FOREST SERVICE

SUPPLEMENTAL SPECIFICATIONS

For

MCINERNIE CREEK
CULVERT REPLACEMENT
NSFR 38 MP 22.68

U.S.D.A. FOREST SERVICE
FLATHEAD NATIONAL FOREST

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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.

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_9_5_2018

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.

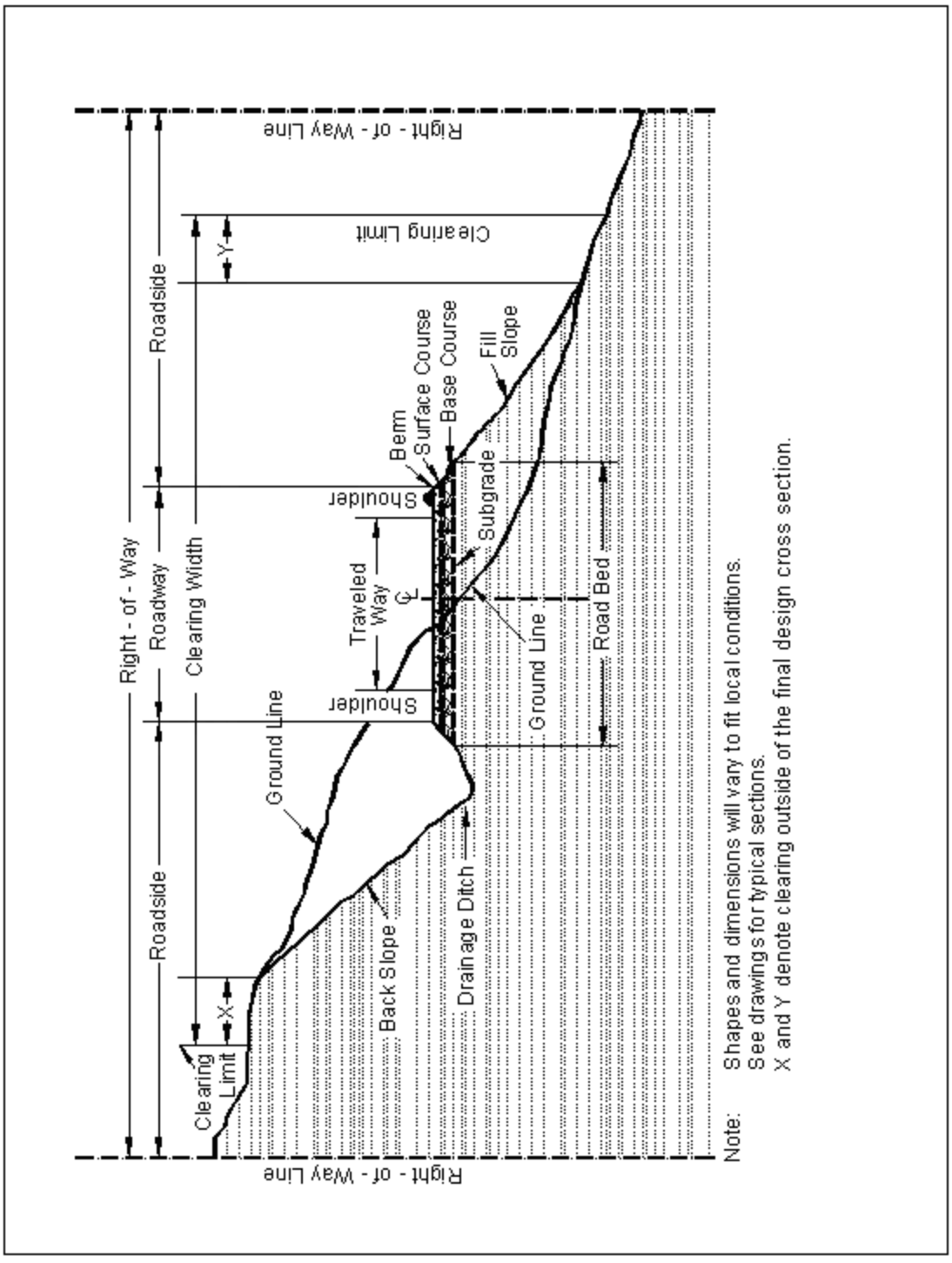
Road Order — An order affecting and controlling traffic on roads under Forest Service jurisdiction. Road Orders are issued by a designated Forest Officer under the authorities of 36 CFR, part 260.

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.

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

Figure 101-1—Illustration of road structure terms.



102 - Bid¸ Award¸ and Execution of Contract

102.00_National_11_9_2016

Delete Section 102 in its entirety.

Delete Section 102.

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.

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.

105 - Control of Material

105.02_National_11_1_2016

Add the following to Subsection 105.02(a):

105.02(a) Government-provided sources.

Government-provided sources for this project are identified as follows:

(1) Government-provided sources.

Pay Item	Description	Material source number or name
25101	**Riprap**	Murray Pit, NFSR 11071, MP 0.3 T29N, R16W,S20 or as directed by CO
30207	**Crushed Aggregate Surfacing**	007 Pit, NFSR 5301, MP 0.9 T30N, R18W,S25 or as directed by CO
64804 & 64806	**Streambed Channel Rock, Class CR-1**	Murray Pit, NFSR 11071, MP 0.3 T29N, R16W,S20 or as directed by CO
	Waste Site (Unsuitable)	Murray Pit, NFSR 11071, MP 0.3 T29N, R16W,S20 or as directed by CO

105.02_National_7_10_2017

Add the following to Subsection 105.02 (a):

105.02 (a) Government-provided sources.

Complete any pit or quarry development specified for a designated source, even when material is not obtained from the source.

105.02_National_11_1_2016

Add the following to Subsection 105.02c:

105.02(c) Contractor-located sources.

All material (e.g., soil, gravel, sand, borrow, aggregate, etc.) transported onto National Forest System land or incorporated into the work shall be weed-free. The Contracting Officer may request written documentation of methods used to determine the weed-free status of any and all materials furnished by the contractor. Contractor-provided expertise and methods to establish weed-free status must be appropriate for the weeds of concern in the local area.

A Forest Service weed specialist will inspect proposed sources to determine weed-free status. Provide the Contracting Officer written notification of proposed material sources **14** days prior to use. Written approval of the specific source will be provided to the contractor by the CO. If weed species are present in the proposed source, appropriate mitigation measures may allow conditional use of the source as required by the Contracting Officer.

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;
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 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.

107 - Legal Relations and Responsibility to the Public

107.05_National_7_18_2017

Delete Subsection 107.05:

Delete Subsection 107.05.

108 - Prosecution and Progress

108.00_National_11_9_2016

Delete Section 108 in its entirety.

Delete Section 108.

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.

109.02_National_11_9_2016

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.

151 - Mobilization

151.01 Description

Add the following at the end of the last sentence:

Work also includes cleaning of all equipment used at the project site. Clean all construction equipment prior to entry on the project site. Remove all dirt, plant parts and material that may carry noxious weed seeds into the area. Construction equipment includes all construction heavy equipment, service vehicles, all highway-legal trucks (including dump trucks, cement trucks, water trucks, etc.), and trailers (including lowboys), except cars. Unless otherwise agreed, the Contractor shall give the Forest Service at least 24 hours' notice when equipment is ready for inspection. Only construction equipment inspected by the Forest Service will be allowed to operate within the project area. Treat subsequent move-ins of equipment the same as the initial move-in. Clean truck beds and dump boxes hauling to the project site prior to entering the work area.

152 - Construction Survey and Staking

Add the following to Subsection 152.04(c):

152.04 General.

(c) Material.

Use required stake dimensions and materials. Pre-paint the top 2 inches of all stakes and lath, or mark them with plastic flagging. Use designated colors for paint or flagging. Mark all stakes with a stake pencil that leaves a legible imprint, or with waterproof ink.

Do not use aerosol spray paints.

Use moisture-resistant paper for survey notes. Keep notes in books with covers that will protect the contents and retain the pages in numerical sequence.

Make the following changes to Subsection 152.05:

152.05 Survey and Staking Requirements.

Delete Subsection 152.05(d)(2) and replace with the following:

(d) Slope and reference stakes.

(2) Conventional survey methods. When required, locate slope stakes on designated portions of the road. Locate the slope stake catch points and use them to establish clearing limits and slope stake references.

Mark slope stakes with the station, the amount of cut or fill, the horizontal distance to centerline, and the slope ratios.

Place slope reference stakes at least 10 feet outside the clearing limit and mark with the offset distance to the slope stake. Place sight stakes when required.

Prior to clearing and grubbing operations, move the slope stake outside the clearing limit to the slope reference stake. After clearing and grubbing and before excavation, reset the slope stakes in their original position.

Use the designated method to establish the slope stake catchpoint.

Method I—Computed Method. Use the template information shown in the plans or other Government-provided data to calculate the actual location of the catchpoint. The slope stake "catchpoint distance" provided may be used as a trial location to initiate slope staking. Recatch slope stakes on any section that does not match the staking report within the tolerances established in Table 152-2.

Method II—Catchpoint Measurement Method. Determine the location of slope stake catchpoints by measuring the catchpoint distances shown in the plans or other Government-provided data.

Add the following to Subsection 152.05(e):

(e) Clearing and grubbing limits.

Mark the clearing limits with flagging or tags on trees to be left standing, or on lath. Make markings intervisible, and no more than 90 feet apart.

After establishing clearing limits, move the location line stake outside the clearing limits for station identification purposes, and mark it with horizontal distance to location line.

Replace Table 152-1 with the following:

Table 152-1 Construction Survey and Staking Tolerances

Table 152-1
Construction Survey and Staking Tolerances (1)

Staking Phase	Horizontal	Vertical
Control points set from existing Government control points- Tolerance Class A	±0.03 feet (±10 millimeters)	±0.01 feet × $\sqrt{N}$ (±3 millimeters × $\sqrt{N}$)(2)
Mapping, topography, and cross-section Points- Tolerance Class A	±0.16 feet (±50 millimeters)	±0.16 feet (±50 millimeters)
Centerline points (3) including (PC), (PT), (POT),(POC), and references- Tolerance Class A	±0.06 feet (±20 millimeters)	±0.06 feet (±20 millimeters)
Slope-stake and slope-stake references- Tolerance Class A (4)	±0.16 feet (±50 millimeters)	±0.16 feet ±50 millimeters)
Culverts, ditches, and minor drainage structures stakes- Tolerance Class A	±0.16 feet (±50 millimeters)	±0.06 feet (±20 millimeters)
Retaining walls stakes	±0.06 feet (±20 millimeters)	±0.03 feet (±10 millimeters)
Curb and gutter stakes	±0.06 feet (±20 millimeters)	±0.03 feet (±10 millimeters)
Bridge substructures stakes	±0.03 feet (±10 millimeters)(5)	±0.03 feet (±10 millimeters)
Bridge superstructures stakes	±0.03 feet (±10 millimeters)(5)	±0.03 feet (±10 millimeters)
Clearing and grubbing limit stakes- Tolerance Class A	±1.00 feet (±300 millimeters)	–
Roadway subgrade finish stakes- Tolerance Class A (6)	±0.16 feet (±50 millimeters)	±0.03 feet (±10 millimeters)
Roadway finish grade stakes (6)	±0.16 feet (±50 millimeters)	±0.03 feet (±10 millimeters)

Table 152-1

Construction Survey and Staking Tolerances (continued) (1)

Staking Phase	Horizontal	Vertical
Control points set from existing Government control points –Tolerance Class B (7)	±0.16 feet (±20 millimeters)	±0.16 feet × $\sqrt{N}$ (±20 millimeters × $\sqrt{N}$)(2)
Mapping, topography, and cross-section points–Tolerance Class B (7)	±1.00 feet (±300 millimeters)	±0.50 feet (±150 millimeters)
Centerline points including (PC), (PT), (POT),(POC), and references–Tolerance Class B (7)	±0.16 feet (±20 millimeters)	±0.16 feet (±20 millimeters)
Slope-stake and slope-stake references–Tolerance Class B (7)	±0.50 feet (±50 millimeters)	±0.16 feet ±50 millimeters)
Culverts, ditches, and minor drainage structures stakes–Tolerance Class B (7)	±0.50 feet (±150 millimeters)	±0.16 feet (±20 millimeters)
Clearing and grubbing limit stakes–Tolerance Class B (7)	±2.00 feet (±600 millimeters)	—
Roadway subgrade finish stakes–Tolerance Class B (7)	±0.50 feet (±50 millimeters)	±0.16 feet (±10 millimeters)
Roadway finish grade stakes–Tolerance Class B (7)	±0.50 feet (±50 millimeters)	±0.16 feet (±10 millimeters)

(1) At statistical 95 percent confidence level. Tolerances are relative to existing Government control points.

(2) N is the number of instrument setups.

(3) Centerline points: PC - point of curve, PT - point of tangent, POT - point on tangent, POC - point on curve.

(4) Take the cross-sections normal to the centerline ±1 degree.

(5) Bridge control is established as a local network and the tolerances are relative to that network.

(6) Includes paved ditches.

(7) Tolerance Class B for Very Low Volume Roads with an aggregate or native finished surface.

153 - Contractor Quality Control

153.02_National_2_8_2019

Delete Subsection 153.02 and replace with the following:

153.02 Qualifications.

Submit the following for approval with the quality control plan:

(a) Quality control manager (QCM). Furnish a QCM who has at least 2 years' experience in construction, inspector, quality control and material testing on construction projects of similar type and scope.

(b) Testers. Provide testers with at least one year experience in the type of sampling and testing required, and with one of the following for the type of sampling and testing performed:

(1) NICET Level II certification in highway material or equivalent state or industry certification;

(2) Certification by a regional certification program (such as Western Alliance for Quality Transportation Construction (WAQTC), Northeast Transportation Technician Certification Program (NETTCP), Southeast Task Force for Technician Training and Qualification (STFTTQ), or Multi Regional Training and Certification (M-TRAC)); or

(3) At least one year employment by an AASHTO accredited laboratory performing equivalent sampling and

153.03_National_2_8_2019

Add the following paragraph to the end of Subsection 153.03(b):

153.03 Quality Control Plan.

(b) Quality Control Procedures.

Submit written proposals for approval of alternate AASHTO or State approved test methods. Alternate methods may be allowed based on documented equivalence to the specified method.

153.03_National_11_1_2016

Add the following to the end of Subsection 153.04(a)(2):

At a minimum the contractor shall provide project submittals as shown on the below Submittal Log. Submittal requirements are listed in the Standard Specifications, Supplemental Specifications, and Plans.

Submittal Log					
Log No.	**Incidental to Pay Item(s)**	**Description of Submittal**	**Type of Submittal**	**Requirement found in Specification No. /Drawings**	**Additional Specification References**
1	151	Weed Free Material Source Certification	Material Certification	FSSS 105.02(c)	
2	151	Spill Prevention, Control, and Countermeasure (SPCC) Plan	Plan	107.10	
3	151	Contractor Quality Control Plan	Plan	153.02	
4	151	Traffic Control Plan	Plan	FSSS 156.03	
5	157	Dewatering and Soil Erosion and Pollution Control Plan	Plan	FSSS 157.04	
6	208	Excavation Plan	Plan	208.03	
7	208	Material Moisture/Density Testing	Test Results	Table 208-1	106
8	208	Culvert Backfill Compaction Testing	Test Results	208.11, 208.12	106
9	272	Geocell Abutment Stabilization	Material Certification	272.06	106, FSSS 736, Drawings
10	272	Geocell: Course Granular Backfill	Material Certification	272.06	106, FSSS 703.03, Drawings
11	272	Geocell: Geotextile – Type II	Material Certification	272.06	106, 714, Drawings
12	552	Structural Concrete: Mix Design	Mix Design	552.03	Drawings
13	552	Structural Concrete: Testing	Test Results	552.20	106, Drawings
14	552	Reinforcing Steel	Material Certification	709.01	Drawings
15	552	Miscellaneous Material: Grout	Material Certification	725	Drawings
16	552	Welder Certification	Copy of Certification	Sheet 2 of Plans	
17	552	Precast Concrete Structures	Shop Drawing	FSSS 552.11(b)(6)	104, 554
18	552	Precast Concrete Structures: Industry Certification	Fabrication Certification	FSSS 552.11(b)(6)	
19	552	Precast Concrete Structures: Testing	Test Results	FSSS 552.11(b)(6)	106, 554, 562
20	603	Structural Plate Structures	Material Certification	603.04	106, Drawings
21	603	Structural Plate Structures	Assembly Instructions	603.04	106, Drawings

Submittal Log					
Log No.	**Incidental to Pay Item(s)**	**Description of Submittal**	**Type of Submittal**	**Requirement found in Specification No. /Drawings**	**Additional Specification References**
22	622	Equipment Rental	Equipment Approval	FSSS 622.02	

153.07_National_2_8_2019

Delete Subsection 153.07 and replace with the following:

153.07 Records and control charts.

Maintain complete testing and inspection records by pay item number and make them accessible to the CO.

155 - Schedules for Construction Contracts

155.00_National_11_9_2016

Delete Section 155 in its entirety.

Delete Section 155.

156 - Public Traffic

156.00_National_2_8_2019

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. Delays may not exceed **30** minutes at any one time followed by an open period of no less than **15** minutes. 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
Temporary Road Closures

Road Number	From Terminus	To Terminus	Maximum Consecutive Days of Closure	Minimum Consecutive Days Open
38	**Intersection with Road 11071**	**Intersection with Road 1624**	**28**	**N/A**

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.

157 - Soil Erosion and Sediment Control

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.

Delete the first two paragraphs and replace with the following:

Submit a Dewatering Plan along with a Soil Erosion and Pollution Control Plan detailing permanent and temporary control measures to minimize erosion and sedimentation during and after construction in accordance with the plans. Do not modify the type, size, or location of any control or practice without approval. Submit the erosion control plan proposal at least 7 days before operations begin to the CO for approval.

Reflect in the Dewatering Plan and Soil Erosion and Pollution Control Plan special concerns and measures necessary to protect resources and government improvements. Include:

(a) The construction activities and sequence of implementation relating to specific erosion control measures.

(b) The location and type of permanent controls to be implemented during construction.

(c) The location and type of temporary controls to be implemented during construction. The following pollution prevention measures are a requirement for endangered species protection:

i. All equipment will be inspected for leaks prior to commencing work each day and any identified problems corrected before equipment is allowed to operate.

ii. Fueling, maintenance and staging of equipment will occur in designated areas away from water bodies.

iii. A spill containment kit will be available onsite at all times during construction, and proper notification procures will be in place in the event of a hazardous release.

iv. Absorbent pads will be placed beneath fuel tanks during fueling and maintenance. Pads will also be placed under any pumps while operating.

(d) For work in stream channels with running water a detailed dewatering plan is required. The following dewatering, fish salvage, and turbidity control measures are a requirement for endangered species protection:

i. All instream work must be completed during the designated instream fisheries work window.

ii. The Contracting Officer shall be notified at least 72 hours in advance of commencing dewatering and re-watering activities.

iii. The Contractor shall coordinate and participate in the fish salvage operations in cooperation with the Contracting Officer's fisheries biologist(s). The Contracting Officer will provide fisheries biologists and capture equipment to lead the fish salvage effort. The Contractor shall provide pumps, equipment,

labor and resources during the fish salvage operations to ensure fish passage and flow conditions per the Drawings and specifications.

iv. Work area isolation and fish capture activities will occur during periods of the coolest air and water temperatures possible, normally early in the morning, and during conditions appropriate to minimize mortality for the species present. Electrofishing during cooler water temperatures would reduce the stress levels of salmonids.

v. Flows will be completely diverted around the instream work site through a combination of pumping and/or pre-approved, alternative methods and returned to the channel below the project area. Pump screen openings shall not exceed 3/32 or 0.0938 inches (2.38 mm). If the diversion inlet is not screened, the diversion outlet will be placed in a location that facilitates safe reentry of fish into the stream channel.

vi. Flow diversion structures will be constructed with sand bags covered with plastic sheeting. Cofferdams, portable bladder dams, or other technologies constructed of non-erodible material may also be used to contain stream flow.

vii. Once channel rehabilitation is complete, the streambed will be washed and sediment-laden water within the isolation area should be pumped to the forest floor and not allowed to return to the stream. Once the isolated streambed is washed, water will be slowly released back into the channel to minimize sediment suspension, reaching full streamflow over a period of at least one hour.

(e) For work in stream channels without flowing water describe level of ground and vegetative disturbance and measures to reduce potential sediment delivery.

201 - Clearing and Grubbing

201.04_National_11_2_2016

Add the following paragraph to Subsection 201.04:

201.04 Clearing.

(e) Do not cut vegetation less than 3 feet in height and less than 3 inches in diameter that is within the clearing limits but beyond the roadway and not in a decking area and that does not interfere with sight distance along the road unless otherwise designated.

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

201.06 Disposal.

Merchantable timber is the Government's property. Limb and deck merchantable timber on site as directed by the CO.

Measurement

Delete this subsection 201.08 and replace with the following:

201.08. Do not measure clearing and grubbing for payment.

203 - Removal of Structures and Obstructions

203.04_National_2_8_2019

Make the following changes to Subsection 203.04(b):

203.04 (b) General.

Delete the fifth paragraph of Subsection 203.04(b) and replace with the following:

Remove structures and obstructions in the roadbed to 12 inches (300 millimeters) below subgrade elevation. Remove structures and obstructions outside the roadbed to 12 inches (300 millimeters) below finished ground or to the natural stream bottom.

Delete the seventh paragraph of Subsection 203.04(b) and replace with the following:

When abandoning an existing culvert pipe, remove the upstream and downstream portion of the culvert to within 12 inches (300 millimeters) of the subgrade or embankment slope. Ensure the abandoned pipe is at least 48 inches (1200 millimeters) from a new culvert or structure. Seal the abandoned culvert ends with a tight-fitting plug of concrete at least 6 inches (150 millimeters) thick. Ensure the structure does not entrap water.

203.05_National_2_8_2019

Add the following to Subsection 203.05:

203.05 Disposing of Material.

(e) Windrowing Construction Slash. Place construction slash outside the roadway in neat, compacted windrows approximately parallel to and along the toe line of embankment slopes. Do not permit the top of the windrows to extend above subgrade. Use construction equipment to matt down all material in a windrow to form a compact and uniform pile. Construct breaks of at least 15 feet at least every 200 feet in a windrow. Do not place windrows against trees.

(f) Scattering. Scatter construction slash in designated areas without damaging trees. Limb all logs. Place logs and stumps away from trees, positioned so they will not roll, and are not on top of one another. Limb and scatter other construction slash to reduce slash concentrations. When scattering for erosion control, place construction slash as flat as practicable on the completed slope.

(g) Chipping. Use an approved chipping machine to chip slash longer than 3 feet. Deposit chips on embankment slopes or outside the roadway to a loose depth less than 6 inches. Minor amounts of chips or ground woody material may be permitted within the roadway if they are thoroughly mixed with soil and do not form a layer.

(h) Debris Mat. Use tree limbs, tops, cull logs, split stumps, wood chunks, and other debris to form a mat upon which construction equipment is operated. Place stumps upside down and blend stumps into the mat.

(i) Decking. Remove brush from designated log deck areas. Limb and top logs.

Logs not meeting the Utilization Standards described in Subsection 201.04(c) shall be cut to lengths less than **8** feet and decked in designated log deck location.

Merchantable timber not associated with an existing timber sale shall be cut to length meeting the Utilization Standards described in Subsection 201.04(c).

Deck logs so that logs are piled parallel to one another; can be removed by standard log loading equipment; will not damage standing trees; will not interfere with drainage, and will not roll. Keep logs in log decks free of brush and soil.

(j) Removal to designated locations. Remove construction slash to designated locations.

(k) Piling. Pile construction slash in designated areas. Place and construct piles so that if the piles are burned, the burning will not damage remaining trees. Keep piles free of dirt from stumps.

204 - Excavation and Embankment

Delete Section 204 in its entirety and replace with the following:

Section 204. — Excavation and Embankment

Description

204.01 This work consists of excavating material and constructing embankments. This work also includes furnishing, hauling, stockpiling, placing, disposing, sloping, shaping, compacting, and finishing earthen and rocky material.

204.02 Definitions.

(a) Excavation. Excavation consists of the following:

(1) Roadway excavation. Material excavated from within the right-of-way or easement areas, except subexcavation covered in Subsection 204.02(a)(2) and structure excavation covered in Sections 208 and 209. Roadway excavation includes all material encountered regardless of its nature or characteristics.

(2) Subexcavation. Material excavated from below subgrade elevation in cut sections or from below the original ground-line in embankment sections. Subexcavation excludes the work required by Subsection 204.05 or 204.06.

(3) Borrow excavation. Material used for embankment construction that is obtained from outside the roadway prism. Borrow excavation includes unclassified borrow, and topping.

(b) Embankment construction. Embankment construction consists of placing and compacting roadway or borrow excavation. This work includes:

(1) Preparing foundation for embankment;

(2) Constructing roadway embankments;

(3) Benching for side-hill embankments;

(4) Constructing dikes, ramps, mounds, and berms; and

(5) Backfilling subexcavated areas, holes, pits, and other depressions.

(c) Conserved topsoil. Excavated material conserved from the roadway excavation and embankment foundation areas that is suitable for growth of grass, cover crops, or native vegetation.

(d) Waste. Excess and unsuitable roadway excavation and subexcavation that cannot be used.

Material

204.03 Conform to the following Subsections:

Topping	704.05
Unclassified borrow	704.06
Water	725.01(c)

Construction Requirements

204.04 Preparation for Roadway Excavation and Embankment Construction. Clear the area of vegetation and obstructions according to Sections 201 and 203.

Road pioneering, slash disposal, and grubbing of stumps may proceed concurrently with excavation and embankment. Maintain drainage during pioneering operations.

204.05 Conserved Topsoil. When designated, conserve topsoil from roadway excavation and embankment foundation areas. Stockpile conserved topsoil in low windrows immediately beyond the rounding limits of cut and embankment slopes or in other approved locations. Separate conserved topsoil from other excavated material. When designated, place conserved topsoil on completed slopes according to Section 624.

204.06 Roadway Excavation. Excavate as follows:

(a) Rock cuts. Blast rock according to Section 205. Excavate rock cuts to 6 inches (150 millimeters) below subgrade within the roadbed limits. Backfill to subgrade with topping or other suitable material. Compact the material according to Subsection 204.11.

(b) Earth cuts. Scarify earth cuts to 6 inches (150 millimeters) below subgrade within the roadbed limits. Compact the scarified material according to Subsection 204.11.

(c) Pioneer Roads. Conduct excavation and placement operations so material to be treated under Section 201 will not be incorporated into the roadway unless specified in the slash treatment method. Maintain drainage during pioneering operations.

Remove snow and ice in advance of the work and deposit beyond the roadway limits in a manner that will not waste material or generate sediment. Do not incorporate snow and ice into embankments. Place snow or ice in a manner to prevent resource damage.

(d) Drainage Feature. Drainage feature includes construction of all ditches, minor channel changes, drainage dips, catch basins, surface water deflectors, and other minor drainage structures. Compact the material according to Subsection 204.11. Excavate on a uniform grade between control points.

Do not disturb material and vegetation outside the construction limits. Retrieve material deposited outside the construction limits. Dispose of unsuitable or excess excavation material according to Subsection 204.14. Replace shortage of suitable material caused by premature disposal of roadway excavation.

Shape to drain and compact the work area to a uniform cross-section at the end of each day's operations.

204.07 Subexcavation. Excavate material to the required limits. Dispose of unsuitable material according to Subsection 204.14. Take cross-sections according to Section 152. Backfill subexcavated area with suitable material in horizontal layers not exceeding 12 inches (300 millimeters) in compacted thickness and compact according to Subsection 204.11. Prevent unsuitable material from mixing with suitable backfill material.

204.08 Borrow Excavation. Use suitable roadway excavation in embankment construction. Do not use borrow excavation when it results in excess roadway excavation. Deduct excess borrow excavation from the total borrow excavation quantity.

Obtain borrow source approval according to Subsection 105.02. Develop and restore borrow sources according to Subsections 105.03 and 105.06. Do not excavate beyond the established limits. When applicable, shape the borrow source to permit accurate measurements when excavation is complete.

204.09 Preparing Foundation for Embankment Construction. Prepare foundation for embankment construction as follows:

(a) Embankment over natural ground. Remove topsoil and break up the ground surface to a minimum depth of 6 inches (150 millimeters) by plowing or scarifying. Compact the ground surface according to Subsection 204.11.

(b) Embankments over an existing asphalt, concrete, or gravel road surface. Scarify gravel roads to a minimum depth of 6 inches (150 millimeters). Scarify or pulverize asphalt and concrete roads to 6 inches (150 millimeters) below the pavement. Reduce particles to a maximum size of 6 inches (150 millimeters) and produce a uniform material. Compact the surface according to Subsection 204.11.

(c) Embankment across ground not capable of supporting equipment. Dump successive loads of embankment material in a uniformly distributed layer to construct the lower portion of the embankment. Limit the layer thickness to the minimum depth necessary to support the equipment.

(d) Embankment on an existing slope steeper than 1V:3H. Cut horizontal steps in the existing slope to a sufficient width to accommodate placement and compaction operations and equipment. Step the slope as the embankment is placed and compacted in layers. Begin each step at the intersection of the original ground and the vertical cut of the previous step.

204.10 Embankment Construction. Incorporate only suitable roadway excavation material into the embankment. When the supply of suitable roadway excavation is exhausted, furnish unclassified borrow to complete the embankment. Obtain written approval before beginning construction of embankments over 6 feet (2 meters) high at subgrade centerline. Construct embankments as follows:

(a) General. At the end of each day's operations, shape to drain and compact the embankment surface to a uniform cross-section. Eliminate ruts and low spots that could hold water.

During all stages of construction, route and distribute hauling and leveling equipment over the width and length of each layer of material.

Compact embankment side slopes with a tamping foot roller, by walking with a dozer, or by over-building the fill and then removing excess material to the final slope line. For slopes 1V:1¾H or steeper, compact the slopes as embankment construction progresses.

(b) Embankment within the roadway prism. Place embankment material in horizontal layers not exceeding 12 inches (300 millimeters) in compacted thickness. Incorporate oversize boulders or rock fragments into the 12-inch (300-millimeter) layers by reducing them in size or placing them individually as required below. Compact each layer according to Subsection 204.11 before placing the next layer.

Material composed predominately of boulders or rock fragments too large for 12-inch (300-millimeter) layers may be placed in layers up to 24 inches (600 millimeters) thick. Incorporate oversize boulders or rock fragments into the 24-inch (600-millimeter) layer by reducing them in size or placing individual rock fragments and boulders greater than 24 inches (600 millimeters) in diameter as follows:

(1) Reduce rock to less than 48 inches (1200 millimeters) in the largest dimension;

(2) Distribute rock within the embankment to prevent nesting;

(3) Place layers of embankment material around each rock to a depth not greater than that permitted above. Fill voids between rocks; and

(4) Compact each layer according to Subsection 204.11(a) before placing the next layer.

(c) Embankment outside of roadway prism. When placing embankment outside the staked roadway prism, place material in horizontal layers not exceeding 24 inches (600 millimeters) in compacted thickness. Compact each layer according to Subsection 204.11.

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

(a) Placement 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 204.11(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 204.11(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 204.11(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.

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) Placement 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) Placement 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) Placement 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) Placement 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) Placement 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.

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

204.12 Drainage Features. Slope, grade, and shape all drainage features. Remove projecting roots, stumps, rock, or similar matter. Maintain all drainage features in an open condition and without sticks, and other debris.

Form furrow ditches by plowing or using other acceptable methods to produce a continuous furrow. Place excavated material on the downhill side so the bottom of the ditch is approximately 18 inches (450 millimeters) below the crest of the loose material. Clean the ditch using a hand shovel or other suitable method. Shape to provide drainage without overflow.

204.13 Sloping, Shaping, and Finishing. Complete subgrade, slopes, drainage features, culverts, riprap, and other underground minor structures before placing aggregate courses. Slope, shape, and finish to the designated tolerance class as defined in Table 204-2 as follows:

(a) Sloping. Leave earth slopes with uniform roughened surfaces, except as described in Subsection 204.13(b), with no noticeable break as viewed from the road. Except in solid rock, round tops and bottoms of slopes including the slopes

of drainage ditches. Round material overlaying solid rock to the extent practical. Scale rock slopes. Slope rounding is not required on tolerance class D through M roads.

If a slide or slipout occurs on a cut or embankment slope, remove or replace the material and repair or restore damage to the work. Bench or key the slope to stabilize the slide. Reshape the cut or embankment slope to an acceptable condition.

(b) Stepped slopes. Where required, construct steps on slopes of 1⅓V:1H to 1V:2H. Construct the steps approximately 18 inches (450 millimeters) high. Blend the steps into natural ground at the end of the cut. If the slope contains non-rippable rock outcrops, blend steps into the rock. Remove loose material found in transitional area. Except for removing large rocks that may fall, scaling stepped slopes is not required.

(c) Shaping. Shape the subgrade to a smooth surface and to the cross-section required. Shape slopes to gradually transition into slope adjustments without noticeable breaks. At the ends of cuts and at intersections of cuts and embankments, adjust slopes in the horizontal and vertical planes to blend into each other or into the natural ground.

(d) Finishing. Ensure that the subgrade is visibly moist during shaping and dressing; smooth and uniform, and shaped to conform to the typical sections. Remove material larger than 6 inches (150 millimeters) from the top 6 inches (150 millimeters) of the roadbed. Remove unsuitable material from the roadbed, and replace it with suitable material. Scarify to 6 inches (150 millimeters) below the bottom of low sections, holes, cracks, or depressions and bring back to grade with suitable material.

Maintain proper ditch drainage.

204.14 Disposal of Unsuitable or Excess Material. Dispose of unsuitable or excess material at designated sites or according to Subsection 203.05(a)

When there is a pay item for waste, shape and compact the waste material in its final location. Do not mix clearing or other material not subject to payment with the waste material.

204.15 Acceptance. See Table 204-1 for sampling, testing, and acceptance requirements.

Material for embankment and conserved topsoil will be evaluated under Subsections 106.02 and 106.04.

Excavation and embankment construction will be evaluated under Subsections 106.02 and 106.04.

Subexcavation will be evaluated under Subsections 106.02 and 106.04.

Measurement

204.16 Measure the Section 204 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

(a) Roadway excavation. Measure roadway excavation in its original position as follows:

(1) Include the following volumes in roadway excavation:

(a) Roadway prism excavation;

(b) Rock material excavated and removed from below subgrade in cut sections;

(c) Unsuitable material below subgrade and unsuitable material beneath embankment areas when a pay item for subexcavation is not listed in the bid schedule;

(d) Ditches, except furrow ditches measured under a separate pay item;

(e) Conserved topsoil;

(f) Borrow material used in the work when a pay item for borrow is not listed in the bid schedule;

(g) Loose scattered rocks removed and placed as required within the roadway;

(h) Conserved material taken from pre-existing stockpiles and used in Section 204 work, except topsoil measured under 624; and

(i) Slide and slipout material not attributable to the Contractor's method of operation.

(2) Do not include the following in roadway excavation:

(a) Overburden and other spoil material from borrow sources;

(b) Overbreakage from the backslope in rock excavation;

(c) Water or other liquid material;

(d) Material used for purposes other than required;

(e) Roadbed material scarified in place and not removed;

(f) Material excavated when stepping cut slopes;

(g) Material excavated when rounding cut slopes;

(h) Preparing foundations for embankment construction;

(i) Material excavated when benching for embankments;

(j) Slide or slipout material attributable to the Contractor's method of operation;

(k) Conserved material taken from stockpiles constructed at the option of the Contractor;

(l) Material excavated outside the established slope limits; and

(m) Road pioneering for the convenience of the Contractor.

(3) When both roadway excavation and embankment construction pay items are listed in the bid schedule, measure roadway excavation only for the following:

(a) Unsuitable material below subgrade in cuts and unsuitable material beneath embankment areas when a pay item for subexcavation is not listed in the bid schedule;

(b) Slide and slipout material not attributable to the Contractor’s method of operations; and

(c) Drainage ditches, channel changes, and diversion ditches.

(b) Unclassified borrow, and topping. When measuring by the cubic yard (cubic meter) measure in its original position. If borrow excavation is measured by the cubic yard (cubic meter) in-place, take initial cross-sections of the ground surface after stripping overburden. Upon completion of excavation and after the borrow source waste material is returned to the source, retake cross-sections before replacing the overburden. Do not measure borrow excavation until suitable roadway excavation is depleted.

(c) Embankment construction. Measure embankment construction in its final position. Do not make deductions from the embankment construction quantity for the volume of minor structures.

(1) Include the following volumes in embankment construction:

(a) Roadway embankments;

(b) Material used to backfill subexcavated areas, holes, pits, and other depressions;

(c) Material used to restore obliterated roadbeds to original contours; and

(d) Material used for dikes, ramps, mounds, and berms.

(2) Do not include the following in embankment construction:

(a) Preparing foundations for embankment construction;

(b) Adjustments for subsidence or settlement of the embankment or of the foundation on which the embankment is placed; and

(c) Material used to round fill slopes.

(d) Rounding cut slopes. If a pay item for slope rounding is included in the bid schedule measure rounding cut slopes horizontally along the centerline of the roadway. If a pay item is not included for slope rounding is not included in the bid schedule payment will be considered indirect to roadway excavation.

(e) Waste. Measure waste by the cubic yard (cubic meter) in its final position. Take initial cross-sections of the ground surface after stripping over-burden. Upon completion of the waste placement, retake cross-sections before replacing overburden.

(f) Slope scaling. Measure slope scaling by the cubic yard (cubic meter) in the hauling vehicle.

(g) Subexcavation. Measure subexcavation by the cubic yard (cubic meter) in its original position.

(h) Drainage features. Measurement includes all excavation, embankment, shaping, and grading necessary for a completed drainage feature.

Payment

204.17 The accepted quantities will be paid at the contract price per unit of measurement for the Section 204 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.**Table 204-1**

Sampling, Testing, and Acceptance Requirements

Material or Product (Subsection)	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
Source								
Topping (704.05)	Measured and tested for conformance (106.04 & 105)	Classification(1)	–	AASHTO M 145	1 per soil type and source of material	Processed material	Yes	Before using in work
Unclassified borrow (704.06)	"	"	–	"	"	"	"	"
Production								
Topping (704.05) and (204.11(a))	Measured and tested for conformance (106.04)	Moisture-density	–	T 99, Method C(2)	1 per soil type, but not less than 1 per each 13,000 yd^3 (10,000 m^3)	Processed material	Yes	Before using in work
		Density	–	AASHTO T 310 or other approved procedures	1 per 3500 yd^2 (3000 m^2), but not less than 3 per layer	In-place	No	Before placement of next layer

204.17 The accepted quantities will be paid at the contract price per unit of measurement for the Section 204 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.**Table 204-1**

Sampling, Testing, and Acceptance Requirements

Material or Product (Subsection)	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
Unclassified borrow (704.06) and (204.11(a))	"	Moisture-density	–	T 99, Method C(2)	1 per soil type, but not less than 1 per each 13,000 yd^3 (10,000 m^3)	Processed material	Yes	Before using in work
		Density	–	AASHTO T 310 or other approved procedures	1 per 3500 yd^2 (3000 m^2), but not less than 3 per layer	In-place	No	Before placement of next layer
Production (continued)								
Earth embankment (204.11(a))	Measured and tested for conformance (106.04)	Classification	–	AASHTO M 145	1 per soil type	Source of material	Yes	Before using in work
		Moisture-density	–	T 99, Method C(2)	1 per soil type, but not less than 1 per each 13,000 yd^3 (10,000 m^3)	"	"	"
		Density	–	AASHTO T 310 or other approved procedures	1 per 3500 yd^2 (3000 m^2), but not less than 3 per layer	In-place	No	Before placement of next layer

204.17 The accepted quantities will be paid at the contract price per unit of measurement for the Section 204 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.**Table 204-1**

Sampling, Testing, and Acceptance Requirements

Material or Product (Subsection)	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
Top of subgrade (204.11(a))	"	Density	–	AASHTO T 310 or other approved procedures	1 per 2500 yd^2 (2000 m^2), but not less than 3 per layer	In-place	No	Before placement of next layer
Finished Product								
Roadbed (204.13)	Measured and tested for conformance (106.04)	Final line & grade	–	Field measured	Determined by the CO	Determined by the CO	No	Before placement of next layer

(1) Not required when using Government-provided source.
(2) Minimum 5 points per proctor.

Table 204-2
Construction Tolerances

Location Description	Tolerance Class (a)												
	A	B	C	D	E	F	G	H	I	J	K	L	M
Roadbed width (ft)	+0.5	+0.5	+1.0	+1.0	+1.0	+1.0	+1.5	+1.0	+2.0	+2.0	+2.0	+2.0	+2.0
Subgrade elevation (ft)	±0.1	±0.2	±0.2	±0.5	±0.5	±1.0	±1.0	±1.5	±2.0	±3.0	±2.0	±3.0	(c)
Centerline alignment (ft)	±0.2	±0.2	±0.5	±0.5	±1.0	±1.0	±1.5	±1.5	±2.0	±3.0	±3.0	±5.0	(c)
Slopes, excavation, and embankment (% slope[(b)])	±3	±5	±5	±5	±5	±5	±10	±10	±10	±10	±20	±20	±20

(a) Maximum allowable deviation from construction stakes and drawings.
(b) Maximum allowable deviation from staked slope measured from slope stakes or hinge points.
(c) Unless otherwise shown the centerline alignment and subgrade elevation, as built, have no horizontal curves with a radius of less than 80 feet, and no vertical curves with a curve length of less than 80 feet when the algebraic difference in the grade change is less than 10 percent, or a curve length of less than 100 feet when the algebraic difference of the grade change is greater than or equal to 10 percent. The centerline grade is not to exceed 20 percent in 100 feet of length.

208 - Structure Excavation and Backfill for Selected Major Structures

Delete the 6th paragraph of Subsection 208.03 and replace with the following:

208.03 General.

Conserve suitable material for backfill from excavated material, some sorting may be required. Do not deposit excavated material in or near a waterway. Do not stockpile excavated material or allow equipment closer than 24 inches from the edge of the excavation. Use suitable material in embankment construction when approved. Field drain and dry excessively wet material that is otherwise suitable for backfill before placement. Dispose of unsuitable or excess material at designated sites shown on the drawings or as directed by the CO according to Subsection 204.14.

Add the following to Subsection 208.03:

208.03 General.

Submit an Excavation Plan for approval prior to beginning the work. As a minimum, the Excavation Plan must include: drawings and a written outline illustrating and describing the proposed excavation limits, methods, equipment to be used, location of stockpiles, and estimated quantities. The Excavation Plan must comply with all applicable OSHA requirements and list the soil type assumed.

208.07_National_2_8_2019

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.

209 - Structure Excavation and Backfill

209.09_National_2_8_2019

Make the following Changes to Subsection 209.09:

209.09 Backfill.

Add the following to Subsection 209.09(a):

(a) General.

Backfill without damaging or displacing the culvert or structural plate structure. Replace any pipe that is distorted by more than 5 percent of nominal dimensions, or that is ruptured or broken.

Add the following to Subsection 209.09(b):

(b) Pipe culverts.

Do not place or backfill pipe that meets any of the following conditions until the excavation and foundation have been approved in writing by the CO:

- Embankment height greater than 6 feet at subgrade centerline.
- Installation in a protected stream course.
- Round pipe with a diameter of 48 inches or greater.
- Pipe arches with a span of 50 inches or greater.
- Any box culvert or structure other than pipe culverts.

209.10_National_2_8_2019

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..

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.

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

272 - Geocell Abutment Stabilization

Description

272.01 This work consists of constructing geocell abutment stabilization at each abutment using a cellular confinement system such as Presto Geoweb Cellular Confinement System or Webtec TerraCell in accordance with the plans and manufacturers recommendations.

Materials

272.02 Requirements. Ensure that material conforms to specifications in the following subsections:

Granular Backfill Type (c)	703.03
Geotextile, Class 1, Type A	714.01
Geocell	736

Construction Requirements

272.03 General. Perform the work specified in Section 208 or 209. Use ditches, grading or similar methods to prevent surface runoff that may occur during inclement weather from ponding in the foundation excavation.

272.04 Storage and Handling of Material. During shipment and storage, wrap geotextile materials in heavy-duty protective covering. Protect the material from mud, soil, dust, debris and sunlight prior to installation.

272.05 Geotextile Installation. Place the geotextile according to Section 207. Have the surface approved by the CO prior to placing geotextile.

Sew or overlap adjacent strips a minimum of 12” at joints. Insert securing pins through both strips of overlapped geotextile at minimum intervals of 3 feet, but no closer than 2 inches to each edge, to prevent the geotextile from being displaced.

Have the installed geotextile approved by the CO prior to setting the geocells.

272.06 Geocell Installation. Furnish the CO with product literature and certification as required in Section 106.03 for review and approval 7 days prior to installation. When requested by the CO, furnish a sample of the geocell from each lot for verification testing.

Place the geocell sections directly on the prepared subgrade. Expand the geocell sections into position at the grades and lines as shown on the plans. Hold the expanded geocell sections with suitable “stretcher frames”, steel stakes driven inside selected outer cell walls, or other similar methods as allowed by the manufacturer prior to filling. Ensure that the individual cells have expanded to the minimum dimensions required by the manufacturer. If necessary field cut sections as per the manufacturer’s recommendations to the lines shown on the plans.

Connect geocell panels in accordance with the manufacturer’s recommendations.

272.07 Infill Placement. Furnish the CO with the manufacturer’s specific recommendations for backfilling 7 days prior to placement of the geocells.

Place coarse granular backfill meeting Subsection 703.03 into the expanded cells with equipment appropriate for the site conditions such as a backhoe or a front-end loader. Do not drop infill material more than 3 feet to avoid damage or displacement of the cell walls.

Overfill the geocell cells and level to a minimum of 2 inches above the top of the cell walls. A front-end loader may be used to place the infill provided that it only traffics above geocell sections that have been filled and covered with the minimum 2 inches of additional material. Compact the infill material with a vibratory plate compacter. Operate compaction equipment over the full width of the geocell. Make at least three complete passes or until visible deformation of the infill ceases. Grade the surface to be ½ inch above the top of the cells. Ensure that the cell walls are not exposed after fine grading is completed.

Use the geocell manufacturer's specific recommendations for backfilling if they are more stringent than stated above.

272.08 Acceptance. Geotextile will be evaluated under Subsections 106.02 and 714.01.

Material for geocell will be evaluated under Subsections 106.02 and 106.03.

Granular backfill material will be evaluated under Section 106.02 and 106.04.

Measurement

272.09 Method. Measure the items listed in the bid schedule according to Subsection 109.02 and the following.

Measure geocell by the square yard in place, exclusive of wastage.

Payment

272.10 Basis. The accepted quantities will be paid for at the contract price per unit of measurement for the Section 272 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

The cost for furnishing and placing the granular backfill required in Sections 207, 208, and 209 for geocell infill is incidental to this pay item and no separate payment will be made.

The cost for furnishing and placing geotextile for the geocell installation is incidental to this pay item and no separate payment will be made.

302 - Minor Crushed Aggregate

Delete paragraph (a) of Subsection 302.05 and substitute the following:

302.05 Compacting and Finishing Crushed Aggregate.

(a) Roadway aggregate. Compact using the methods below, specified in the Schedule of Items.

(1) Method 1. Compact the aggregate by operating compaction equipment over the total width until visible deformation ceases. A minimum of three complete roller passes shall be made at a moisture content suitable for compaction.

(2) Method 2. Operate equipment over the full width of spread aggregate.

552. – Structural Concrete

552.01 Description.

Delete the first paragraph of Subsection 552.01 and replace with the following:

This work consists of furnishing, placing, finishing, and curing concrete to be cast-in-place in bridges, culverts, and other structures; furnishing precast concrete elements by forming, placing reinforcing steel, placing and finishing concrete, curing, and transporting members; and materials testing and implementing quality control procedures. When specified, work also includes installation of furnished precast concrete elements, including performing all necessary grouting, welding or other connections; and repairs or finishing associated with transport and the removal of lifting devices.

552.02 Material.

Add the following references to Subsection 552.02:

Dowel bars	709.01(f)
Falsework and forms	562
Hook bolts	709.01(e)
Mortar cement	701.02(b)
Reinforcing steel	554
Structural steel	717.01

552.03 Construction Requirements.

Delete Table 552-1 and its footnotes and replace with the following table and footnotes:

Table 552-1

Composition of Concrete

Class of Concrete	Minimum Compressive Strength @ 28-Days, f'c, psi (MPa)	Maximum Water/ Cementitious Material Ratio	Coarse Aggregate Size Number AASHTO M 43 [1]
A	4500 (31.0)	0.45	5, 56, 57
A(AE) [5]	4500 (31.0)	0.45	5, 56, 57
C	4500 (31.0)	0.45	7, 78
C(AE)	4500 (31.0)	0.45	7, 78
D(AE) [2]	5000 (34.5)	0.40	5, 56, 57
P (Precast, Prestressed) [3] [4] [5]	See plans	–	6,7,67,68,78
P(AE) [3] [4] [5]	See plans	–	6,7,67,68,78
S (Seal)	–	0.54	5, 56, 57

[1] Meet the processing requirements of AASHTO M 43, Table 1 – Standard Sizes of Processed Aggregate.

[2] The maximum water-soluble chloride ion (Cl-) content is 0.15 percent by mass of cement. Determine the water-soluble chloride ion content of concrete made with mix ingredients at an age between 28 and 48 days according to ASTM C1218. Submit test results with the concrete mix design for approval.

[3] The maximum water-soluble chloride ion (Cl-) content is 0.06 percent by mass of cement. Determine the water-soluble chloride ion content of concrete made with mix ingredients at an age between 28 and 48 days according to ASTM C1218. Submit test results with the concrete mix design for approval.

[4] Use Class P (AE) concrete in the entire depth of the top flange of all multi-beam bridge girders. In lieu of this, Class P (AE) concrete may be used for fabrication of the entire girder and throughout the entire depth of prestressed slabs. In all cases, furnish concrete meeting the 28 day specified minimum concrete strength requirements for the prestressed members as shown on the plans, unless otherwise specified.

[5] Use Class A (AE) or Class P (AE) concrete for precast elements to be used as substructure elements, such as footings or foundations. Use Class P (AE) concrete for fabrication of precast elements to be used in a precast (non-prestressed) superstructure element, including slabs, girders, and box culverts where traffic will be in contact with the horizontal top surface. In all cases, furnish concrete meeting the 28 day specified minimum concrete strength requirements for the precast or prestressed members as shown on the plans, unless otherwise specified.

Delete the second and third paragraph of Subsection 552.03 and replace with the following:

Submit written concrete mix designs on FHWA Form 1608, 552 *Structural Concrete Mix Design Submittal*, or other format that is professional in appearance and provides all of the required information in subsections (a) through (z) of this section, 552.03. Allow at least 30 calendar days for approval before production.

Add the following item to Subsection 552.03 under the list of items to be included in the mix design submittal:

(z) Evaluation of potential aggregate reactivity

552.08 Delivery.

Delete the last sentence of the first paragraph of Subsection 552.08(a) and replace with the following:

Do not exceed 130 total revolutions at mixing speed, including both initial mixing and remixing. Do not exceed 300 total revolutions, including both mixing and agitating speed.

Delete table 552-4 and its footnotes and replace with the following table and footnotes:

Table 552-4
Concrete Remixing and Discharge Time Limits

Cement Type [1]	**Admixtures**	**Remixing Time Limit (hour)**	**Discharge Time Limit (hour)**
Type I, IA, II, IIA, V, or approved blended hydraulic cement	None	0.75	1.00
Type I, IA, II, IIA, V, or approved blended hydraulic cement	ASTM C494, Type B, D, or G[2]	1.25	1.50
Type I, IA, II, IIA, V, or approved blended hydraulic cement	Hydration stabilizer	3.00	Approved design discharge time limit, 3.50 maximum
Type III	None	0.50	0.75
Type III	ASTM C494, Type B, D, or G[2]	1.00	1.25

[1] AASHTO M 85 or AASHTO M 240 as applicable.

[2] ASTM C494 defines Type B as a retarding admixture, Type D as a Water-reducing and retarding admixture, and Type G as a Water-reducing, high range, and retarding admixture.

552.18 Loads on New Concrete Structures.

Add the following paragraph to Subsection 552.18:

Do not allow public traffic on the bridge until approaches, curbs, and bridge rail are completed and in-place. Erect barricades at each end of bridge spans when road approaches allow vehicles to drive directly onto the structure.

Delete ***Subsections 552.20, 552.21, and 552.22 and replace with the following:***

552.20 Precast Elements. Precast concrete elements and members considered structural in nature shall meet the following specifications of this section.

(a) Certification and/or Quality Assurance of Precast Manufacturing Plant. Furnish precast concrete members using a plant with one of the following certifications, appropriate to the type of member being fabricated:

(1) Precast/Prestressed Concrete Institute (PCI)
   (a) Bridge 1, Precast Bridge Products (no prestressed reinforcing).
   (b) Commercial 1, Precast Concrete Products (no prestressed reinforcing).
(2) National Precast Concrete Association (NPCA)
(3) American Concrete Pipe Association (ACPA)

When available, submit a copy of the transmittal letter of the latest PCI, NPCA, or ACPA inspection and certification with the shop drawings.

In lieu of the above certification, the Contractor shall retain a professional engineer to provide quality assurance for the work by inspecting and certifying in writing the concrete members are constructed in accordance with the contract specifications and FSSS Section 552 and shall include information including but not limited to the following:

(a) Shop drawings review.
(b) Concrete member dimensions.
(c) Concrete mix design.
(d) Aggregate sources, moisture contents, test results.
(e) Steel reinforcing placement.
(f) Concrete curing and strength test results.
(g) Concrete material certifications.
(h) Placement mixing, delivery and sampling.
(i) Properly calibrated production and test equipment
(j) Proper records keeping including; personnel qualifications and training records, material sources, quality control testing results for the aggregate and concrete, pre-

pour and post-pour inspection reports, batching records, disposition of failing products, and shipping.

Material sources shall be on the State's approved supplier list or approved in writing by the CO.

Furnish the certification or supplemental information above to the CO prior to shipment of materials and installation at the job site.

Perform all sampling, testing, and inspection necessary to ensure quality control of the component materials and the concrete. Sample and test for quality control and acceptance testing in accordance with the AASHTO or ASTM test methods prescribed in Section 552.

Maintain adequate records of all inspections and tests. Keep records that indicate the nature and number of observations made, the number and type of deficiencies found, the quantities approved and rejected, and the nature of any corrective action taken.

(b) Precast Manufacturing Plant (i.e. Casting Yard). The precasting of concrete structural members may be done at a casting yard of an industry-certified plant or a casting yard of the Contractor's choice with the appropriate certifications discussed above.

(c) Tolerances. Place and consolidate concrete so that shrinkage cracks are not produced in the member.

Verify that the prefabricated elements will fit-up and align properly before shipping from the precast facility. Assembling each superstructure and substructure composed of prefabricated elements in the yard prior to shipping the elements to the project site is a suitable way to perform such verification. If assembled in the yard, use blocking to simulate the support of the elements and the spacing between the elements. Verify all elements are constructed in compliance with all plan requirements. Dry fit all connections in the fabrication yard prior to installation of the elements at the bridge site.

Fabricate precast concrete foundation units straight and true size and shape with exposed edges and corners precise and true so each finished unit complies with the following dimension tolerances as well as position tolerances for cast in items:

(1) Do not vary the length by more than ¾ inch.
(2) Do not vary the height/width from that shown in the design by more than ¼ inch.
(3) Do not allow defects in local smoothness that vary more than ¼ inch in 10 feet for any surface, except when special finishing or form liners are called out or accepted as part of the submittal
(4) Do not vary the position of inserts for structural connections from that shown in the shop drawings by more than ½ inch, except as submitted and approved.
(5) Comply with Section 554 Reinforcing steel in the placement of mild reinforcement.

(d) Submittals. Submit four (4) sets of shop drawings to the CO for approval according to subsection 104.03, a minimum of 21 days before fabrication of the precast member(s). In lieu of hard copy shop drawing submittals, electronic submittals are acceptable. Show all details necessary for fabrication, including the following:

(1) Details and location of all lifting holes, inserts, hardware, devices, and any additional reinforcing required for lifting. Include supporting calculations and lifting procedures.

(2) Description of the method of curing, handling, storing, and transporting the elements.

(3) Concrete mix design for all precast elements.

(4) Details and location of Government-furnished date plate if shown on the plans.

(e) Quality Assurance.

(1) Permanently mark each element with date of fabrication, supplier identification and module identification. Stamp markings in fresh concrete.

(2) Prevent cracking or damage of precast components during handling and storage.

(3) Replace or repair defective or broken precast concrete deck and concrete deck overhang elements according to section 106. Requests to repair defective or broken elements are subject to the following;

(a) Obtain approval before performing concrete repairs.

(b) Concrete repair work must re-establish the module's structural integrity, durability, and aesthetics to the satisfaction of the CO.

(c) Describe the cause of damage and the corrective action taken to eliminate future damage.

(d) Submit an updated CPM schedule showing the effects of repair work on project completion.

(4) Elements will be rejected if they do not conform to the contract documents, and for the following reasons:

(a) Full-depth cracking of concrete and concrete breakage that is not repairable.

(b) Cracks that extend to the nearest reinforcement plane, or fine surface cracks that do not extend to the nearest reinforcement plane but are numerous or extensive.

(c) Camber that does not meet the requirements of the plans or fabrication drawings.

(d) Honeycombed texture.

(e) Dimensions exceeding the allowable tolerances.

(f) Damage during fabrication, transportation, erection, or construction.

(5) Document all test results for structural concrete. Show in the quality control files at least the following information:

(a) Element identification.

(b) Date and time of fabrication concrete pour.

(c) Concrete cylinder test results.
(d) Concrete mix design and the batch print out.
(e) Form-stripping date.
(f) Location and number of blockouts and lifting inserts.
(g) Temperature, moisture, and duration of curing period.
(h) Approved repair procedures.

(f) Handling, storing, and transporting.

(1) *Damage/Cracking.* Prevent cracking or damage of prefabricated elements and modules during handling, storing, and transporting.

(2) *Precast Element Sizes.* Finalize the size of precast elements with consideration for shipping restrictions, equipment availability, and site constraints. Show the final element sizes on the assembly plan.

(3) *Lifting Devices.* The design and detailing of the lifting devicesare the responsibility of the contractor. Use lifting devices in a manner that does not cause damage, cracking, or torsional forces. Place the lifting devices in locations that are not visible once the prefabricated element is placed, or within recessed pockets that can be patched after installation.

(4) *Safety.* The Contractor is responsible for the safety and stability of prefabricated elements during all stages of handling, transportation, and construction.

(5) *Handling and Storing.* Store the precast units in a horizontal and upright position, supported at their designated bearing points. Follow Chapter 5 of the PCI Design Handbook for handling and erection bracing requirements.

Lift the precast elements so that the angle between the top surface of the precast element and the lifting line is not less than 60 degrees when measured from the top surface of the precast elements to the lifting line. If two cranes are used, then the lifting lines shall be vertical. Lift the modules at the designated points. The Contractor is responsible for handling stresses in the modules. Choose the locations of the lifting points so that the anticipated flexural tensile stress induced in the top of the structural concrete for the assumed support locations is not greater than the allowable stress.

Select smooth and well compacted storage areas to prevent damage due to differential settlement. Support precast elements during storage to prevent cracking or creep induced deformation (sagging). Check precast elements at least once per month to ensure that creep-induced deformation does not occur.

Protect the elements from freezing temperatures for 5 days after casting or until precast concrete attains design compressive strength. Do not remove thermal protection for any length of time before the units attain the specified compressive strength when the surrounding air temperature is below 20 °F (-6 °C).

Before transporting precast concrete members, provide written certification that the members were fabricated and visually inspected in conformance with 552 and meet minimum quality requirements.

(6) *Additional Reinforcement.* Provide additional reinforcement, as needed, to meet the requirements of handling, transporting, and erecting precast members.

(7) *Requirements Prior to Shipping.* Do not ship precast concrete members until concrete cylinder tests, manufactured from the same concrete and cured under the same conditions as the members, indicate that the concrete in each member has attained the minimum required design strength and is at least 7 days old.

(g) Installation.

(1) Install members without damage to structural capacity, shape, or finish. Replace or repair damaged members.

(2) Install members level and plumb without exceeding the following allowable tolerances:
   (a) Plan Location from Design Datum: Plus or Minus ½ in. (±13mm).
   (b) Top Elevation from Nominal Top Elevation: Plus or Minus 3/8 in. (±6mm).
   (c) Maximum Plumb Variation over the Lesser of Height of Structure or 100 ft (30m): 1 in. (25 mm).
   (d) Plumb in Any 10 ft (3 m) of Element Height: ¼ in. (6mm).
   (e) Maximum Jog in Alignment of Matching Edges: ¼ in. (6mm).

552.21 Acceptance.

See Table 552-9 for sampling, testing, and acceptance requirements and the quality characteristic category.

Reinforcing steel, anchor devices, elastomeric bearings, and material for concrete and grout will be evaluated under Subsection 106.03. Furnish production certifications for hydraulic cement, reinforcing steel, and any other cementitious materials.

Cast in place concrete mixture's slump, air content, density, and temperature will be evaluated under Subsections 106.02 and 106.04.

Concrete compressive strength will be evaluated under Subsection 106.05. The lower specification limit is the minimum required compressive strength at 28 days (f'_c) specified in the contract. Remove and replace concrete represented by cylinders having a compressive strength less than 90 percent of the minimum 28-day strength (f'_c).

Concrete for precast concrete members will be evaluated under Subsections 106.02, 106.03, and 106.04.

Construction of all precast concrete members and concrete structures (including batching, placing, finishing, and curing concrete) will be evaluated under Subsections 106.02 and 106.04.

Reinforcing steel will be evaluated under Section 554.

Falsework and forms will be evaluated under Section 562.

Measurement

552.22 Measure the Section 552 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable.

When measuring structural concrete by the cubic yard (cubic meter), measure in the structure.

Do not measure reinforcing steel, concrete, anchorages, plates, nuts, and other material contained within or attached to the unit for precast concrete structural members.

Payment

552.23 The accepted quantities will be paid at the contract price per unit of measurement for the Section 552 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05

554 - Reinforcing Steel

554.03_nat_us_06_20_2007

Construction Requirements

554.03 Order Lists.

Delete the first paragraph and replace with the following:

Do not submit order lists or bending diagrams for approval.

603 - Structural Plate Structures

603.00_National_2_8_2019

Make the following changes to Subsection 603.04:

603.04 Erecting.

Add to the third paragraph:

Torque all bolts before beginning the backfill.

Delete the seventh paragraph and substitute with the following:

Torque steel bolts and aluminum bolts on 0.1-inch thick and heavier aluminum plates to at least 115 foot-pounds, and a maximum of 130 foot-pounds.

Delete the first sentence of the eighth paragraph and substitute with the following:

Assemble multi-plate structures according to manufacturer's instructions and in conformance with parts (a) thru (e).

625 - Turf Establishment

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

625.00_National_11_4_2016

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 July 1 and October 31**.** Apply turf establishment to the areas shown on the plans or worklists within **7** 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:

Moisten seeding areas before seeding and maintain the moisture until turf is established or until final acceptance.

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.

Apply fertilizer at the rate of **NA** pounds per acre. Insure that the fertilizer meets the following chemical analysis:

Nutrient	Percent
Nitrogen, N	**NA**
Phosphorus, $P_2 0_5$	**NA**
Potassium, K	**NA**

625.07 Seeding. Apply Government-furnished seed at the rate directed by the CO 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.

625.08 Mulching. Apply Mulch within **24** hours after seeding by the following methods.

(a) Dry Method. Apply mulch with a hand spreader or a spreader utilizing forced air at a rate of 4**200** pounds per acre. Anchor the mulch with an approved stabilizing emulsion tackifier at a rate of **<NA>** gallons per acre. Do not mark or deface structure, pavements, utilities, or plant growth with tackifier.

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

Apply wood fiber or grass straw cellulose fiber mulch at a rate of **NA** pounds per acre.

Apply bonded fiber matrix hydraulic mulch at a minimum rate of **NA** 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.

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.

648 - Stream Simulation

Add Section 648:

Description

648.01 This work consists of furnishing and installing alluvium, rock, logs, trees, rootwads and specified fill to simulate natural stream profile, grade control structures, and streambed through culverts, bridge structures, and existing stream channels. Work includes developing materials; hauling materials; dewatering; sediment control; placing bedding and backfill to construct stream simulation channels inside and outside of the structures (culverts, bridges, existing channels); placing, keying, sealing, and compacting designed streambed fill; constructing instream structures (steps, pools, riffles, ribs, banks); reconstructing existing channels; and all other streambed work to complete the project. Specific culvert installation time restrictions and installation plan requirements are indicated in the contract.

Material

648.02 Conform to the following Section and Subsections:

Foundation Fill 704.01

Streambed Simulation Rock.....705.08

Streambed Channel Rock 705.09

Furnish instream structures materials (boulders, cobbles, gravel, wood, etc.) and stream simulation streambed mix with the sizes and gradations as required in the contract.

Provide native log materials that are green, sound, and free of cracks or defects that would affect structural integrity or accelerate decay.

Sort material for streambed simulation rock by screening (power screen or grizzly/stationary screen) as shown on the plans. Large particles may be machine sorted by heavy equipment or hand labor.

Mix streambed simulation rock in proportions based on Table 705-4. All streambed material will be similar in shape / angularity as those found in the natural stream channel or as designated in the specifications. Tolerance for material gradation is + or – 5% for each screen size listed in the gradation.

Provide streambed simulation rock and channel rock that is durable and at least as angular as those found in the natural stream channel or as SHOWN ON THE PLANS.

Request approval of rock to be used for steps, banks and all grade control structures at least 3 days prior to scheduled placement.

Construction Requirements

648.03 General. Place streambed simulation rock on a prepared surface to form a well-graded, low permeability mass, similar in appearance and form to the natural stream channel or as specificed in the

contract.

648.04 Equipment Operations. An oil spill containment kit is required on each job site when working in and around open water. Composition of the kit is dependent on the job; determine contents of the kit as needed for each job. At a minimum, include tarps and oil-absorbent pads. Provide a floating oil boom downstream of the work site when specified in the contract.

648.05 Equipment Limitations. Do not drive metal track equipment directly on metal or concrete structure surfaces. Place a layer of streambed mix material on the structure bottom before operating metal track equipment directly on metal or concrete structure surfaces.

648.06 Excavation. Control excavated material to minimize disturbance to the adjacent channel and banks. Incorporate suitable streambed materials into the project if required gradations are in accordance with contract specifications.

648.07 Dewatering. Dewatering or diversions are required for structure placement and instream work in the adjacent stream channel. Dewatering is not required when constructing isolated or infrequent structures such as single rock, log step and other instream structures in channel reconstruction areas outside 25 feet from the inlet or outlet of the structure. Customize dewatering to the site depending on flow, ground water depths at the time of installation, terrain configuration, and culvert embedment depths. Submit a dewatering plan 15 days in advance of construction. Include in the plan the method (bypass or pumping), number of pumps and capacity required, pump and bypass culvert calculations, location/layout of dewatering operations and equipment, and erosion control measures for dealing with the return flow back to the existing stream channel. The plan will be approved by the CO within 14 calendar days of plan submission.

Dewatering operations shall be capable of passing the estimated average monthly discharge for the stream or other design flows as approved by the CO.

Maintain the dewatering pumping operations to ensure return flow does not exceed State water quality standards. Water pumped from the construction site may require additional filtration by filter bags or other methods (settling basins, gravel filters, etc.) to prevent turbid water from directly entering the stream.

Place additional erosion control measures or cease operations when turbidity exceeds State water quality standards.

Relocate fish contained within the cofferdams before the site is completely dewatered. Place relocated fish in the closest pool upstream of the construction zone.

If trash pumps are used during construction, the intake must be operated and maintained to prevent fish entrapment, entrainment, or injury. If fish are present at the intake, screen the pump intake with woven wire mesh size with opening less than 3/32 inch. Approach velocities shall not exceed a passive velocity of 0.2 feet per second (fps) or an active velocity 0.4 fps.

648.08. Rewatering. Conduct rewatering activities to minimize sediment movement downstream of the site upon completion of instream work. Prior to rerouting stream flow into the new channel, rinse the surface of the streambed to remove fine-grained sediment. After the initial sediment pulse is removed, slowly breach the coffer/diversion dams to avoid a large pulse of water being sent through the newly constructed channel.

648.09 Blasting and Rock Removal. Remove bedrock encountered during excavation to the lines and grades required in the contract. Remove rock by either mechanical means with hydraulic impact hammers / rock breakers, by ripping, or blasting. When explosives are used, do not cause mortality to juvenile fish by transmitting excessive blasting overpressures through the ground to the fish habitat. Limit blasting overpressures to a maximum of 2 psi in occupied fish habitat.

648.10 Placed Streambed Simulation Material. Begin construction from the downstream end working upstream. Changes to this sequence will be allowed on a case by case basis due to poor stream to culvert alignment, traffic requirements, limited access, and preservation of existing trees reinforcing the banks, etc.

Place streambed simulation rock in one or more layers with a maximum layer depth less than 1.5 times the maximum size of the intermediate-axis of the streambed simulation rock, but no greater than 2ft. Place streambed simulation rock by methods that do not cause segregation or damage to the prepared surface. Place or rearrange individual rocks to obtain a uniformly dense, compact, low permeability mass, matching streambed simulation details. Fill voids by machine or hand tamping before placing the next lift. Compact streambed materials with mechanical hand tampers or excavator-operated vibratory plate compactors.

Fill all voids left during placement of streambed simulation rock, boulders, steps, ribs, banks and streambed materials adjacent to footings, concrete structures or corrugated pipes with streambed simulation material. Use water pressure, metal tamping rods, and similar hand operated equipment to force material into all surface and subsurface voids between the structure and rocks, and between individual rocks. Ensure the streambed is sealed to limit permeability.

Notify the CO at least 48 hours in advance of the streambed material installation.

648.11 Rock Bedforms (steps, ribs, riffles, banks), Forcing Features (boulders, boulder clusters), and Bank Construction. Construct bedforms and banks as specified in the contract. Construction will proceed from downstream to upstream. Machine or hand-place rock for banks, steps, and ribs and lock in place with select key pieces of the required size class, along with smaller materials of varying sizes to fill voids. Construct a low flow channel through the center of the channel AS SHOWN ON THE DRAWINGS. Construct steps and ribs so the tops are uneven, containing several high and low points to concentrate water during low flows. Place step and rib surfaces so they are higher at the outside edge of the culvert (culvert wall) and slope down to the outside edge of the constructed low flow channel AS SHOWN ON THE DRAWINGS.

Construct steps with footer rocks placed before the top step rocks are installed AS SHOWN ON THE DRAWINGS. Use footer rocks which are the same size class as the top step rocks. Fill all voids with smaller materials as construction progresses to minimize permeability.

Construct banks out of large blocky key pieces of the required size class AS SHOWN ON THE DRAWINGS. Key and lock smaller materials of varying sizes to fill voids. Bank materials will be hand keyed in place and compacted depending on the size of materials used as designated in the field by the CO. Construct bank faces to be uneven, protrude into the channel, and be rough in appearance. Construct the top of the bank to be fairly uniform. Tie back constructed banks and margins at the edge of the structure walls into the existing stream banks at dimensions similar to those found in the reference reach or AS SHOWN ON THE DRAWINGS.

When single rocks are used as roughness elements and habitat diversity, bury to 50% of the diameter or as SHOWN ON THE PLANS. Fill and compact voids around these structures. When constructed as clusters of particles, key pieces within the cluster will be buried 50% of the diameter or as SHOWN ON THE PLANS.

Notify the CO at least 48 hours in advance of the installation of any streambed, bedform, roughness feature, log structure, or bank construction.

648.12 Log and Root Wad Structures. Locate and place log structures as required in the contract, and/or designated in the field by the CO.

Construct log weirs with cross slope gradients not less than 5(H):1(V), unless SHOWN ON THE DRAWINGS or staked in the field by the CO, and maximum tolerance of 6(H):1(V), unless approved in writing by the CO.

Embed log weirs to a minimum depth of 10 feet beyond bank full widths or half bankfull width on each side, whichever is greater or AS SHOWN ON THE DRAWINGS. When placing habitat logs (overhanging a portion of the stream) that lay on the banks, ensure 2/3 of the log remain behind bankfull width on top of the bank.

Embed rootwad revetment trunks a minimum of 10 feet behind bankfull width limits or as SHOWN ON THE DRAWINGS. Bury the root to a point where the base of the bol is resting in the bottom of the bank or as required in the contract, and/or designated in the field by the CO.

Measurement

648.13 Measure the Section 648 items listed in the bid schedule according to Subsection 109.02 and the following as applicable.

All log structures and rootwad revetment will be measured separately for payment if designated on the schedule of items.

Instream structures composed of rock and wood will be measured separately for payment if designated on the schedule of items.

Do not measure dewatering and diversions; they are considered incidental to construction of the structures unless measured separately for payment as designated on the schedule of items.

Work and materials required for stream simulation are considered incidental to installation of the structure unless designated on the schedule of items.

Payment

648.14 The accepted quantities, measured as provided in Subsection 109.02, will be paid at the contract price per unit of measurement for the Section 648 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

703 - Aggregate

703.03 Granular Backfill.

Add the following:

(c) **Coarse Granular Backfill.** Furnish backfill material that consists of clean, hard durable particles or fragments of crushed stone, crushed slag or crushed gravel meeting the gradation shown below.

Sieve Size	Percent Passing
1 inch	100
¾ inch	75 to 100
No. 4	0 to 60
No. 40	0 to 50
No. 200	0 to 5

704 – Soil

Delete 704.01 and replace with the following:

704.01 Foundation Fill. Furnish crushed Surface Course Aggregate

704.02_National_2_8_2019

Delete Subsection 704.02(a) and replace with the following:

704.02 Bedding Material.

(a)	Maximum particle size	3 in (75 millimeters) or half the corrugation depth, whichever is smaller

Delete 704.04 and replace with the following:

704.04 Structural Backfill. Furnish crushed Surface Course Aggregate

704.06 Unclassified Borrow. Delete 704.06(a) and replace with the following.

(a)	Maximum particle size	12 in (300 mm)

704.08_National_11_8_2016

Make the following changes to Subsection 704.08:

704.08 Select Granular Backfill.

Delete Subsection 704.08(a)(2)

704.08 Select Granular Backfill. (a) Quality requirements. (2)

Delete Table 704-2 and replace with the following:

704.08 Select Granular Backfill. Table 704-2

Table 704-2
Select Granular Backfill Gradation

Sieve Size	Percent by Mass Passing Designated Sieve (AASHTO T 27 & AASHTO T 11)
4 inch (100 mm)	100
No. 40 (425 µm)	0 – 30
No. 200 (75 µm)	0.0 – 8.0

705 – Rock

705.02_National_2_8_2019

Add the following Class to Table 705-1 in Subsection 705.02:

705.02 Riprap. Table 705-1.

Table 705-1
Gradation Requirements for Riprap(1)

Class	% of Rock Equal or Smaller by Count, DX	Range of Intermediate Dimensions,(2) inches (millimeters)	Range of Rock Mass,(3) pounds (kilograms)
0	100	6 – 8 (150 –200)	17 – 41 (8 – 19)
	85	5 – 6 (150 – 150)	10 – 17 (5 – 8)
	50	2 – 5 (50 – 125)	0.6 – 10 (0.3 – 5)
	15	0 – 2 (0 – 50)	0 – 0.6 (0 – 0.3)

705.08_National_2_8_2019

Add Subsection 705.08:

705.08 Streambed Simulation Rock.

(a) Simulation Material. Furnish a mixture of soil, gravel, cobble, and boulders to simulate a natural streambed. The cobbles and boulders should be hard, durable rock that conforms to test values in 705.02.

Table 705-4
Gradation requirements for Streambed Simulation Material (inches or sieve size)

Bed Class	100% passing	84% passing	50% passing	16% passing	10% passing
2	5	2	3/4	1/4	No. 10
4	10	4	1 3/4	1/2	No. 10
6	14	6	2 1/2	3/4	No. 10
8	22	8	3	1	No. 10
10	24	10	4	1	No. 10
12	30	12	5	1 1/2	No. 10
14	36	14	6	1 3/4	No. 10
16	42	16	7	2	No. 10
20	48	20	8	3	No. 10
24	60	24	10	3	No. 10
36	72	36	14	4	No. 10
48	96	48	18	6	No. 10

(b) Streambed Channel Rock. Furnish hard durable rock that is resistant to weathering and water action, free of organic or other unsuitable material, similar in color to those in the area, and at least as angular as that found in the natural stream channel. Do not use shale, rock with shale seams, or other fissile or fissured rock that may break into smaller pieces in the process of handling and placing. Conform to test values in 705.02.

Table 705-5
Gradation Requirement for Channel Rock (CR)

Class	Mass (Pounds)	Approximate Cubic Dimension (inches)
CR - 0	12 - 90	6 - 12
CR - 1	90 - 300	12 - 18
CR - 2	300 - 700	18 - 24
CR - 3	700 - 1350	24 - 30
CR - 4	1350 - 2400	30 - 36
CR - 5	2400 - 3700	36 - 42
CR - 6	3700 - 5500	42 - 48
CR - 7	5500 - 7900	48 - 54
CR - 8	7900 - 10800	54 - 60
Note: Mass / Pounds of channel is based on a sphere of the approximate cubic dimensions composed of granite. Mass will vary with rock type. Inspection should be performed by using the cube root of the A axis * B axis * C axis of each piece.		

725 - Miscellaneous Material

725.04_National_2_8_2019

Delete paragraph (a) of Subsection 725.04 and replace with the following:

725.04 Pozzolans.

(a) Fly ash. Conform to AASHTO M 295, Class C or Class F, except the loss on ignition must not exceed 3.0%.	1.5 max

Add the following to Subsection 725.13 (b):

725.13 Grout.

(b) Nonshrink grout.

When non-shrink grout is called for in bridge deck and prestressed multi-beam girder keyways, furnish non-shrink grout from an approved Qualified Products List for the state the bridge is located in. If specifically listed, use non-shrink grout appropriate for use in keyways.

736 - Geocell

736.01 Geocell.

Furnish geocell material consisting of sheet strips fabricated from high-density polyethylene (H.D.P.E.), connected in series at off-set, full-depth ultrasonic seams aligned perpendicular to the longitudinal axis of the strips. When expanded, the interconnected strips form the walls of a flexible, three-dimensional cellular confinement structure into which the specified infill material is placed.

736.02 Requirements. Furnish geocells consisting of polyethylene material treated to resist ultraviolet degradation and conforming to the requirements shown in table 736-1.

Table 736-1 – requirements for geocells.

Density	ASTM D 1505	0.935 to 0.965 g/cm^3 (58.4 to 60.2 pounds per cubic foot).
Environmental Stress Crack Resistance	ASTM D 1693	3000 hour
Strip Sheet Thickness	ASTM D 5199	1.27 mm (50 mil), minus 5 percent, plus 10 percent. Determine thickness in the flat before any surface texturing or other surface disruption.
Short-term peel strength	U.S. Army Corps of Engineers Technical Report GL-86-19, Appendix A	2000 N (450 pound) minimum for 150 mm (6.0 inch) depth cell
Seam Hang Strength	101.6 mm (4”) weld joint supporting load of 72.5 kg (160 pounds) or 101.6 mm (4”) weld joint supporting load of 72.5 kg (160 pounds) while undergoing temperature change from 23^{O} C to 54^{O} C (74^{O} F to 130^{O} F) on 1 hour cycles.	30 days minimum 7 days minimum