripe shall not deviate from the intended alignment by more than 1 in (25 mm) on tangents and on curves up to and including 1 degree (radius of 1745 m or greater). On curves exceeding 1 degree (radius less than 1745 m), the alignment of the stripe shall not deviate from the intended alignment by more than 2 in (50 mm).

Stop work when deviation exceeds the above dimensions, and remove the nonconforming stripe.

### 653.3.06 Quality Acceptance

Segments of the thermoplastic traffic stripe that have been placed according to the Plans and Specifications may be accepted 30 days after the required work is complete in that segment.

If thermoplastic traffic stripe fails to meet Plan details or Specifications or deviates from stated dimensions, correct it at no additional cost to the Government. If removal of pavement markings is necessary, perform it according to Section 656 and place it according to this Specification. No additional payment will be made for removal and replacement of unsatisfactory striping.

### 653.3.07 Contractor Warranty and Maintenance

After segments are accepted, the Contractor will be relieved of maintenance on those segments.

### 653.4 Measurement

When stripe will be paid for by the square yard (meter), the actual number of square yards (meters) painted will be measured. The space between the stripes will be included in the overall measurement.

Linear measurements may be made by electronic measuring devices attached to a vehicle.

Thermoplastic traffic stripe, complete in place and accepted, is measured as follows:

#### A. Solid Traffic Stripe

Stripe is measured by the linear foot (meter), linear mile (kilometer), or square yard (meter). Breaks or omissions in solid lines or stripes at street or road intersections are not measured for payment.

#### B. Skip Traffic Stripe

Skip stripe is measured by the gross linear mile (kilometer) as specified. The unpainted space between the painted stripes is included in the overall measurement if the Plan ratio of one to three (10 ft [3 m] segment and 30 ft [9 m] gap or other patterns as designated on the Plans) remains uninterrupted. Measurement begins and ends on a stripe.

## Section 652— Painted Traffic Stripe

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### C. Words and Symbols

Each word or symbol complete according to Plan dimensions is measured by the Unit.

#### 653.4.01 Omitted

#### 653.5 Payment

Payment is full compensation for the Work under this section, including:

- Cleaning and preparing surfaces
- Furnishing all materials
- Applying, curing, and protecting stripe
- Protecting traffic, including providing necessary warning signs

Furnishing tools, machines, and other equipment necessary to complete the Item

Measurement and payment for removing pavement markings will be according to [Section 656](#) when shown in the Proposal as a payment Item. Otherwise, removal will not be paid for separately, but will be included in the payment for other Work under this section.

Payment will be made under:

Item No. 653	Thermoplastic traffic stripe	Lump Sum
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## Section 668—Miscellaneous Drainage Structures

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### 668.1 General Description

This work includes constructing catch basins, drop inlets, manholes, junction boxes, spring boxes, drain inlets, special inlets with safety grates, and vertical tee sections.

Construct according to these Specifications and the lines and grades shown on the Plans, or as established by the Engineer.

#### 668.1.01 Omitted

#### 668.1.02 Related References

##### A. Standard Specifications

Section 207—Excavation and Backfill for Minor Structures

Section 500—Concrete Structures

Section 607—Rubble Masonry

Section 608—Brick Masonry

Section 801—Fine Aggregate

Section 830—Portland Cement

Section 834—Masonry Materials

Section 843—Concrete Pipe

Section 853—Reinforcement and Tensioning Steel

Section 854—Castings and Forgings

Section 866—Precast Concrete Catch Basin, Drop Inlet, and Manhole Units

##### B. Omitted

#### 668.1.03 Omitted

### 668.2 Materials

The structures in this section may be constructed of brick, cast-in-place concrete, or pre-cast concrete, unless the Plans or Proposal specifies a specific type of construction.

Use rubble masonry only when specified on the Plans. Ensure that materials meet the following specifications:

Material	Section
Class "A" or "B" Concrete	<u>500</u>

## Section 668—Miscellaneous Drainage Structures

Sand for Bedding Material	<u>801.2.01</u>
Fine Aggregate for Mortar	<u>801.2.02</u>
Portland Cement	<u>830.2.01</u>
Brick	<u>834</u>
Masonry Stone	<u>834</u>
Mortar and Grout	<u>834</u>
Nonreinforced Concrete Pipe	<u>843</u>
Steel Bars for Reinforcement	<u>853.2.01</u>
<b>Material</b>	<b>Section</b>
Gray Iron Castings	<u>854.2.01</u>
Precast Reinforced Concrete Catch Basin, Drop Inlet, and Manhole Units	<u>866</u>

Ensure that the materials for fabricating special inlets and their safety grates are according to Plan details.

Construct the following manholes and drainage structures from pre-cast or cast-in-place concrete:

- Structures within the backfill limits of mechanically stabilized embankment retaining walls
- Structures within 5 ft (1.5 m) of the wall foundation's front.

**668.2.01 Delivery, Storage, and Handling** General Provisions 101 through 150.

### 668.3 Construction Requirements

**668.3.01 Omitted.**

**668.3.02 Omitted**

**668.3.03 Omitted**

**668.3.04 Omitted**

**668.3.05 Construction**

#### A. Excavation and Backfill

Excavate and prepare foundations for the structures included in this section; place pipe through the structures according to Section 207.

#### B. Concrete

## Section 668—Miscellaneous Drainage Structures

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Concrete units may be either poured-in-place or precast. Construct units as follows:

1. Poured-in-Place Units

The throat or other nonreinforced portions of catch basins may be Class B concrete. Use Class A concrete for the top slab. Construct units according to [Section 500](#).

2. Pre-Cast Reinforced Concrete Units

Construct pre-cast reinforced concrete units as follows:

a. Holes for Pipe

Cast each unit with the number and dimensions of pipe holes necessary to incorporate the unit into the drainage system according to Plan details.

Installation conditions may require additional pipe for which no holes have been cast. If so, make the holes and repair or replace, to the Engineer's satisfaction, pipe damaged during the process.

b. Pipe Connections

Use mortar or Class A concrete to connect pipe to units.

c. Installation of Pre-cast Concrete

- 1) Pre-cast Reinforced Units: Set these units to within 1/2 in ( $\pm 13$  mm) of grade on a bed of compacted sand 2 in to 3 in (50 mm to 75 mm) thick.
- 2) Sectional Precast Reinforced Units: When using these units to build-up extra-depth catch basins or drop inlets, fill the joints between sections with mortar and wipe smooth.

### C. Brick Masonry

Construct brick masonry structures according to [Section 608](#).

### D. Mortar Rubble Masonry

Construct rubble masonry structures according to [Section 607](#).

### E. Castings

Hold frame castings securely in place to proper line and grade. Make castings an integral part of the complete structure. After completion, ensure that castings subject to traffic use are firm and stable under traffic.

### F. Maintenance

Thoroughly clean fallen masonry, silt, debris, and other foreign matter from structures. **G. Safety Grates**

Fabricate safety grates according to Plan details.

### H. Sanitary Sewer Manholes

Ensure that sanitary and combination sanitary and storm sewer manholes conform to the following requirements and the related Specifications.



## Section 668—Miscellaneous Drainage Structures

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### 1. Form Invert Channels

Shape invert channels to the lines and grades shown on the Plans, or as established by the Engineer. Ensure that channel surfaces are smooth.

Form invert channels by one of the following methods:

- Directly
- form the invert channel in the concrete base of the manhole.
  - 
  - Construct the invert channel of brick and mortar.
- Lay half-
- round tile in the concrete base of the manhole.

Lay round sewer pipe through the manhole and cut out the top half of the pipe after the concrete base has set. Do not use this method if the Plans provide for an offset drop in the invert.

### 2. Plaster Outside Walls

Plaster outside walls as follows:

- a. Saturate the outside wall of each brick manhole with water.
- b. Plaster the wall smooth with a mortar coat at least 1/2 in (13 mm) thick. Manufacture the mortar according to [Section 834](#) with the following exceptions:

- Manufacture
- the mortar with one part cement to two parts mortar sand.
  -
- Do not add
- hydrated lime.

### 3. Connections to Manholes

Complete manhole connections to the Engineer's satisfaction and as follows:

- a. Carefully connect existing sewer lines to new manholes to prevent infiltration of foreign substances.
- b. Construct manholes in or adjacent to existing sewer lines according to [Section 660](#) to maintain continuous sewage flow in existing lines.

#### **668.3.06 Quality Acceptance**

General Provisions 101 through 150.

#### **668.3.07 Omitted**

### **668.4 Measurement**

Catch basins, drop inlets, manholes, junction boxes, drain inlets, special inlets, and safety grates, complete in place and accepted, are measured for payment according to the following:

#### **A. Catch Basins and Drop Inlets**

Each catch basin or drop inlet is grouped for measurement as follows:

- Group 1: Structures connected to pipe 36 in (900 mm) or less in diameter, regardless of the pipe skew

## Section 668—Miscellaneous Drainage Structures

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- Group 2: Structures connected to pipe over 36 in (900 mm) diameter regardless of the pipe skew Catch basins or drop inlets, complete in place and accepted, are measured by the unit.

### B. Manholes

Manholes are measured for payment as follows:

1. Sanitary and Storm Sewer Manholes

Sanitary sewer manholes and storm sewer manholes are measured separately and divided into two types:

- Type 1: Structures connected to pipe 42 in (1050 mm) or less in diameter regardless of the pipe skew
- Type 2: Structures connected to pipe 48 in to 84 in (1200 mm to 2100 mm) diameter regardless of the pipe skew

### C. Junction Boxes, Spring Boxes, and Drain Inlets

Junction boxes, spring boxes, and drain inlets are measured by the unit.

1. Each junction box will be complete according to Plan details.
2. Each drain inlet will consist of a pipe elbow or tee, concrete collar, and casting of the required diameter.
3. Each spring box will be complete according to Plan details.

### D. Omitted

### E. Omitted

### F. Omitted

### 668.4.01 Omitted

### 668.5 Payment

Payment for the various structures under this Section will be made as follows:

#### A. Catch Basins and Drop Inlets

Catch basins or drop inlets will be paid for at the Contract Price per each.

Depth in excess of 6 ft (2 m) will be paid for at the Contract Price per linear foot (meter).

Payment is full compensation for the following:

- Furnishing castings
- 
- Making pipe connections regardless of skew

Providing materials, making forms, and disposing of surplus material

#### B. Manholes

Sanitary sewer and storm sewer manholes, complete in place, will be paid for at the Contract Price per each.

## Section 668—Miscellaneous Drainage Structures

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Manhole additional depth of the appropriate class will be paid for at the Contract Price per linear foot (meter).

Payment is full compensation for the following:

- Furnishing castings, fittings, and other appurtenances called for on the Plans to complete the Item
- Making pipe connections regardless of skew

Providing materials, making forms, and disposing of surplus material

**NOTE: No additional payment will be made for connecting manholes to existing or new sewer lines. Include costs related to connections in the Contract Price for the structure.**

### C. Junction Boxes, Spring Boxes, and Drain Inlets

Junction boxes, spring boxes, or drain inlets will be paid for at the Contract Price per each. Payment is full compensation for the following:

- Furnishing castings, fittings, and other appurtenances called for on the Plans to complete the Item
- Making pipe connections regardless of skew
- Providing materials, making forms, and disposing of surplus material

### D. Pipe

Pipe entering or exiting catch basins, drop inlets, manholes, junction boxes, spring boxes, or drain inlets, will be paid for under the section of the Specifications governing the pipe.

### E. Sand Bedding Material for Precast Structures

No separate payment will be made for this material. Its cost is included in the Contract Price for the structure under which it is used.

### F. Excavation and Normal Backfill

No separate payment will be made for excavation and normal backfill. Their cost is included in the Contract Price for the structure being excavated.

### G. Omitted

### H. Omitted

### Miscellaneous Drainage Structures

#### I. Omitted

Payment will be made under:

Item No. 668	Catch basin, group 1	Per each
Item No. 668	Drop inlet, group 1	Per each

## Section 700—Grassing

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### 700.1 General Description

This work includes preparing the ground, furnishing, planting, seeding, fertilizing, sodding, and mulching disturbed areas within the Right-of-Way limits and easement areas adjacent to the right-of-way as shown on the Plans except as designated by the Engineer.

#### 700.1.01 Omitted

#### 700.1.02 Related References

##### A. Standard Specifications

Section 160—Reclamation of Material Pits and Waste Areas

Section 163—Miscellaneous Erosion Control Items

Section 718—Wood Fiber

Section 822—Emulsified Asphalt

Section 882—Lime

Section 890—Seed and Sod

Section 891—Fertilizers

Section 893—Miscellaneous Planting Materials

##### B. Referenced Documents

[QPL 33](#)

#### 700.1.03 Omitted

### 700.2 Materials

Use materials that meet the requirements of the following Specifications:

Material	Section
Wood Fiber Mulch	<u>718.2</u>
Emulsified Asphalt	<u>822</u>
Agricultural Lime	<u>882.2.01</u>
Seed	<u>890.2.01</u>

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Sod	<a href="#">890.2.02</a>
Fertilizer	<a href="#">891.2.01</a>
Plant Topsoil	<a href="#">893.2.01</a>
Mulch	<a href="#">893.2.02</a>
Inoculants	<a href="#">893.2.04</a>
Tackifiers	<a href="#">QPL 33</a>

### A. Seeds

Whenever seeds are specified by their common names, use the strains indicated by their botanical names.

### B. Water

Obtain the water for grassing from an approved source. Use water free of harmful chemicals, acids, alkalies, and other substances that may harm plant growth or emit odors. Do not use salt or brackish water.

### C. Asphalt

Secure the mulch with asphalt made of a homogenous emulsification of a refined petroleum. Ensure that the asphalt can be sprayed on with or without diluting with water.

Use suitable asphalt free of petroleum solvents or other diluting agents that may harm plant growth. Use asphalt according to [Section 822](#). Do not use asphalt that separates after freezing or from any other cause.

### D. Fertilizer Mixed Grade

Select fertilizer mixed grade such as 10-10-10, 6-12-12, 5-10-15, or other analysis within the following limits:

- Nitrogen 5 to 10 percent
- Phosphorus 10 to 15 percent
- Potassium 10 to 15 percent

If using mixed grade fertilizer for hydroseeding, ensure that it has the following analysis:

- Nitrogen 5 to 19 percent
- Phosphorus 10 to 19 percent
- Potassium 10 to 19 percent

### E. Mulch

## **Section 700 - Grassing**

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Use straw or hay mulch according to [Subsection 700.3.05.G](#).

Use wood fiber mulch in hydroseeding according to [Subsection 700.3.05.F.1](#).

### **700.2.01 Omitted**

## **700.3 Construction Requirements**

### **700.3.01 Omitted**

### **700.3.02 Equipment**

Use grassing equipment able to produce the required results.

Never allow the grading (height of cut) to exceed the grassing equipment's operating range.

#### **A. Blower Equipment**

When using blower equipment to apply bituminous treated mulch in a single operation, place two or more jets or spray nozzles at or near the end of the discharge spout to eject a uniform coat of mulch.

#### **B. Mulch Material Equipment**

Use mulching equipment that uniformly cuts the specified materials into the soil to the required control depth.

#### **C. Rollers**

Use at least 12 in (300 mm) diameter rollers with corrugated or notched surfaces. Do not use smooth surface rollers.

#### **D. Hydroseeding Equipment**

For hydroseeding equipment, see [Subsection 700.3.05.F](#).

### **700.3.03 Omitted**

### **700.3.04 Omitted**



**700.3.05 Construction**

Follow the planting zones, planting dates, types of seed, seed mixtures, and application rates described throughout this Section.

In general:

- Obtain the Engineer’s approval before changing the ground cover type.
- Do not use annual rye grass seeds with permanent grassing.
- Follow the planting zones indicated on the Georgia State Planting Zone Map,
- below.

Sod may be installed throughout the year, weather permitting.

For permanent grassing, apply the combined amounts of all seeds for each time period within each planting zone and roadway location listed in the Seeding Table, below. Do not exceed the amounts of specified seed.

**Section 700 - Grassing**

Planting Zone Map

**SEEDING TABLE**

		Pounds (kg) Of Seed Per Acre (hectare)									REQUIRED PERMANENT PLANTING
		Rye Grass, Millet, Cereal Grass (Oats)	Common Bermuda Grass (Hulled)	Common Bermuda Grass (Unhulled)	Tall Fescue	Weeping Love Grass	White Or Crimson Clover	Crown Vetch	Scarified Interstate Lespedeza	Unscarified Interstate Lespedeza	
Planting Zones	Planting Dates										
1	March 1 – May 15		10 (11)	10 (11)	50 (56)						Common Bermuda Grass
1	May 1 – July 31		10 (11)	10 (11)							
1	August 1 – February 28	15 (17)									
1	November 15 – January 31						6 (7)				
2,3,4	February 15 – August 31		10 (11)	10 (11)							
2,3,4	September 1 – February 14	15 (17)									Common Bermuda Grass
2,3,4	November 15 – January 31						6 (7)				

Plant these combinations on back slopes, fill slopes and areas which will not be subject to frequent mowing											
1,2	March 1 – July 31					4 (5)			50 (56)		Interstate Lespedeza Of Crown Vetch
1,2	August 1 – February 28				30 (34)			15 (17)		75 (84)	
3,4	February 15 – August 31					4 (5)			50 (56)		Interstate Lespedeza
3,4	September 1 – February 14	50 (56)								75 (84)	

**A. Ground Preparation**

Prepare the ground by plowing under any temporary grass areas and preparing the soil as follows:

1. Slopes 3:1 or Flatter

On slopes 3:1 or flatter, plow shoulders and embankment slopes to between 4 in and 6 in (100 mm and 150 mm) deep.

Plow front and back slopes in cuts to no less than 6 in (150 mm) deep. After plowing, thoroughly disk the area until pulverized to the plowed depth.



## Section 700 - Grassing

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### 2. Slopes Steeper Than 3:1

Serrate slopes steeper than 3:1 according to Plan details when required.

On embankment slopes and cut slopes not requiring serration (sufficient as determined by the Engineer), prepare the ground to develop an adequate seed bed using any of the following methods as directed by the Engineer:

- Plow • to a depth whatever depth is practicable.
- 
- Use a • spiked chain.
- 
- Walk • with a cleated track dozer.

Scarify.

Disking cut slopes and fill slopes is not required.

### 3. All Slopes

#### a. Obstructions

Remove boulders, stumps, large roots, large clods, and other objects that interfere with grassing or may slide into the ditch.

#### b. Topsoil

Spread topsoil stockpiled during grading evenly over cut and fill slopes after preparing the ground.

Push topsoil from the top over serrated slopes. Do not operate equipment on the face of completed serrated cuts.

## B. Grassing Adjacent to Existing Lawns

When grassing areas adjacent to residential or commercial lawns, the Engineer shall change the plant material to match the type of grass growing on the adjacent lawn. The Contract Unit Price will not be modified for this substitution.

If the Engineer believes bituminous treated mulch would harm other portions of the work, bituminous treated mulch may be substituted with 1,500 lbs/acre (1680 kg/ha) of wood fiber mulch with tackifier.

## C. Temporary Grassing

Apply temporary grassing according to Subsection 163.3.05.F and the following:

- Determine lime requirements by a laboratory soil test.
- 

Add mulch only if the temporary grass does not provide adequate mulch to meet the requirements of Subsection 700.3.05.G.

In March or April of the year following planting and as soon as the weather is suitable, replace all areas of temporary grass with permanent grass by plowing or overseeding using the no-till

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method. If the no-till method is used, ensure that temporary grass is less than 3 inches in height (this may be achieved by mowing). Additional mulch will be required only if the temporary grass does not provide adequate mulch to meet the requirements of Subsection 700.3.05.G, "Mulching."

Temporary grass, when required, will be paid for according to Section 163.

**D. Applying Agricultural Lime and Fertilizer Mixed Grade** Apply and mix lime and fertilizer as follows:

1. Agricultural Lime

Uniformly spread agricultural lime on the ground at the approximate rate determined by the laboratory soil test.

2. Fertilizer Mixed Grade

Uniformly spread the fertilizer selected according to Subsection 700.2.D over the ground at approximately 1,200 lbs/acre (1350 kg/ha).

If using a higher analysis fertilizer with hydroseeding, apply it at the same rate per acre (hectare) as the standard fertilizer.

3. Mixing

Before proceeding, uniformly work the lime and fertilizer into the top 4 in (100 mm) of soil using harrows, rotary tillers, or other equipment acceptable to the Engineer.

On cut slopes steeper than 3:1, other than serrated slopes, reduce the mixing depth to the maximum practical depth as determined by the Engineer.

Omit mixing on serrated slopes.

**E. Seeding**

Following is a list of both common names and botanical names for approved seed types.

Whenever seeds are specified by the common names, the strains indicated by their botanical name apply.

Common Name	Botanical Name
Annual Ryegrass	Lolium multiflorum
*Bermuda Grass, Common Hulled and Unhulled	Cynodon dactylon
**Crimson Clover	Trifolium incranatum Var. Reseeding
**Lespedeza Virgata	Lespedeza Ambro Virgata

## Section 700 - Grassing

**Lespedeza Sericea	Lespedeza cuneta, Var. Sericea
<b>Common Name</b>	<b>Botanical Name</b>
**Lespedeza Serala	Lespedeza cuneta, Var. Serala
**Lespedeza Interstate	Lespedeza cuneta, Var. Interstate
**Lespedeza Korean	Lespedeza stipulacea Maxim
Pensacola Bahiagrass	Paspalum notatum, var. Pensacola
Tall Fescue	Festuca arundinacea
Weeping Love Grass	Eragrostis curvula
**White Dutch Clover	Trifolium repens
**Crown Vetch	Coronilla Varia
*Do not use Giant Bermuda Seed (Cynodon species) including NK-37.	
**Requires inoculation.	

Prepare seed and sow as follows:

- Inoculation of Seed

Inoculate each kind of leguminous seed separately with the appropriate commercial culture according to the manufacturer's instructions for the culture.

When hydroseeding, double the inoculation rate.

Protect inoculated seed from the sun and plant it the same day it is inoculated.

- Sowing

Weather permitting, sow seed within 24 hours after preparing the seed bed and applying the fertilizer and lime, or sow seed within 24 hours after applying mixed-in-place mulch.

Sow seed uniformly at the rates specified in the [Seeding Table](#). Use approved mechanical seed drills, rotary hand seeders, hydraulic equipment, or other equipment to uniformly apply the seed. Do not distribute by hand.

To distribute the seeds evenly sow seed types separately, except for similarly sized and weighted seeds. They may be mixed and sown together.

- Rolling

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Roll seeded areas before applying mulch, except on steep slopes where rollers cannot operate satisfactorily. On slopes inaccessible to compaction equipment, cover the seeds by dragging spiked chains over them or by using other methods.

Do not sow during windy weather, when the prepared surface is crusted, or when the ground is frozen, wet, or otherwise nontillable.

### 4. Overseeding

Temporary grass areas that were prepared in accordance with Subsection 700.3.05.A, shall be overseeded using the no-till method. The no-till method is defined by planting permanent grass seeds using a drill-type seeder over existing temporary grass without plowing or tilling soil and in accordance with Subsection 700.3.05.C. This method shall be shown on the Plans or directed by the Engineer before being implemented.

## F. Hydroseeding

Hydroseeding may be used on any grassing area. Under this method, spread the seed, fertilizer, and wood fiber mulch in the form of a slurry. Seeds of all sizes may be mixed together. Inoculate the seeds at double the rate for seeds not being hydroseeded. Apply hydroseeding as follows:

1. Use wood fiber mulch as a metering agent and seed bed regardless of which mulching method is chosen. Apply wood fiber mulch at approximately 1,500 lbs/acre (560 kg/ha).
2. Prepare the ground for hydroseeding as for conventional seeding in Subsection 700.3.05.A.
3. Use specially designed equipment to mix and apply the slurry uniformly over the entire seeding area.
4. Agitate the slurry mixture during application.
5. Discharge slurry within one hour after being combined in the hydroseeder. Do not hydroseed when winds prevent an even application.
6. Closely follow the equipment manufacturer's directions unless the Engineer modifies the application methods.
7. Mulch the entire hydroseeded area according to Subsection 700.3.05.F.1, above, and Subsection 700.3.05.G, below.

## G. Mulching

Except as noted in Subsection 700.3.05.B and Subsection 700.3.05.C, apply mulch immediately after seeding areas as follows:

Areas with permanent grass seed and covered with slope mats or blankets will not require mulch.

## Section 700 - Grassing

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Evenly apply straw or hay mulch between 3/4 in and 1-1/2 in (20 mm and 40 mm) deep, according to the texture and moisture content of the mulch material.

Mulch shall allow sunlight to penetrate and air to circulate as well as shade the ground, reduce erosion, and conserve soil moisture. If the type of mulch is not specified on the Plans or in the Proposal, use any of the following as specified.

### 1. Mulch with Binder

Apply mulch with binder regardless of whether using ground or hydroseeding equipment for seeding.

- a. Mulch uniformly applied manually or with special blower equipment designed for the purpose. When using a blower, thoroughly loosen baled material before feeding it into the machine so that it is uniformly coated with binder and broken up.
- b. After distributing the mulch initially, redistribute it to bare or inadequately covered areas in clumps dense enough to prevent new grass from emerging.

Do not apply mulch on windy days.

- c. Apply enough binder to the mulch to hold it in place. Immediately replace mulch that blows away.

When using a power blower to distribute the mulch, spray the binder onto the mulch as the mulch is ejected from the machine. If distributing the mulch by hand, immediately apply the binder uniformly over the mulched areas.

Use one of the following binders:

- Emulsified asphalt, SS-1h or SS-1 (Section 822) : The public, adjacent property, bridges, pavements, curbs, sidewalks, and other existing structures shall be protected from discoloration by the asphalt. Correct discoloration damage at no expense to the Government.
- Tackifier: Use a tackifier listed in the Laboratory Qualified Products Manual may be used at the manufacturer's recommended rates.

### 2. Mixed-in-Place Mulch

Apply mixed-in-place mulch on flat areas or slopes 3:1 or less and treat as follows:

- a. Immediately work the mulch into the soil with appropriate equipment to produce a loose soil and mulch mixture 3 in to 3.5 in (75 mm to 90 mm) deep.
- b. After mixing mulch and soil and restoring areas to line and grade, seed as specified in this Section.

### 3. Walked-in-Mulch

Apply walked-in-mulch on slopes ranging in steepness from 5:1 to 2:1 and treat as follows:

## Section 700 - Grassing

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- a. Immediately walk it into the soil with a cleated track dozer. Make dozer passes vertically up and down the slope.
- b. Where walked-in-mulch is used, do not roll or cover the seeds as specified in Subsection 700.3.05.E.3.

### H. Sod

Furnish and install sod in all areas shown on the Plans or designated by the Engineer.

#### 1. Kinds of Sod

Use only Common Bermudagrass (Cynodon dactylon) or one of the following Bermudagrass varieties:

Tifway 419

Tifway II

Tift 94

Tifton 10

Midlawn

Midiron

GN-1

Vamont

No dwarf Bermuda types shall be used. Sod shall be nursery-grown and be accompanied with a Georgia Department Of Agriculture Live Plant License Certificate or Stamp. Sod shall consist of live, dense, well-rooted material free of weeds and insects as described by the Georgia Live Plant Act.

#### 2. Type And Size Of Sod:

Furnish either big roll or block sod. Ensure that big roll sod is a minimum of 21 inches wide by 52 feet long. Minimum dimensions for block sod are 12 inches wide by 22 inches long. Ensure all sod consists of a uniform soil thickness of not less than 1 inch.

#### 3. Ground Preparation

Excavate the ground deep enough and prepare it according to Subsection 700.3.05.A to allow placing of sod. Spread soil, meeting the requirements of Subsection 893.2.01, on prepared area to a depth of 4 inches.

#### 4. Application Of Lime And Fertilizer

Apply lime and fertilizer according to Subsection 700.3.05.D within 24 hours prior to installing sod.

#### 5 Weather Limitation

## Section 700 - Grassing

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Do not place sod on frozen ground or where snow may hinder establishment.

### 6. Install Sod

Install Sod as follows:

- Place sod by hand or by mechanical means so that joints are tightly abutted with no overlaps or gaps. Use soil to fill cracks between sod pieces, but do not smother the grass.
  - Stake sod placed in ditches or slopes steeper than 2:1 or any other areas where sod slipping can occur.
  - Use wood stakes that are at least 8 in (200 mm) in length and not more than 1 in (25 mm) wide.

Drive the stakes flush with the top of the sod. Use a minimum of 8 stakes per square yard (meter) to hold sod in place.

- Once sod is placed and staked as necessary, tamp or roll it using adequate equipment to provide good contact with soil.
- Use caution to prevent tearing or displacement of sod during this process. Leave the finished surface of sodded areas smooth and uniform.

### 7. Watering Sod

After the sod has been placed and rolled or tamped, water it to promote satisfactory growth. Additional watering will be needed in the absence of rainfall and during the hot dry summer months. Water may be applied by Hydro Seeder, Water Truck or by other means approved by the Engineer.

### 8. Dormant Sod

Dormant Bermuda grass sod can be installed. However, assume responsibility for all sod through establishment and until final acceptance.

### 9. Establishment

Sod will be inspected by the Engineer at the end of the first spring after installation and at the time of Final Inspection. Replace any sod that is not live and growing. Any cost for replacing any unacceptable sod will be at the Contractor's expense.

## I. Application of Nitrogen

Apply nitrogen at approximately 50 lbs/acre (56 kg/ha) when specified by the Engineer after plants have grown to 2 in (50 mm) high.

One application is mandatory and must be applied before Final Acceptance.

Apply nitrogen with mechanical hand spreaders or other approved spreaders capable of uniformly covering the grassed areas. Do not apply nitrogen on windy days or when the foliage is damp.

## Section 700 - Grassing

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Do not apply nitrogen between October 15 and March 15 except in Zone 4.

### 700.3.06 Quality Acceptance

The Engineer may require replanting of an area that shows unsatisfactory growth for any reason at any time.

Except as otherwise specified or permitted by the Engineer, prepare replanting areas according to the Specifications as if they were the initial planting areas. Use a soil test or the Engineer's guidance to determine the fertilizer type and application rate, then furnish and apply the fertilizer.

### 700.3.07 Contractor Warranty and Maintenance

#### A. Plant Establishment

Before Final Acceptance, provide plant establishment of the specified vegetation as follows:

1. Plant Establishment

Preserve, protect, water, reseed or replant, and perform other work as necessary to keep the grassed areas in satisfactory condition.

2. Watering

Water the areas during this period as necessary to promote maximum growth.

3. Mowing

Mow seeded areas of medians, shoulders, and front slopes at least every 6 months. Avoid damaging desirable vegetation.

In addition, mow as necessary to prevent tall grass from obstructing signs, delineation, traffic movements, sight distance, or otherwise becoming a hazard to motorists.

Do not mow lespedezas or tall fescue until after the plants have gone to seed.

#### B. Additional Fertilizer Mixed Grade

Apply fertilizer at approximately 600 lbs/acre (675 kg/ha) each spring after initial plant establishment. Continue annual applications until Final Acceptance. This additional fertilizer will be measured and paid for at the Contract Unit Price for fertilizer mixed grade.

#### C. Growth and Coverage

Provide satisfactory growth and coverage, ensuring that vegetation growth is satisfactory with no bare spots larger than 1 ft<sup>2</sup> (0.1 m<sup>2</sup>). Bare spots shall comprise no more than 1 percent of any given area. An exception is given for seed not expected to have germinated and shown growth at that time.

#### D. Permissible Modifications



## **Section 700 - Grassing**

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When all Items of the work are ready for Final Acceptance except for newly planted repaired areas or other areas with insufficient grass, the Contractor may fill the eroded areas or treat bare areas with sod obtained, placed, and handled according to Subsection 700.3.05.H.

Carefully maintain the line and grade established for shoulders, front slopes, medians, and other critical areas.

Sod as described above will not be paid for separately, but will be an acceptable substitute for the satisfactory growth and coverage required under this Specification. These areas treated with sod are measured for payment under the Item for which the sod is substituted.

### **700.4 Measurement**

#### **A. Permanent Grassing**

Permanent Grassing will be measured for payment as lump sum.

#### **B. Mulches**

Mulches, including wood fiber mulch, furnished by the Contractor for permanent grassing are not measured for separate payment.

#### **C. Quantity of Sod**

Sod is measured for payment by the number of square yards (meters) , surface measure, completed and accepted.

#### **D. Water**

Water furnished and applied to promote a satisfactory growth is not measured for payment.

#### **E. Quantity of Lime and Fertilizer Mixed Grade**

Lime and fertilizer are measured by the ton (megagram).

#### **F. Quantity of Nitrogen Used for Permanent Grassing**

Nitrogen is measured in pounds (kilograms) based on the weight of fertilizer used and its nitrogen content.

#### **G. Replanting and Plant Establishments**

No measurement for payment is made for any materials or work required under Subsection 700.3.06 and Subsection 700.3.07.

#### **H. Temporary Grass**

Temporary grass is measured for payment by the pound (kilogram) of seed according to Section 163.

### **700.4.01 Omitted**

### **700.5 Payment**

## **Section 700 - Grassing**

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As grassing and planting progress, the Contractor will receive full measurement and payment on regular monthly estimates provided the work complies with the Specifications.

### **A. Permanent Grassing**

Permanent grassing will be paid for Lump Sum, complete and in place. Payment is full compensation for preparing the ground, seeding, mulching, and providing plant establishment.

1. 70% of the Contract Price will be paid at the satisfactory completion of the installation.
2. 20% of the Contract Price will be paid upon satisfactory review of sod which is healthy, weed free and viable at the inspection made at the end of the first spring after installation.
3. 10% of the contract price will be paid upon satisfactory review of sod that is healthy, weed free and viable at the Final Acceptance.

### **B. Fertilizer Mixed Grade**

Fertilizer mixed grade will be paid for at the Contract Price per ton. Payment is full compensation for furnishing and applying the material.

### **C. Lime**

Lime will be paid for at the Contract Price per ton. Payment is full compensation for furnishing and applying the material.

### **D. Nitrogen**

Nitrogen will be paid for at the Contract Price per pound (kilogram) of nitrogen content. Payment is full compensation for furnishing and applying the material.

### **E. Sod**

Sod will be paid by the square yard in accordance with the following schedule of payments. Payment is full compensation for ground preparation, including addition of topsoil, furnishing and installing live sod, and for Plant Establishment.

4. 70% of the Contract Price per square yard will be paid at the satisfactory completion of the installation.
5. 20% of the Contract Price will be paid upon satisfactory review of sod which is healthy, weed free and viable at the inspection made at the end of the first spring after installation.
6. 10% of the contract price will be paid upon satisfactory review of sod that is healthy, weed free and viable at the Final Acceptance.

## Section 700 - Grassing

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### F. Temporary Grass

Temporary Grass will be paid for under Section 163.

Payment will be made under:

700-6910	Permanent grassing	Lump sum
700-9300	Sod	Square Yard

## Section 710—Permanent Soil Reinforcing Mats

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### 710.1 General Description

This work includes furnishing and placing a permanent mat over prepared areas according to the Plans or as directed by the Engineer.

#### 710.1.01 Omitted

#### 710.02 Omitted

#### 710.1.03 Omitted

### 710.2 Materials

Use materials listed in the [QPL 49](#).

Ensure that materials meet the following requirements.

#### A. Preformed Mat

Use mat with a web of mechanical or melt-bonded polymer nettings, monofilaments, or fibers entangled to form a dimensionally stable matrix. Bond the mat with one of the following:

- Polymer welding
- Thermal fusion
- Polymer fusion

Fibers placed between two high-strength, biaxially oriented nets bound by parallel-lock stitching with polyolefin, nylon, or polyester threads

Use a mat with enough strength and elongation to limit stretching and maintain its shape before, during, and after installation under dry or wet conditions. Provide a mat with stabilized components that avoid ultraviolet degradation and are inert to chemicals normally encountered in a natural soil environment. Ensure that the mat conforms to the following physical properties:

Property	Minimum Value	Test Method
Thickness	1/2 in (13 mm)	
Weight	0.60 lbs/yd <sup>2</sup> (325 g/m <sup>2</sup> )	
Roll width	38 in (965 mm)	
Tensile strength		ASTM D 5034*
Length (50% elongation)	15 lbs/in (2.5 N/mm)	

## Section 716 – Erosion Control Mats (Slopes)

Length (ultimate)	20 lbs/in (3.5 N/mm)	
Width (50% elongation)	5 lbs/in (1 N/mm)	
Width (ultimate)	10 lbs/in (2 N/mm)	
Ultraviolet stability	80%	ASTM D 4355
1,000 hours in an Atlas ARC Weatherometer (ASTM G 23, Type D)		ASTM D 822

### B. Stakes or Staples

Use 1 in by 3 in (25 mm by 75 mm) wood stakes made from sound stock cut in a triangular shape. Cut stakes 12 in to 18 in (300 mm to 450 mm) long depending on soil compaction. Use metal staples with the following characteristics:

- Diameter of 1/8 in (3 mm) or greater
- U shape
- Legs at least 8 in (200 mm) long
- Crown 2 in (50 mm) across

### C. Filter Fabric

Use woven or nonwoven filter fabric that meets the requirements of Subsection 881.2.05, "Plastic Filter Fabric."

**710.2.01 Delivery, Storage, and Handling** General Provisions 101 through 150.

#### 710.3 Construction Requirements

##### 710.3.01 Personnel

General Provisions 101 through 150.

##### 710.3.02 Equipment

General Provisions 101 through 150.

##### 710.3.03 Preparation A. Site Preparation

Before protecting areas with mat, prepare the area according to Section 700 with the following steps:

1. Bring to final grade
2. Plow
3. Lime
4. Fertilize

## **Section 716 – Erosion Control Mats (Slopes)**

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Provide a smooth, firm, and stable surface free of rocks, clods, roots, or other obstructions that would prevent the mat from contacting the soil directly.

### **710.3.04 Omitted**

### **710.3.05 Construction**

#### **A. Installing Mat**

Do not use a mat in areas with rock outcroppings or large rocks. Install the mat either in ditches or on slopes according to the following requirements:

##### **1. Ditches**

To install the mat in ditches:

- a. Cut a transverse trench 6 in wide by 9 in deep (150 mm wide by 225 mm deep) at the ends of the mat and at 25 ft (7.5 m) intervals along the ditch.
- b. Cut longitudinal, 4 in (100 mm) deep anchor slots along each side of the mat along the full length of the ditch, burying mat edges.
- c. Roll out the center strip of matting, starting at the lower end of the ditch.
- d. Roll out each adjacent strip of matting to overlap the preceding strip at least 3 in (75 mm).
- e. Overlap the ends of each mat roll 3 ft (1 m) with the upslope mat on top. Stretch the mat to the bottom of the slot, folding it back and staking through two layers of material.
- f. Stake each strip of matting at 1 ft (300mm) intervals in each anchor slot, with one stake serving the overlapped edges of adjoining strips.
- g. Backfill and compact the slot.
- h. Fold the mat back over the slot and continue in the upstream direction (closed anchor slot).
- i. Stake the mat snugly in the longitudinal slots and at intervals a maximum of 5 ft (1.5 m) along the ditch (open anchor slot).
- j. Backfill and dress the longitudinal anchor slots.

Lay up to 10 ft (3 m) of filter fabric under runs of matting that begin at pipe outlets.

#### **B. Grassing**

Grass the entire soil-filled mat and disturbed soil area according to [Section 700](#).

### **710.3.06 Omitted**

### **710.3.07 Omitted**

### **710.4 Measurement**

Permanent soil-reinforcing mat complete and accepted is measured for payment by the square yard (meter), surface measured.

## Section 716 – Erosion Control Mats (Slopes)

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### 710.4.01 Limits

Overlaps and anchor slots are incidental to the work and are not measured for payment.

### 710.5 Payment

This work will be paid for at the Contract Price per square yard for permanent soil-reinforcing mat, complete in place and accepted. Payment is full compensation for furnishing and installing the mat according to this Specification, including filter fabric and maintenance.

Preparing the area and grassing will be paid for according to Section 700.

Payment will be made under:

Item No. 710	Permanent soil reinforcing mat	Per square yard
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## Section 716—Erosion Control Mats (Slopes)

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### 716.1 General Description

This work includes furnishing and placing erosion control mats (blankets) made of fiberglass, excelsior, jute mesh, bituminous treated roving, and straw, synthetic, or coconut over grass areas prepared according to Section 700 for permanent grass. Place according to the Plans or as directed by the Engineer. This specification is not applicable for waterways.

### 716.2 Omitted

### 716.3 Construction Requirements

#### 716.3.01 Omitted

#### 716.3.02 Omitted

#### 716.3.03 Omitted

#### 716.3.04 Omitted

#### 716.3.05 Construction

The contractor may elect to use either Section 712 – Fiberglass Blanket, Section 713 – Organic and Synthetic Material Fiber

Blanket (except do not use Type II Wood Fiber Blanket), Section 714 – Jute Mesh Erosion Control, or Section 715 – Bituminous Treated Roving, on slopes. All of the materials, construction and measurement portions of the noted sections apply to the type mat (blanket) selected for use.

Place blankets or mats vertically on the slopes beginning at the top of the slope and extending to the bottom of the slope. Horizontal installation of the blankets or mats is not permitted.

The application of mulch is not required for permanent grassing when one of the above noted mats or blankets is placed on the previously prepared and grassed slopes with 24 hours.

### 716.4 Measurement

Erosion control mats (Slopes) are measured according to the Specification sections referenced in Subsection 716.3.05.

#### 716.4.01 Limits

General Provisions 101 through 150.

### 716.5 Payment

Erosion control mats (Slopes), measured as specified in Section 712, Section 713, Section 714, or Section 715 will be paid for at the Contract Unit Price per square yard.



## Section 716 – Erosion Control Mats (Slopes)

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This payment is full compensation for constructing the mat (blanket) and providing materials, equipment, tools, labor, and incidentals needed to maintain mats (blankets) for the life of the Contract or until a stand of grass has developed enough to prevent erosion.

Payment will be made under:

Item No. 716	Erosion control mats (slopes)	Per square yard (meter)
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