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USDA FOREST SERVICE

SUPPLEMENTAL SPECIFICATIONS

For

Bridge Replacements (202-3.1, 251H-3.4 & 3.6)

Francis Marion & Sumter National Forests

USDA FOREST SERVICE
Francis Marion Ranger District

Prepared by:

TGS Engineers

September 23rd, 2022

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9/23/2022

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Preface

Delete all but the first paragraph and add the following:

The Forest Service, US Department of Agriculture has adopted FP-14 for construction of National Forest System Roads.

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101 - Terms¸ Format¸ and Definitions

101.01_National_11_9_2016

Add the following paragraph to Subsection 101.01:

101.01 Meaning of Terms.

Delete all references to the TAR (Transportation Acquisition Regulations) in the specifications.

101.03_National_11_9_2016

Add the following to Subsection 101.03:

101.03 Abbreviations.

(a) Acronyms.

AGAR — Agriculture Acquisition Regulations

AFPA — American Forest and Paper Association

FSAR — Forest Service Acquisition Regulations

MSHA — Mine Safety and Health Administration

NESC — National Electrical Safety Code

WCLIB — West Coast Lumber Inspection Bureau

(f) Miscellaneous unit abbreviations.

MP	—	milepost	location
ppm	—	parts per million	volume
STA		station	location

101.04_National_1_22_2020

Make the following changes to Subsection 101.04:

101.04 Definitions.

Delete these definitions and replace the following:

Bid Schedule — The Schedule of Items.

Bridge — A structure, including supports, erected over a depression or an obstruction such as water along a road, a trail, or a railway and having a deck for carrying traffic or other loads.

Contractor — The individual or legal entity contracting with the Government for performance of prescribed work. In a timber sale contract, the contractor is the "Purchaser".

Culvert — Any structure with a bottom, regardless of fill depth, depth of invert burial, or presence of horizontal driving surface, or any bottomless (natural channel) structure with footings that will not have wheel loads in direct contact with the top of the structure.

Drawings — (Public Works Contracts) Design sheets or fabrication, erection, or construction details submitted to the CO by the Contractor according to FAR Clause 52.236-21 Specifications and Drawings for Construction. Also refers to submissions and submittals.

Notice to Proceed — (Public Works Contracts) Written notice to the Contractor to begin the contract work.

Right-of-Way — A general term denoting (1) the privilege to pass over land in some particular line (including easement, lease, permit, or license to occupy, use, or traverse public or private lands), or (2) Real property necessary for the project, including roadway, buffer areas, access, and drainage areas.

Solicitation—(Public Works Contracts) The complete assembly of documents (whether attached or incorporated by reference) furnished to prospective bidders.

Add the following definitions:

Adjustment in Contract Price — "Equitable adjustment," as used in the Federal Acquisition Regulations, or "construction cost adjustment," as used in the Timber Sale Contract, as applicable.

Change — "Change" means "change order" as used in the Federal Acquisition Regulations, or "design change" as used in the Timber Sale Contract.

Forest Service — The United States of America, acting through the Forest Service, U.S. Department of Agriculture.

Neat Line — A line defining the proposed or specified limits of an excavation or structure.

Pioneer Road — Temporary construction access built along the route of the project.

Purchaser — The individual, partnership, joint venture, or corporation contracting with the Government under the terms of a Timber Sale Contract and acting independently or through agents, employees, or subcontractors.

Protected Streamcourse — A drainage shown on the plans or timber sale area map that requires designated mitigation measures.

Road Order — An order affecting and controlling traffic on roads under Forest Service jurisdiction. Road Orders are issued by a designated Forest Officer under the authorities of 36 CFR, part 260.

Shop Drawings — (Timber and Stewardship Contracts) Referred to as "Drawings" in FP-14, include drawings, diagrams, layouts, schematics, descriptive literature, illustrations, lists or tables, performance and test data, and similar materials furnished by Purchaser to explain in detail specific portions of the work required by the contract.

Utilization Standards —

The minimum size and percent soundness of trees described in Public Works contract specifications or Timber Sale and IRTC contract provisions to determine merchantable timber.

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Add Figure 101-1—Illustration of road structure terms:

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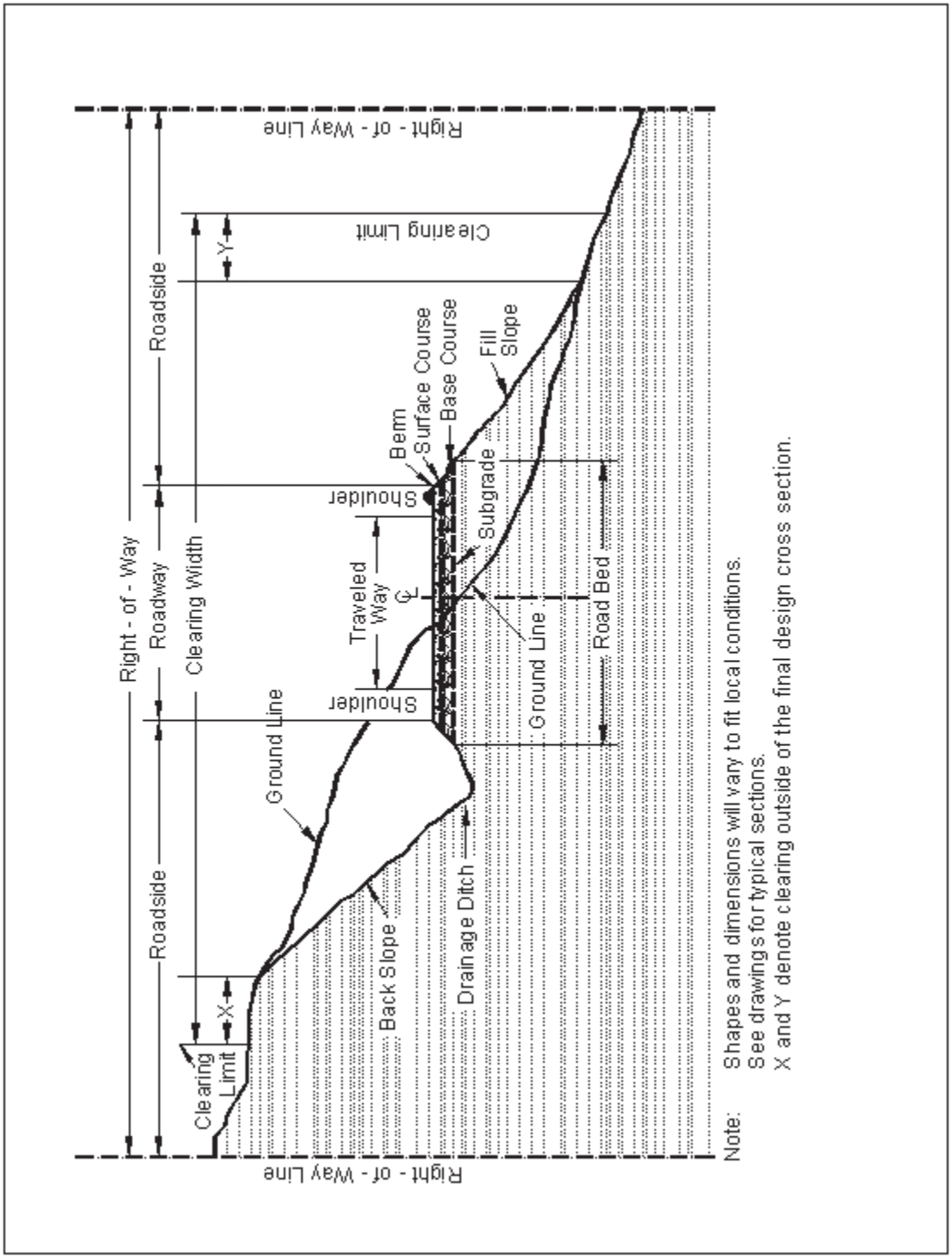
Figure 101-1—Illustration of road structure terms.



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102 - Bid¸ Award¸ and Execution of Contract

102.00_National_11_9_2016

Delete Section 102 in its entirety.

Delete Section 102.

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103 - Scope of Work

103.00_National_11_9_2016

Delete all of Section 103 except Subsection 103.01 Intent of Contract.

Delete Subsections 103.02, 103.03, 103.04, 103.05.

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104 - Control of Work

104.00_National_11_9_2016

Delete Subsections 104.01, 104.02, and 104.04.

Delete Subsections 104.01, 104.02, 104.04.

104.06_National_11_9_2016

Add the following to Subsection 104.06:

104.06 Use of Roads by Contractor.

The Contractor is authorized to use roads under the jurisdiction of the Forest Service for all activities necessary to complete this contract, subject to the limitations and authorizations designated in the Road Order(s) or described in the contract, when such use will not damage the roads or national forest resources, and when traffic can be accommodated safely.

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105 - Control of Material

105.05_National_6_29_2020

105.05 Use of Material Found in the Work.

Delete 105.05 (a) and (b) and the last sentence of the second paragraph and substitute the following:

Materials produced or processed from Government lands in excess of the quantities required for performance of this contract are the property of the Government. Place excess material safely at government-approved location, at no additional cost to government.

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106 - Acceptance of Work

106.01_National_7_18_2017

Delete Subsection 106.01 and replace with the following:

106.01 Conformity with Contract Requirements.

Follow the requirements of FAR Clause 52.246-12 Inspection of Construction.

References to standard test methods of AASHTO, ASTM, GSA, and other recognized standard authorities refer to the methods in effect on the date of solicitation for bids.

Perform all work to the lines, grades, cross-sections, dimensions, and processes or material requirements shown on the plans or specified in the contract.

Incorporate manufactured materials into the work according to the manufacturer's recommendations or to these specifications, whichever is more strict.

Plan dimensions and contract specification values are the values to be strived for and complied with as the design values from which any deviations are allowed. Perform work and provide material that is uniform in character and reasonably close to the prescribed value or within the specified tolerance range. The purpose of a tolerance range is to accommodate occasional minor variations from the median zone that are unavoidable for practical reasons.

When standard manufactured items are specified (such as fence, wire, plates, rolled shapes, pipe conduits, etc., that are identified by gauge, unit mass, section dimensions, etc.), the identification will be considered to be nominal masses or dimensions. Unless specific contract tolerances are noted, established manufacturing tolerances will be accepted.

The Government may inspect, sample, or test all work at any time before final acceptance of the project. When the Government tests work, copies of test reports are furnished to the Contractor upon request. Government tests may or may not be performed at the work site. If Contractor testing and inspection is verified by the Government, the Contractor's results may be used by the Government to evaluate work for acceptance. Do not rely on the availability of Government test results for process control.

Acceptable work conforming to the contract will be paid for at the contract unit bid price. Four methods of determining conformity and accepting work are described in Subsections 106.02 to 106.05 inclusive. The primary method of acceptance is specified in each Section of work. However, work may be rejected at any time it is found by any of the methods not to comply with the contract.

Remove, repair, or replace work that does not conform to the contract, or to prevailing industry standards where no specific contract requirements are noted. Removing, repairing, or replacing work; providing temporary traffic control; and any other related work to accomplish conformity will be at no cost to the Government.

(a) Disputing Government test results. If the accuracy of Government test results is disputed, promptly inform the CO. If the dispute is unresolved after reasonable steps are taken to resolve the dispute, further evaluation may be obtained by written request. Include a narrative describing the dispute and a proposed resolution protocol that addresses the following:

1. Sampling method;
2. Number of samples;
3. Sample transport;
4. Test procedures;
5. Testing laboratories;
6. Reporting;

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7. Estimated time and costs; and
8. Validation process.

If the evaluation requires additional sampling or testing be performed, mutually agree with the Government on witnessing procedures and on sampling and testing by a third party laboratory. Use a third party laboratory accredited by the AASHTO accreditation program. Provide proof of the laboratory's accreditation for the test procedures to be used. Do not use the same laboratory that produced the disputed Government test results or that produced the test results used as a basis for the dispute.

The CO will review the proposed resolution protocol and may modify it before final approval and execution.

The Government will use the approved resolution protocol test results to determine the validity of the disputed testing. If the Government test results are validated, the Contractor will be responsible for all costs associated with developing and performing the resolution protocol. If the Government test results are not validated, the Government will be responsible for all costs associated with developing and performing the resolution protocol. If the validity of the Government test results cannot be determined, the Contractor and Government will equally share all costs associated with developing and carrying out the resolution protocol.

(b) Alternatives to removing and replacing non-conforming work. As an alternative to removal and replacement, the Contractor may submit a written request to:

1. Have the work accepted at a reduced price; or
2. Be given permission to perform corrective measures to bring the work into conformity.

The request must contain supporting rationale and documentation. Include references or data justifying the proposal based on an evaluation of test results, effect on service life, value of material or work, quality, aesthetics, and other tangible engineering basis. The CO will determine disposition of the nonconforming work.

106.02_National_11_9_2016

Delete Subsection 106.02 and replace with the following:

106.02 Visual Inspection.

Acceptance is based on visual inspection of the work for compliance with the specific contract requirements. Use prevailing industry standards in the absence of specific contract requirements or tolerances.

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107 - Legal Relations and Responsibility to the Public

107.05_National_7_18_2017

Delete Subsection 107.05.

Delete Subsection 107.05.

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108 - Prosecution and Progress

108.00_National_11_9_2016

Delete Section 108 in its entirety.

Delete Section 108.

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109 - Measurement and Payment

109.00_National_11_9_2016

Delete Subsections 109.06, 109.07, 109.08, and 109.09:

Delete Subsections 109.06, 109.07, 109.08, 109.09.

109.01_National_2_22_2019

Delete the third paragraph and Table 109-1 of Subsection 109.01 and replace with the following:

109.01 Measurement of Work.

Take measurements as described in Subsection 109.02 unless otherwise modified by the Measurement Subsection of the section controlling the work being performed. Table 109-1 indicates the accuracy required for quantities of the various pay units used in the Schedule of Items. Use this guide to determine the decimal placement in the final payment.

Table 109-1

Decimal Accuracy of Quantities for Final Payment

Pay Item	Level of Precision
Linear Foot	1
Exception--Timber, Steel, and concrete Piles	0.1
Station	0.1
Mile	0.01
Square Foot	0.1
Square Yard	0.1
Each	1
Acre	0.01
Gallon	1
M-Gals.	0.1
Cubic Yard	1
Exception--Structure Excavation; Sheathing Materials; Bedding, Bed Course, and Backfill Materials; Gabions;	0.1
Exception--Concrete; Masonry	0.01
Pound	1
Ton	0.1
Exception--Calcium Chloride; Sodium Chloride; Hydrated Lime; Bituminous Materials; Pavements; Bed Course Materials	0.01
Hour	0.1
MFBM	0.01
Station Yard	1
Cubic Yard Mile	1
Ton Mile	1

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Add the following sentence to Subsection 109.02(b):

109.02 Measurement Terms and Definitions.

(b) Contract quantity.

Contract quantities will be adjusted only when there are errors in the original design of 15% or more.

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155 - Schedules for Construction Contracts

155.00_National_11_9_2016

Delete Section 155 in its entirety.

Delete Section 155.

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156 - Public Traffic

Delete Section 156 in its entirety and replace with the following:

Section 156. – PUBLIC TRAFFIC

Description

156.01 This work consists of controlling and protecting public traffic adjacent to and within the project.

Material

156.02 Conform to the MUTCD and the following Sections and Subsections:

Permanent Traffic Control	633
Traffic Signing and Marking Material	718
Concrete Barriers and Precast Guardwalls	618
Temporary plastic fence	710.11

Construction Requirements

156.03 General. Accommodate traffic according to MUTCD, approved traffic control plan and this section. Perform work in a manner that ensures safety and convenience of the public. Unless otherwise provided for in Table 156-1, keep existing roads open to all traffic during road improvement work, and maintain them in a condition that will adequately accommodate traffic. Accommodate public traffic on roads adjacent to and within the project until the project is accepted according to Subsection 106.07(b).

Submit traffic control plan at least 30 days prior to intended use. Perform no work that interferes or conflicts with traffic or existing access to the roadway surface until a traffic control plan has been approved.

Post construction signs and traffic control devices in conformance with MUTCD and Forest Service EM 7100-15. All required signs will be in place and approved prior to beginning work on project.

If the Contractor agrees in writing to allow public traffic to use a new road being constructed prior to completion, it will be considered an existing road for traffic control purposes.

156.04 Temporary Traffic Control. Install and maintain temporary traffic control devices adjacent to and within the project as required by the approved traffic control plan and the MUTCD. Install and maintain traffic control devices as follows:

(a) Furnish and install traffic control devices before the start of construction operations.

(b) All detours outside of clearing limits will be approved in writing by the Contracting Officer as part of the traffic control plan.

(c) Install only those traffic control devices needed for each stage or phase.

(d) Relocate temporary traffic control devices as necessary.

(e) Remove devices that no longer apply to the existing conditions.

(f) Immediately replace any device that is lost, stolen, destroyed, or inoperative.

(g) Keep temporary traffic control devices clean.

(h) Remove all temporary traffic control devices upon contract completion or when approved.

(i) When required, use flaggers certified by the American Traffic Safety Services Association, the National Safety Council, the International Municipal Signal Association, a state agency, or other acceptable organization. Perform the work described under MUTCD Part 6. Use type III, VII, VIII, or IX retroreflective sheeting on flagger paddles. Do not use flags. Flaggers must wear high visibility safety apparel as required by MUTCD 6E.02.

156.05 Temporary Closures. Road segments may be closed as shown in Table 156-1. The maximum consecutive days of closure shall be followed by a minimum number of consecutive days open to traffic as shown. Maintain traffic control devices during closure period(s). Appropriate barricades and signs will be erected and maintained as shown in the traffic control plan or as otherwise designated.

Prior to closing roads during construction, give written notice to the Contracting Officer at least 10 days in advance.

Table 156-1 Editted by KBB 6/4/2026

Temporary Road Closures

Road Number	From Terminus	To Terminus	Maximum Consecutive Days of Closure	Minimum Consecutive Days Open
<number>	**<MP or description>**	**<MP or description>**	**<number>**	**<number>**
FSR 202	Intersection with FSR 226	Intersection with FSR 224	90 days	

156.06 Acceptance. Public traffic work will be evaluated under Subsection 106.02.

Measurement and Payment

156.07 Do not measure Public Traffic for payment. Payment for contract work is provided indirectly. See Subsection 109.05.

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157 - Soil Erosion and Sediment Control

157.04_National_11_1_2016

Delete Subsection 157.04 and replace with the following:

157.04 General.

Thirty (30) days prior to the start of construction, submit a written plan according to subsection 104.03 with all necessary permits that provides permanent and temporary erosion control measures to minimize erosion and sedimentation during and after construction. Do not begin work until the necessary controls for that particular phase of work have been implemented. Do not modify the type, size, or location of any control without approval.

When erosion control measures are not functioning as intended, take corrective action to eliminate or minimize pollutants in storm water discharges from the project.

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201 - Clearing and Grubbing

201.04_National_9_10_2018

Construction Requirements

Delete paragraph (c) and replace with the following:

201.04 Clearing

(c) In areas outside the excavation, embankment, and slope rounding limits, cut stumps to maximum stump height shown in table below. Editted by KBB 6/4/2026

Utilization standards for merchantable timber are listed below. Fall and buck merchantable material into lengths not to exceed 7_____ feet. Pieces (logs) meet utilization standards when such pieces would have met Utilization Standards if bucking lengths were varied to include such material.

Minimum Utilization Standards				
Species	**Maximum Stump Height (inches)**	**Length (feet)**	**Diameter[1] (inches)**	**% Net Scale[2]**
N/A				

[1] measured at inside bark at small end
[2] in % gross scale

201.06_National_2_22_2018

Delete the first sentence of Subsection 201.06 and replace the following:

201.06 Disposal.

Merchantable timber is Government property.

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208 - Structure Excavation and Backfill for Selected Major Structures

208.07_National_11_8_2016

Replace the first line of 204.02 Definitions. (a) Excavation with the following:

204.02(a) Excavation.

All excavation is unclassified and consists of the following:

Add the following to Subsection 208.07:

208.07 Dewatering.

Construct diversions according to Subsection 157.10 Diversions. Submit dewatering plans according to Subsection 104.03.

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Delete Subsection 209.10 and replace with the following:

209.10 Compacting.

Compact the embankment using one of the following methods as specified.

(a) Compaction Method 1. Use AASHTO T 27 to determine the quantity of material retained on a No. 4 (4.75-millimeter) sieve. Compact as follows:

(1) More than 80 percent retained on a No. 4 (4.75-millimeter) sieve. Adjust the moisture content to a level suitable for compaction. Fill the interstices around rock with earth or other fine material as practical. Use compression-type rollers at speeds less than 6 feet (1.8 meters) per second and vibratory rollers at speeds less than 3 feet (1 meter) per second. Compact each layer of material full width with one of the following and until there is no visible evidence of further consolidation:

(a) Four roller passes of a vibratory roller having a minimum dynamic force of 40,000 pounds (180 kilonewtons) impact per vibration and a minimum frequency of 1000 vibrations per minute;

(b) Eight roller passes of a 20-ton (20-metric ton) compression-type roller; or

(c) Eight roller passes of a vibratory roller having a minimum dynamic force of 30,000 pounds (130 kilonewtons) impact per vibration and a minimum frequency of 1000 vibrations per minute.

Increase the compactive effort for layers deeper than 12 inches (300 millimeters) as follows:

- For each additional 6 inches (150 millimeters) or fraction thereof, increase the number of roller passes in Subsection 209.10(a)(1)(a), by four passes; or
- For each additional 6 inches (150 millimeters) or fraction thereof, increase the number of roller passes in Subsection 209.10(a)(1)(b) and (c), by eight passes.

(2) 50 to 80 percent retained on a No. 4 (4.75-millimeter) sieve. Classify the material according to AASHTO M 145. Adjust the moisture content of material classified A-1 through A-5 to a moisture content suitable for compaction. Adjust the moisture content of material classified A-6 and A-7 to within 2 percent of the optimum moisture content. Use AASHTO T 99 to determine the optimum moisture content of the portion of the material passing a No. 4 (4.75-millimeter) sieve. Multiply this number by the percentage of material passing a No. 4 (4.75-millimeter) sieve, and add 2 percent to determine the optimum moisture content of the material.

Use nonvibratory rollers at speeds less than 6 feet (1.8 meters) per second and vibratory rollers at speeds less than 3 feet(1 meter) per second. Compact each layer of material full width according to Subsection 209.10(a)(1).

(3) Less than 50 percent retained on a No. 4 (4.75-millimeter) sieve. Classify the material according to AASHTO M 145. For material classified A-1 or A-2-4, determine the maximum density according to AASHTO T 99, Method C..

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Adjust the moisture content of material classified A-1 through A-5 to a moisture content suitable for compaction. Adjust the moisture content of material classified A-6 and A-7 to within 2 percent of the optimum moisture content.

Use compression-type or vibratory rollers. Compact each layer of material full width to at least 95 percent of the maximum density. Determine the in-place density and moisture content according to AASHTO T 310 or other approved test procedures. When required, use AASHTO T 224 to correct for coarse particles.

(b) Compaction Method 2. Adjust the moisture content of the material to a moisture content suitable for compaction. Fill the interstices around rock with earth or other fine material as practical. Operate roller compaction equipment over the full width of each layer until there is no visible evidence of further consolidation or, if when a sheepsfoot roller is used, the roller "walks out" of the layer. Make at least three complete passes. Use compression-type rollers at speeds less than 6 feet (1.8 meters) per second and vibratory rollers at speeds less than 3 feet (1 meter) per second. Ensure rollers meet the following requirements:

(1) Steel wheeled rollers, other than vibratory, capable of exerting a force of not less than 250 pounds per inch (4.5 kilogram/millimeter) of width of the compression roll or rolls.

(2) Vibratory steel wheeled rollers equipped with amplitude and frequency controls with a minimum dynamic force of 30,000 pounds (130 kilonewtons) impact per vibration, specifically designed to compact the material on which it is used.

(3) Pneumatic-tired rollers with smooth tread tires of equal size that will provide a uniform compacting pressure for the full width of the roller and capable of exerting a ground pressure of at least 80 psi (550 Kilopascals).

(4) Sheepsfoot, tamping, or grid rollers capable of exerting a force of 250 pounds per inch (4.5 kilogram/millimeter) of width of roller drum.

(c) Compaction Method 3. Adjust the moisture content of the material to a moisture content suitable for compaction. Fill the interstices around rock with earth or other fine material as practical. Operate hauling and spreading equipment uniformly over the full width of each layer until there is no visible evidence of further consolidation. Make at least three complete passes.

(d) Compaction Method 4. Adjust the moisture content of the material to a moisture content suitable for compaction. Fill the interstices around rock with earth or other fine material as practical. Operate hauling and spreading equipment uniformly over the full width of each layer.

(e) Compaction Method 5. Adjust the moisture content of the material to a moisture content suitable for compaction. Compact the complete surface with a bucket of an excavator larger than 39,000 pounds (18 metric ton) Gross Vehicle Weight using a minimum of three blows. Overlap compaction by ½ width of bucket.

(f) Compaction Method 6. Adjust the moisture content of the material to a moisture content suitable for compaction. Compact using an approved mechanical tamper for a minimum of three complete passes.

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When compacting with rollers or hauling and spreading equipment is not practical, use approved mechanical tampers for a minimum of three complete passes.

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301 - Untreated Aggregate Courses

301.03_National_7_17_2017

Add the following to Subsection 301.03:

301.03 General.

Written approval of the roadbed is required before placing aggregate.

For pit run or grid-rolled material, furnish material smaller than the maximum size, no gradation will be required otherwise. After processing on the road, remove all oversize material from the road and dispose as directed by the CO.

Provide additives or binder, if required, at the proportions specified.

Develop and use Government furnished sources according to Section 105.

If the aggregate is produced and stockpiled before placement, handle and stockpile according to Section 314.

301.05_National_7_17_2017

Delete Subsection 301.05 and replace with the following:

301.05 Compacting.

Compact each layer full width. Roll from the sides to the center, parallel to the centerline of the road. Along curbs, headers, walls, and all places not accessible to the roller, compact the material with approved tampers or compactors.

Compact the aggregate using one of the following methods as specified:

(a) **Compaction A.** Operating spreading and hauling equipment over the full width of the travelway.
(b) **Compaction B.** Operate rollers and compact as specified in Subsection 204.11(a)(1).
(c) **Compaction C.** Moisten or dry the aggregate to a uniform moisture content between 5 and 7 percent based on total dry weight of the mixture. Operate rollers and compact as specified in Subsection 204.11(a)(1).
(d) **Compaction D.** Compact to a density of at least 95 percent of the maximum density, as determined by AASHTO T 99, method C or D.
(e) **Compaction E**. Compact to a density of at least 95 per-cent of the maximum density, as determined by AASHTO T 180, method C or D.

For all compaction methods, blade the surface of each layer during the compaction operations to remove irregularities and produce a smooth, even surface. When a density requirement is specified, determine the in place density and moisture content according to AASHTO T 310 or other approved test procedures.

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625 - Turf Establishment

Delete Section 625 in its entirety and replace with the following:

Section 625. — TURF ESTABLISHMENT

Description

625.01 This work consists of soil preparation, watering, fertilizing, seeding, and mulching. Seeding and mulching methods are designated as dry or hydraulic.

Material

625.02 Conform to the following Subsections:

Agricultural limestone	713.02
Fertilizer	713.03
Mulch	713.05
Seed	713.04
Tackifiers	713.11
Water	725.01(b)

Construction Requirements

625.03 General. Apply turf establishment to prepared ground or any disturbed area between **April 15th** and **September 15th.** Apply turf establishment to the areas shown on the plans or worklists within **14** days after completion of ground disturbing activities.

Seeded areas damaged by construction activities shall be reseeded within 10 days of the damage. Do not seed during windy weather or when the ground is excessively wet, frozen, or snow covered.

Assure that all seed and mulch used in the work conforms to the weed free requirements of Section 713.

625.04 Preparing Seedbed. Ensure that the surface soil is in a roughened condition favorable for germination and growth.

625.05 Watering. Maintain moisture as follows:

Watering is not required

625.06 Fertilizing. Apply fertilizer by the following methods:

(a) Dry Method. Apply the fertilizer with approved mechanical equipment. Hand operated methods are satisfactory on areas inaccessible to mechanical equipment.

(b) Hydraulic Method. Use hydraulic-type equipment capable of providing a uniform application using water as the carrying agent. Add fertilizer to the slurry and mix before adding seed. Add the tracer material when designated by the CO.

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Fertilizer shall be applied at a rate of 200 pounds of 10-20-10 (Nitrogen-Phosphorus-Potassium) fertilizer plus 100 pounds of 46-0-0 Urea Nitrogen per acre in all seed applications.

625.07 Seeding. Apply seed by the following methods:

(a) Dry Method. Apply the seed with approved power driven seeders, drills, or other mechanical equipment. Hand-operated seeding methods are satisfactory on areas inaccessible to mechanical equipment; or

(b) Hydraulic Method. Use hydraulic-type equipment capable of providing a uniform application using water as the carrying agent. Add a tracer material consisting of either wood or grass cellulose fiber mulch to the water. Apply the tracer material at a rate of 400 pounds per acre (450 kilograms per hectare) to provide visible evidence of uniform application. Add the seed to the water slurry no more than 30 minutes before application. Seed by hand areas inaccessible to seeding equipment.

Furnish and apply the following kinds and amounts of pure live seed:

Type of Seed		Quantity of Pure Live Seed (Lbs/Acre)
1.	**Boreal Red Fescue**	**18**
2.	**Annual Ryegrass**	**9**
3.	**Arctared Fescue**	**18**
	Total	**45**

If Boreal Red Fescue or Arctared Fescue is unavailable, Fawn Tall Fescue may be substituted in the same proportion.

625.08 Mulching. Apply Mulch within **48** hours after seeding by the following methods.

(a) Dry Method. Apply straw mulch with a hand spreader or a spreader utilizing forced air at a rate of **4,000** pounds per acre.

(b) Hydraulic Method. Apply mulch in a separate application from the seed using hydraulic-type equipment according to Subsection 625.07(b).

Apply bonded fiber matrix hydraulic mulch at a minimum rate of **1,200** pounds per acre.

Apply so no hole in the matrix is greater than 0.04 inches. Apply so that no gaps exist between the matrix and the soil.

Apply mulch uniformly over the entire disturbed area. Mulch by hand areas inaccessible to mulching equipment.

625.09 Protecting and Caring for Seeded Areas. Protect and care for seeded areas including watering according to 625.05. Repair or apply supplemental applications of seed, mulch, fertilizer, and water according to 625.05 as many times as needed until turf is established or final acceptance.

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625.10 Acceptance. Material for turf establishment will be evaluated under Subsections 106.02 and 106.03.

Placing of turf establishment will be evaluated under Subsections 106.02 and 106.04.

Measurement

625.11 Measure the Section 625 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

When measuring turf establishment and supplemental applications by the acre (hectare), measure on the ground surface.

When measuring water by volume or mass, measure in the hauling vehicle or by metering.

Payment

625.12 The accepted quantities will be paid at the contract price per unit of measurement for the Section 625 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

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633 - Permanent Traffic Control

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Delete the first sentence of Subsection 633.02 and replace with the following:

633.02 Material.

Conform to the MUTCD, USDA Forest Service EM-7100-15, and the following Section and Subsections:

Make the following changes to Subsection 633.03:

633.03 General.

Delete the first paragraph of Subsection 633.03 and replace with the following:

Furnish and install permanent traffic control devices according to the MUTCD, USDA Forest Service EM-7100-15 and permanent traffic control plans. Provide traffic control devices that are crashworthy.

Add the following sentence to Subsection 633.03:

Sign panel layout proofs shall be approved by the CO prior to ordering.

Add the following to Subsection 633.05(a):

633.05 (a) Fabrication.

(3) Protective Overlay Film. When specified, cover the entire face of a sign with a clear high-performance, solvent-resistant, ultraviolet-stabilized, pressure-sensitive adhesive, protective overlay film. Use 3M Scotchlite Premium Protective Overlay Film Series 1160 or approved equivalent.

(4) Edge Film. When specified, edge film shall be 3 inches wide vinyl film that is pressure-sensitive, premium quality, clear, and ultraviolet-resistant.

801 – Bridge Approach Slabs

DESCRIPTION

Construct reinforced concrete slabs at bridge approaches, including curbs and sidewalks; furnish and place temporary slope drains; remove existing pavement or approach slab; furnish and place concrete, reinforcing steel, joint filler, sealer and other materials; finish and cure concrete.

Construct the approach slabs after the adjacent bridge deck is cast and before constructing concrete barrier rails or sidewalks.

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MATERIALS

Refer to Division 700.

Item	Section
Curing Agents	711
Joint Filler	712
Joint Sealer	712
Portland Cement Concrete	701
Reinforcing Steel	709

CONSTRUCTION METHODS

Construct the subgrade and approach fills in accordance with the contract.

Apply Section 552 to all concrete except as otherwise provided herein. Use 4500 psi concrete.

Finish and groove the reinforced concrete bridge approach slabs in accordance with Section 552; however, for approach slabs with a length of 15 feet or less, the contractor may submit an alternate screed type for approval. Do not groove the approach slabs when grooving the bridge deck is not required.

When grooving is not required, apply a broomed texture to the approach slabs before the concrete becomes non-plastic. Cure bridge approach slabs in the same manner as specified for bridge decks in Section 552.

Temporarily cover or fill the opening in the joint at the end bent until installation of the joint seal, if applicable. Make sure that the covering or filler provides for drainage off the bridge deck and keeps debris out of the joint and off the end bent cap.

When shown in the plans, construct sidewalks on bridge approach slabs in accordance with plan details. Do not construct sidewalks until sawing the joint at the end bent. Finish the concrete in accordance with Section 552.

Construct temporary slope drains in accordance with Section 157.11. Locate this erosion control item as shown in the Structure plan detail.

Backfill around the approach slabs as soon as practical to prevent erosion adjacent to the slab.

MEASUREMENT AND PAYMENT

The price and payment below will be full compensation for all items required to construct bridge approach slabs including, but not limited to, those items contained in the description of work.

Temporary Slope Drains shall be considered incidental to this work.

Bridge Approach Slabs ____ will be paid at the contract lump sum price under SS 801.

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Earthquake Drains

SCDOT Designation: SC-M-205-1 (1/19)

1.0 DESCRIPTION (NOTE: WHERE "PLANS" ARE REFERRED TO IN THIS SPECIFICATION, IT SHALL MEAN THE EARTHQUAKE DRAINS PLANS TO BE PROVIDED BY THE CONTRACTOR)

1.1 Provide all necessary materials, labor, equipment, submittals and incidentals for the installation of Earthquake (EQ) drains in accordance with the details shown on the plans and the requirements of these Supplemental Technical Specifications. The EQ drains consist of a corrugated pipe with slot type perforations encased by a geotextile filter fabric (jacket material). The space within the pipes above the ground water table provides a reservoir for water expelled from the ground for liquefaction mitigation. Construct additional reservoir space, if required, in accordance with details shown on the project plans. Install the EQ drains at the locations shown on the project plans, unless otherwise directed by the Engineer of Record (EOR) and the Geotechnical Engineer-of-Record (GEOR). Install the EQ drains to full length without splicing. Contact the Department for instructions and additional requirements, if splicing is required.

2.0 TESTING STANDARDS

2.1 Use the latest edition of the testing standards indicated in this specification. Substitution of standards will require the prior written approval of the Materials and Research Engineer (MRE) with concurrence of the GEOR. The Contractor is to provide copies of all substituted standards to the EOR. The EOR will provide the copies to the MRE and GEOR for acceptance.

3.0 MATERIALS

3.1 General

3.1.1 The EQ drains shall consist of newly manufactured materials and shall consist of a continuous high-density polyethylene pipe (core) with slot type perforations wrapped in a nonwoven geotextile filter fabric (jacket). The jacket shall allow free passage of pore water to the core without loss of soil material or piping. The core shall provide continuous vertical drainage and shall provide drainage through slot type perforations with a reservoir available in the space above the ground water table. Additional reservoir space may consist of an artificial reservoir provided at the top of the EQ drain as indicated on the plans. The artificial reservoir may range from a layer of stone bridge lift material (see *Bridge Lift Materials* (2007 Supplemental Specifications)) applied over the area receiving EQ drains, to individually constructed reservoirs at each drain location as specified in the plans.

3.2 Jacket Materials

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3.2.1 The jacket components shall conform to the following:

a) Be a synthetic nonwoven polymeric geotextile material capable of resisting bending, punching and tensile forces imposed during installation and during the design life of the EQ drain meeting the requirements indicated in Table 1.

b) The jacket material shall not be subject to localized damage (e.g., punching through the filter by sand/gravel particles).

c) The jacket material shall be flexible enough to bend smoothly during installation and during any induced consolidation settlement without damage.

e) The jacket material shall not undergo cracking and peeling during installation of the vertical drain.

Table 1 – Jacket Material Properties

PROPERTY[1]	TEST METHODS	UNITS	REQUIREMENTS
Mass	ASTM D5261	oz./yd^2	≥ 3.5
Grab Elongation	ASTM D4632	%	≥ 50
Grab Strength	ASTM D4632	lbs.	≥ 95
Tear Strength	ASTM D4533	lbs.	≥ 50
Puncture Strength	ASTM D6241	lbs.	≥ 35
Permittivity	ASTM D4491	sec.$^{-1}$	≥ 0.5
AOS	ASTM D4751	Sieve Size (mm)	#70 (≤ 0.15)
Ultraviolet Stability (Retained Strength)	ASTM D4355	%	≥ 50 after 500 hrs. of exposure

Notes:

[1]All numeric values represent Minimum Average Roll Value (MARV) in the weaker principal direction. Provide geotextiles whose average test results from any roll sampled in a lot for conformance or quality assurance testing meets or exceeds minimum values provided in this Table.

3.3 Core Materials

3.3.1 The core materials shall conform to the following:

a) The core shall be continuous high-density polyethylene (HDPE) annular-corrugated interior and exterior pipe with slot type perforations to promote drainage along the axis meeting the requirements of Table 2.

b) The HDPE shall meet the requirements of ASTM D3350 Cell Classification 424420C. The carbon black content for this pipe shall range from 2 to 4 percent.

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Table 2 – Core Material Properties

PROPERTY	TEST METHODS	UNITS	REQUIREMENTS
Nominal Inside Diameter	ASTM F667	in.	As shown on plans
Minimum Average Wall Thickness	Measured with caliper	in.	0.042
Minimum Pipe Stiffness @ 5% Deflection	ASTM F667	psi	30
Elongation	ASTM F667	%	≥ 5 to ≤ 10
Minimum Drainage Slot Area	ASTM F667	ft^2/ft	0.013

3.4 EQ Drain Assemblies

3.4.1 Label or tag the component materials used to manufacture the EQ drains in such a manner that the information for sample identification and other quality control purposes can be read from the label. As a minimum, identify each roll of material whether jacket or core material used to manufacture the EQ drains by the manufacturer of the material as to lot or control numbers, individual roll number, date of manufacture, manufacturer and product identification. The jacket materials shall be free of defects, rips, holes, and/or flaws. The core materials will be free of defects, crimps, kinks, crushed sections and/or other flaws. Do not use any materials in the work which are damaged during shipment, unloading, storage, or handling, or do not otherwise meet these Specifications. The jacket and core materials shall be wrapped in a protective covering during shipment to the project site.

3.4.2 Wrap the EQ drain component materials as well as the assembled EQ drains in burlap or similar heavy duty protective covering during the storage of the EQ drain. Protect the EQ drains from sunlight, mud, dirt, dust, debris, and other detrimental substances during on-site storage. The assembled EQ drains shall be resistant against wet rot, mildew, bacterial action, insects, dissolved salts, acids, alkalis, solvents, and other ingredients in the site ground water.

4.0 SUBMITTALS

4.1 Earthquake Drain Material

4.1.1 Acceptance of the sample of EQ drain component materials by the MRE will be required prior to delivery of the component materials to the Project. At least 30 calendar days before beginning EQ drain assembly, the Contractor and the EQ Drain Installer shall:

a) Identify the proposed source of the component materials prior to delivery to the site. Supply, to the EOR, a manufacturer's material certification that the component materials meet or exceed the requirements of this specification. The manufacturer's literature shall document the physical and mechanical properties of the component material. The component material manufacturers shall each be a specialist in the manufacture of the component material and shall have produced a minimum of 5,000,000 linear feet of the component material proposed for the Project that have been

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used in successful EQ drain applications within the past 5 years, including details on prior performance on these projects.

b) Submit to the EOR for review and visual inspection 3 samples of the EQ drains, as manufactured/assembled by the EQ Drain Installer. The samples of EQ drains shall be at least 5 feet long. Label the samples of the EQ drains to indicate the manufacturer of each component material as being representative of the component EQ drain material having its specified trade name. In addition, indicate on the label the EQ Drain Installer that assembled the EQ drain.

c) Submit to the EOR for review and visual inspection 3 samples of the proposed anchor plate to be used to anchor the EQ drains at the design depth shown on the plans.

4.2 Earthquake Drain Installer

4.2.1 Provide proof to the EOR and GEOR of the experience of the EQ Drain Installer for the work described at least 30 calendar days before beginning EQ drain assembly and installation. The PVD Installer shall:

a) Document successful assembly and installation of at least 5,000,000 linear feet of EQ drains during the last 5 years.

b) Document at least 5 successfully completed projects within the last 5 years of similar size and complexity to that of the Project. Document the EQ Drain Installer's experience by providing a project summary that includes for each referenced project, the project start and completion dates, total quantity of EQ drains installed, and a detailed description of the project, site conditions, and subsurface conditions. Include in the project description details of the EQ drain component materials, the technique used to assemble the EQ drains, the equipment and technique used to install the EQ drains, the average and maximum length of EQ drain installed, the client name and address, the name and telephone number of the representative of the consultant and owner for whom the work was performed and who can attest to the successful completion of the work, and any other information relevant to demonstrating the EQ Drain Installer's qualifications.

c) Identify a full-time supervisor who has been in responsible charge of supervising EQ drain installation operations for at least 5 projects in the last 5 years. The supervisor shall be present at the work site at all times during EQ drain assembly and installation operations. Provide a detailed resume of the supervisor's experience and qualifications. Provide a detailed resume for the replacement supervisor, if required.

4.3 Earthquake Drain Installation Plan

4.3.1 At least 30 calendar days before beginning EQ drain installation, the Contractor and the EQ Drain Installer shall submit to the EOR for review an EQ Drain Installation Plan that includes as a minimum the following information:

a) Describe the EQ drain assembly procedures/process.

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b) The configuration of the installation equipment including size, type, weight, maximum pushing force, and vibratory hammer rated energy.

c) Dimensions and length of the mandrel.

d) Details of the EQ drain anchorage.

e) Detailed description of proposed installation procedures.

e) Proposed methods and equipment for preaugering or spudding.

f) Documentation of the successful application of the proposed EQ drain installation operations.

g) Provide shop drawings showing the planned locations and bottom elevations of all EQ drains, a unique identification number for each EQ drain, the proposed installation sequence, the location of all potential conflicts with the locations of the EQ drains.

4.4 Submittal Reviews

4.4.1 Acceptance of the proposed component materials will be by the MRE. The equipment, construction sequence, EQ drain assembly procedures and installation method will be accepted by the GEOR. Acceptance of the EQ drain component materials, equipment, construction sequence, assembly procedures or installation method does not relieve the Contractor and EQ Drain Installer of its responsibility to install the EQ drains in accordance with the plans and specifications. Acceptance by the GEOR of the assembly procedure or the method and equipment to be used to install the EQ drains is contingent upon satisfactory demonstration of EQ drain installation at the project site. If, at any time, the EOR or the GEOR considers that the method of assembly or installation does not produce satisfactory EQ drains, alter the assembly procedure, the installation method and/or equipment as necessary to comply with this Supplemental Technical Specification. The EOR or the GEOR will determine the adequacy of the Contractor's methods and equipment.

5.0 CONSTRUCTION REQUIREMENTS

5.1 Install EQ drains as indicated on the plans or as directed by the EOR and GEOR and install in stages coinciding with construction stages.

5.2 Install the EQ drains using a mandrel or a sleeve to advance through the soils to the bottom elevations shown on the plans. Size the equipment to minimize the disturbance of the subsoil during the installation operation. Install the EQ drains using equipment that will maintain the mandrel in a vertical position. The mandrel or sleeve shall protect the drain material from tears, cuts, and abrasion during installation and shall be retracted after each earthquake drain is installed. Fit the mandrel with 3 symmetrically spaced fins for transmitting vibrations to the soil during installation. The mandrel or sleeve shall be sufficiently stiff to prevent wobble or deflection during installation. In no case will alternative raising and lowering of the mandrel during advancement be permitted. Permit the raising of the mandrel only after completion of the EQ drain installation to

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the EQ drain bottom elevation shown on the plans or as otherwise authorized by the GEOR.

5.3 Consider the subsoils at the site when selecting equipment and developing the EQ Drain Installation Plan. On the EQ drain installation rig, utilize a vibrator with an eccentric moment sufficient to generate vertical vibration to the mandrel during installation. The equipment shall also generate sufficient vertical force (static crowd) to the mandrel to install the earthquake drains through all existing subsurface materials to the depths shown on the plans. The equipment shall have sufficient power to penetrate into the materials underlying the potentially liquefiable stratum. Use equipment having the capability of installing the EQ drains to at least 5 feet deeper than the maximum EQ drain depth shown on the plans. Select equipment that will not force the fill soil into the existing soil, nor disturb the fill soil, nor cause any bearing capacity problems with the subgrade soils due to the weight of the equipment.

5.4 Install EQ drains using a continuous push using static weight and vibration. Jetting or the use of an impact hammer will not be allowed to install the EQ drains.

5.5 Provide the EQ drain with an "anchor" plate or similar arrangement to anchor the bottom of the drain at the required depth during mandrel removal and to prevent soil from entering the bottom of the mandrel during EQ drain installation. The anchorage shall be adequate to keep the bottom of the EQ drain at the required depth subject to approval and field verification by the EOR. The corresponding dimension of the anchor shall conform as closely as possible to the breadth dimensions of the mandrel to minimize soil disturbance.

5.6 Notify the Department at least 3 working days prior to installation of the initial EQ drains at the location(s) shown on the plans to allow the Department sufficient time to provide the necessary inspection for the initial EQ drain installation. Do not begin installation of the initial EQ drains at the location(s) indicated without the presence of the EOR or his/her representative. During the installation of the initial 10 EQ drains at the indicated location(s), demonstrate that the equipment, method, and material produce a satisfactory installation, as determined by the EOR. Following completion of the initial EQ drain installations at the indicated location(s), do not proceed with the installation of the remaining EQ drains until authorized by the EOR.

5.7 Since foundations may have been previously installed, install the EQ drains in a manner to minimize the impact to these foundations. The location of the EQ drains relative to the foundations shall be determined and staked out prior to the installation of the EQ drains. In addition, take precautions to preserve the stake locations and re-stake EQ drains locations as necessary.

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5.8 Using a baseline and benchmark determined by the Contractor, locate, number, and stake out the EQ drains. All other construction staking, for taking precautions to preserve the stake locations, and for re-staking, if necessary, is the responsibility of the Contractor. Do not vary the as-installed locations of the EQ drains by more than 12 inches from the locations designated on the plans or approved shop drawings.

5.9 EQ drains that deviate from the plan locations by more than 12 inches, that are damaged, or improperly installed will be rejected. Abandon in place rejected EQ drains. Place replacement EQ drains as close as possible to the correct original locations.

5.10 Provide the EOR with a means of verifying the plumbness of the mandrel and determining the depth of the EQ drains. Check the equipment for plumbness prior to installing each drain. A deviation from the vertical of no more than 2 percent (2%) during installation is allowed.

5.11 Install EQ drains from the working surface to the EQ drain bottom elevations shown on the plans or to refusal. Refusal is defined as the point where the soils resist a reasonable effort at further penetration of the EQ drains. The GEOR will establish refusal criteria based on the existing soil borings and the initial EQ drain installations to be performed by the EQ Drain Installer in the presence of the EOR or his/her representative, as specified herein. Terminate no EQ drains above the design EQ drain bottom elevations shown on the plans without the approval of the GEOR. The GEOR may vary the depths, spacing, and/or number of EQ drains to be installed, and may revise the plan limits for this work based on the actual subsurface conditions encountered.

5.12 Cut off the EQ drains neatly approximately 6 inches above the working surface, unless otherwise shown on the plans. The filter fabric shall be knotted at the top of the drain to prevent soil from entering the drain.

5.13 Provide the EOR with a means of determining the depth of the advancing EQ drain at any given time and the length of the drain installed at each location. Submit a summary tabulation of the number and length (to nearest 1/2 of a foot) of acceptable EQ drains daily to the EOR.

5.14 Where obstructions are encountered below the working surface, install a new drain within an 18-inch radius of the original location of the obstructed EQ drain. As directed by the EOR make a maximum of 2 additional installation attempts for each obstructed EQ drain. If the EQ drain still cannot be installed to the design bottom elevation, abandon the EQ drain location and install a new EQ drain at a location determined by the EOR in consultation with the GEOR. Clearly mark in the field the locations where EQ drains do not meet the depth criteria due to obstructions. The EOR in consultation with the GEOR has the right to waive the replacement EQ drain requirement upon written notice to the Contractor and EQ Drain Installer.

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5.15 Preaugering or spudding for the EQ drain installation shall be allowed to advance the EQ drains through compacted fill material or other obstructions. Penetrate the overlying fill material or any dense layers or obstructions when encountered to satisfactorily install the EQ drains. Obstructions are defined as any man-made or natural object or strata that prevents the proper insertion of the mandrel and installation of the EQ drain.
5.16 The Contractor may use augering, spudding, or other approved methods to loosen the soil and obstructing material prior to the installation of the EQ drains. The obstruction clearance procedure is subject to the approval of the EOR; however, such approval shall not relieve the Contractor or the EQ Drain Installer of the responsibility to clear obstructions in accordance with the specifications.

5.17 If augering is the selected method, the augers shall have a minimum outside diameter equal to the largest horizontal dimension of the mandrel, shoe, or anchor, whichever is greatest. The maximum outside diameter of the auger shall be no more than 3 inches greater than the maximum dimension of the mandrel.

5.18 Limit the use of obstruction clearance procedures and use only when approved by the EOR. Penetrate no more than 3 feet beneath the obstruction when using augering or other obstruction removal techniques.

5.19 Provide the EOR with "As-Built" plans of the EQ drain installation. Include in the plans the location, the date installed, and the length of each EQ drain below the fill soil surface elevation. In addition, include on the "As-Built" EQ drain plans the fill soil surface elevation at each location, the "As-Built" EQ drain bottom elevation, and identify any rejected or abandoned EQ drain installations. Submit "As-Built" plans at least weekly during EQ drain installation operations. Submit a final "As-Built" EQ drain plan within 7 calendar days of the completion of EQ drain installation in all embankment locations. The final "As-Built" plans will be subject to the approval of the EOR.

6.0 METHOD OF MEASURMENT

6.1 Furnish all materials, supervision, equipment, mobilization, crews, tools, required permits, survey stake out of EQ drain locations, and other equipment and materials as necessary to properly execute the work. In addition, this item includes clearing of obstructions and the proper disposal of surplus materials brought to the ground surface by obstruction clearance, ifrequired.

6.2 Measure the length of acceptably installed EQ drains for liquefaction mitigation to the nearest 1/2 foot. Do not include in the length of drains that are not anchored to the required depth, unless previously approved by the GEOR and the EOR in writing.

6.3 The GEOR may vary the depths, spacing, or numbers of EQ drains to be installed

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and may revise the EQ drain installation limits shown on the plans based on the actual subsurface conditions encountered. Such changes or revisions may increase or decrease the total quantity of the EQ drains estimated based on the plans.

7.0 BASIS OF PAYMENT

7.1 Lump Sum Payment will be based on the total of the acceptably installed EQ drains.

7.2 No payment will be made for EQ drains, or for any delays or expenses incurred through changes necessitated by improper material or equipment. No payment will be made for EQ drains placed deeper than the tip elevation designated on the plans unless authorized in writing by the EOR.

7.3 Payments shall be made under:

Item No.	Pay Item	Pay Unit
SS 802	Earthquake Drains	LUMP SUM