

## **SECTION C – DESCRIPTION/SPECIFICATIONS/STATEMENT OF WORK**

### **Scope of Contract**

The Texas Falls Accessibility Improvements work includes, but is not limited to, layout and construction of cast-in-place concrete abutments, furnishing, fabricating, preparing, assembling, and erecting the bridge and pathways, including but not necessarily limited to all steel, timber, connections, concrete, reinforcement, excavation, backfill, wood preservatives, metal parts, and hardware required in conformity with the details shown on the Plans and as noted below.

Work for the original Base Bid Contract, which involved the installation of the prefabricated truss bridge (bridge No. 2) was completed in 2010. Also, work for Bid Alternate 1, which included the installation of a temporary trail, was completed in 2010. **This contract is for Bid Alternate 2 (construction of the permanent trail and bridge No. 1) and Bid Alternate 3 (construction of the observation deck). Additionally, this contract includes removal of the temporary fence installed as part of Bid Alternate 1 (with minor site restoration as noted on the plans), re-painting of the crosswalk, and re-painting of the prefabricated truss bridge.**

### **Project Location**

Project is located on the Green Mountain National Forest near Hancock, VT in Addison County.

### **Statement of Work/Specifications**

The Contractor shall furnish the necessary personnel, material, equipment, services, and facilities (except as otherwise specified), to perform the State of Work/Specifications referenced.

### **FOREST SERVICE SUPPLEMENTAL SPECIFICATIONS**

The U.S. Department of Transportation, Federal Highway Administration, Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-14, U.S. Customary Units and its revisions are included by reference only. Also applicable, but not listed, is any other section or subsection of the included Specification(s) or any specific standard or specification referenced therein. The requirements contained in these specifications are hereby made a part of this Solicitation for Bid and any resulting contract.

A copy of the U.S. Department of Transportation, Federal Highway Administration, Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-14, U.S. Customary Units can be obtained at the following locations:

Superintendent of Documents

U.S. Government Printing Office

Internet: [bookstore.gpo.gov](http://bookstore.gpo.gov)

Phone: (toll free) 866.512.1800

Fax: 202.512.2104

Mail: Stop SSOP, Washington, DC 20402-0001

They can also be downloaded directly at the following website:

<http://flh.fhwa.dot.gov/resources/pse/specs/>

The following Forest Service Supplemental Specifications are revisions to the Standard Specifications that incorporate specification changes or additions that are specific requirements and unique to this particular project. The specifications are herein modified as follows.

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## Preface

Preface\_wo\_03\_16\_2023

**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
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ppm	—	parts per million	volume
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STA		station	location
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101.04\_National\_1\_22\_2020

### **Make the following changes to Subsection 101.04:**

#### **101.04 Definitions.**

##### **Delete these definitions and replace the following:**

**Bid Schedule** — The Schedule of Items.

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

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

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

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

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

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

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

**Add the following definitions:**

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

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

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

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

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

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

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

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

**Shop Drawings** — (Timber and Stewardship Contracts) Referred to as “Drawings” in FP-14, include drawings, diagrams, layouts, schematics, descriptive literature, illustrations, lists or tables, performance



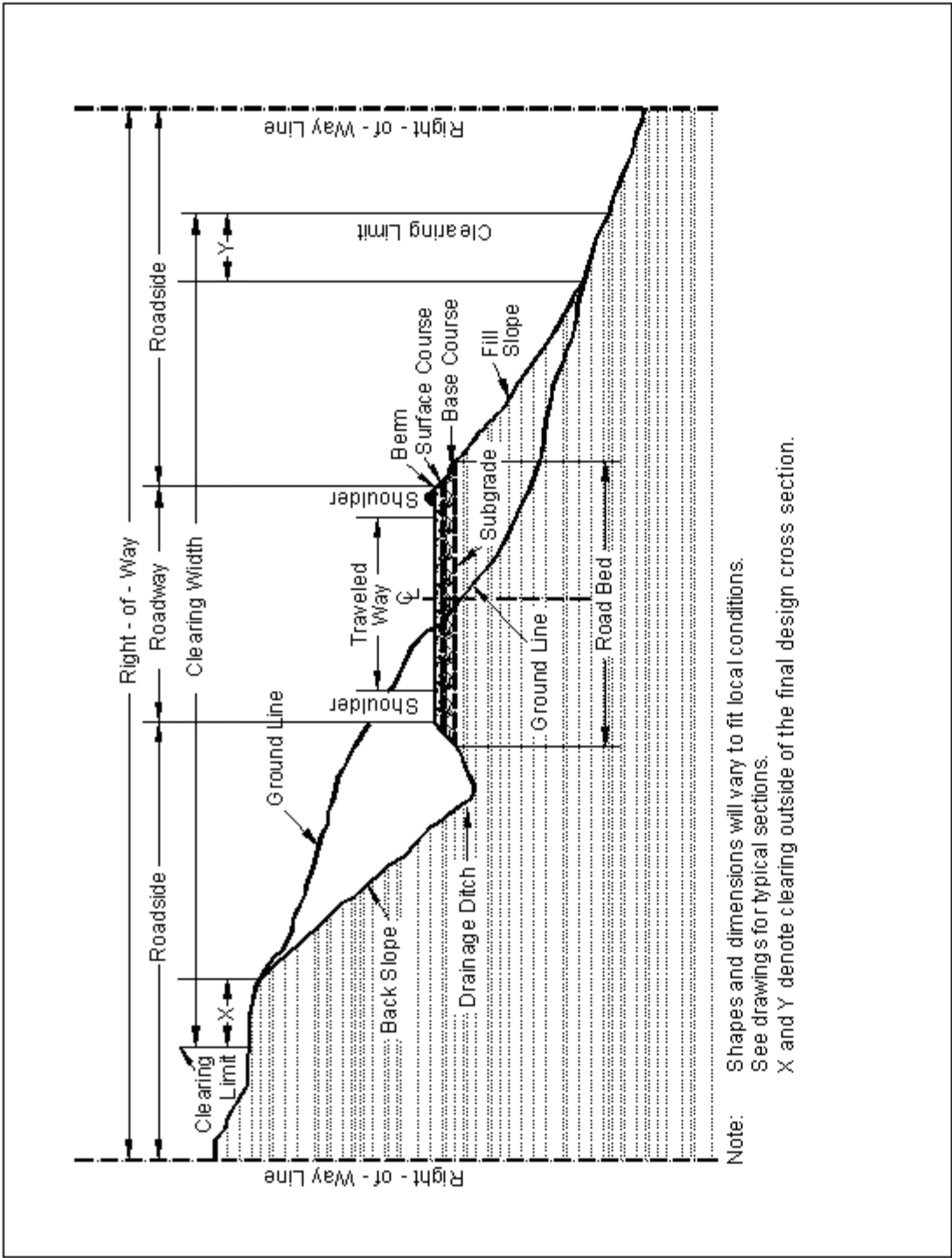
and test data, and similar materials furnished by Purchaser to explain in detail specific portions of the work required by the contract.

**Utilization Standards —**

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

**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**

105.05\_National\_6\_29\_2020

### **105.05 Use of Material Found in the Work.**

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

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

## 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.

**Delete Subsection 106.02 and replace with the following:**



**106.02 Visual Inspection.**

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

## **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.**

109.01\_National\_2\_22\_2019

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

#### **109.01 Measurement of Work.**

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

**Table 109-1**

#### **Decimal Accuracy of Quantities for Final Payment**

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

**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.

## 152 - Construction Survey and Staking

152.00\_National\_12\_12\_2016

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 <sup>(1)</sup>**

<b>Staking Phase</b>	<b>Horizontal</b>	<b>Vertical</b>
Control points set from existing Government control points- Tolerance Class A	±0.03 feet (±10 millimeters)	±0.01 feet $\times \sqrt{N}$ (±3 millimeters $\times \sqrt{N}$ ) <sup>(2)</sup>
Mapping, topography, and cross-section Points- Tolerance Class A	±0.16 feet (±50 millimeters)	±0.16 feet (±50 millimeters)
Centerline points <sup>(3)</sup> 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 <sup>(4)</sup>	±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) <sup>(5)</sup>	±0.03 feet (±10 millimeters)
Bridge superstructures stakes	±0.03 feet (±10 millimeters) <sup>(5)</sup>	±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 <sup>(6)</sup>	±0.16 feet (±50 millimeters)	±0.03 feet (±10 millimeters)
Roadway finish grade stakes <sup>(6)</sup>	±0.16 feet (±50 millimeters)	±0.03 feet (±10 millimeters)

**Table 152-1  
Construction Survey and Staking Tolerances (continued) <sup>(1)</sup>**

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

## **155 - Schedules for Construction Contracts**

155.00\_National\_11\_9\_2016

**Delete Section 155 in its entirety.**

**Delete Section 155.**

## **157 - Soil Erosion and Sediment Control**

157.04\_National\_11\_1\_2016

Delete Subsection 157.04 and replace with the following:

### **157.04 General.**

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

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

## **201 - Clearing and Grubbing**

201.04\_National\_9\_10\_2018

### **Construction Requirements**

Delete and replace Subsection 201.04(d) with the following:

#### **201.04(d) Clearing.**

**(d)** Trim tree branches that extend over the road surface and shoulders to attain a clear height of **10** feet. Trim tree limbs as near flush with the trunk as practicable.

## 203 - Removal of Structures and Obstructions

203.05\_National\_9\_10\_2018

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 <number> 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

204.00\_National\_11\_4\_2016

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

### 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

### 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:1<sup>3</sup>/<sub>4</sub>H 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  $\frac{1}{2}$  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  $1\frac{1}{3}V:1H$  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.

[illegible]

**Table 204-1**  
**Sampling, Testing, and Acceptance Requirements**

<b>Material or Product (Subsection)</b>	<b>Type of Acceptance (Subsection)</b>	<b>Characteristic</b>	<b>Category</b>	<b>Test Methods Specifications</b>	<b>Sampling Frequency</b>	<b>Point of Sampling</b>	<b>Split Sample</b>	<b>Reporting Time</b>
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 <sup>(2)</sup>	1 per soil type, but not less than 1 per each 13,000 yd <sup>3</sup> (10,000 m <sup>3</sup> )	"	"	"
		Density	—	AASHTO T 310 or other approved procedures	1 per 3500 yd <sup>2</sup> (3000 m <sup>2</sup> ), but not less than 3 per layer	In-place	No	Before placement of next layer
Top of subgrade (204.11(a))	"	Density	—	AASHTO T 310 or other approved procedures	1 per 2500 yd <sup>2</sup> (2000 m <sup>2</sup> ), but not less than 3 per layer	In-place	No	Before placement of next layer
<b>Finished Product</b>								
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

		Tolerance Class (a)												
Location Description		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 <sup>(b)</sup> )		+3	+5	+5	+5	+5	+5	+10	+10	+10	+10	+20	+20	+20
<div>(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.</div>														

## **208 - Structure Excavation and Backfill for Selected Major Structures**

208.07\_National\_11\_8\_2016

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\_7\_18\_2017

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\_7\_17\_2017

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.

## **599 – Composite Wood Decking**

The following section is hereby added:

**599.01 Description.** This work consists of furnishing, preparing and erecting composite wood decking. It also includes all associated hardware and accessories.

### **599.02 Submittals.**

- A. Submittals for Review:
  - a. Product Data: Indicate sizes, profiles, surface finishes, and performance characteristics.
  - b. Samples: 12 inch long decking sample illustrating size, profile, color, and surface finish.
- B. Closeout Submittals:
  - a. Maintenance Data: Manufacturer's instructions on care and cleaning of composite wood products.

### **599.03 Delivery, Storage and Handling**

- A. Deliver, store, and handle composite wood in accordance with manufacturer's instructions.
- B. Store composite wood level and flat, off ground or floor, with supports at each end and maximum 24 inches on center.
- C. Do not stack composite wood over 12 feet high.
- D. Cover composite wood with waterproof covering, vented to prevent moisture buildup.

**599.04 Warranties.** Furnish manufacturer's 25 year warranty providing coverage against checking, splitting, splintering, rotting, structural damage from termites, and fungal decay of composite wood.

### **599.05 Manufacturers.**

- A. Contract Documents are based on products by Trex Company, Inc.
- B. Substitutions: Approved Equal

### **599.06 Materials.**

- A. Composite Wood:
  - a. Composition: Reclaimed wood and plastic with integral coloring; free from toxic chemicals and preservatives.
  - b. Profiles:
    - i. Decking: Nominally 2 x 6
    - ii. Nailers: Nominally 1 x 8 ((3) each stacked)
  - c. Surface texture: contoured
  - d. Color: Grey to match existing decking on prefabricated truss bridge (Approval required)
  - e. Characteristics:

- i. Abrasion resistance: 0.01 inch wear per 1000 revolutions, tested to ASTM D2394.
- ii. Hardness: 1124 pounds, tested to ASTM D143.
- iii. Self ignition temperature: 743 degrees F, tested to ASTM D1929.
- iv. Flash ignition temperature: 698 degrees F, tested to ASTM D1929.
- v. Flame spread rating: 80, tested to ASTM E84.
- vi. Water absorption, 24 hour immersion, tested to ASTM D1037:
  - 1. Sanded surface: 4.3 percent.
  - 2. Unsanded surface: 1.7 percent.
- vii. Thermal expansion coefficient, 36 inch long samples: 1) Width: 35.2 x 10<sup>-6</sup> to 42.7 x 10<sup>-6</sup>. 2) Length: 16.1 x 10<sup>-6</sup> to 19.2 x 10<sup>-6</sup>.
- viii. Fastener withdrawal, tested to ASTM D1761:
  - 1. Nail: 163 pounds per inch.
  - 2. Screw: 558 pounds per inch.
- ix. Static coefficient of friction:
  - 1. Dry: 0.53 to 0.55, tested to ASTM D2047. 2) Dry: 0.59 to 0.70, tested to ASTM F1679. 3) Wet: 0.70 to 0.75, tested to ASTM F1679.
- x. Fungus resistance, white and brown rot: No decay, tested to ASTM D1413.
- xi. Termite resistance: 9.6 rating, tested to AWWA E-1.
- xii. Specific gravity: 0.91 to 0.95, tested to ASTM D2395.
- xiii. Compression:
  - 1. Parallel: 1806 PSI ultimate, 550 PSI design, tested to ASTM D198.
  - 2. Perpendicular: 1944 PSI ultimate, 625 PSI design, tested to ASTM D143.
- xiv. Tensile strength: 854 PSI ultimate, 250 PSI design, tested to ASTM D198.
- xv. Shear strength: 561 PSI ultimate, 200 PSI design, tested to ASTM D143.
- xvi. Modulus of rupture: 1423 PSI ultimate, 250 PSI design, tested to ASTM D4761.
- xvii. Modulus of elasticity: 175,000 PSI ultimate, 100,000 PSI design, tested to ASTM D4761.
- xviii. Thermal conductivity: 1.57 BTU per inch per hour per square foot at 85 degrees F, tested to ASTM C177.

**559.07 Accessories.** Fasteners: Type, size and length as specified in the plans.

**559.08 Installation.**

- A. Install composite wood in accordance with manufacturer's instructions, fasten according to plans.
- B. Cut, drill, and rout composite wood using carbide tipped blades.
- C. Pre-drill fastener holes located closer than 1 inch from edges.
- D. Cut ends square and true.
- E. Do not use composite wood products as structural members.
- F. Do not exceed maximum spans recommended by manufacturer.

- G. Leave expansion spaces between abutting boards and between boards and adjacent construction:
- a. End gaps between boards: 1/8 inch at ambient temperatures of 60 degrees F and above and 3/16 inch at ambient temperatures below 60 degrees F.
  - b. Side gaps between boards: 1/4 inch at ambient temperatures of 60 degrees F and above and 3/8 inch at ambient temperatures below 60 degrees F.
  - c. Gaps between boards and adjacent construction: 1/4 inch at ambient temperatures of 60 degrees F and above and 1/2 inch at ambient temperatures below 60 degrees F.

**559.09 Measurement.** Measure the 599 items listed in the bid schedule according to Subsection 109.02. Measure Composite Wood Decking by the Linear Foot of board.

**559.10 Payment.** The accepted quantities will be paid at the contract price per unit of measurement for the Section 599 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this section.



## 633 - Permanent Traffic Control

633.00\_National\_11\_8\_2016

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

### **633.02 Material.**

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

Make the following changes to Subsection 633.03:

### **633.03 General.**

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

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

Add the following sentence to Subsection 633.03:

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

Add the following to Subsection 633.05(a):

### **633.05 (a) Fabrication.**

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

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

## **699 – Benches**

Add the following section:

### **699.01 Description.**

This work consists of furnishing and installing a composite bench. It also includes all associated hardware and accessories.

### **699.02 Submittals.**

- A. Submittals for Review and Approval:
  - 1. Product Data: Indicates sizes, color, profiles, surface finishes, and performance characteristics.

### **699.03 Delivery, Storage, and Handling.**

- A. Store products on a flat and level surface. Adjust support blocks accordingly
- B. Keep material covered prior to installation.

### **699.04 Warranties.**

- A. Provide manufactures warranty against rot, decay, splitting, checking, splintering, fungal damage, and termite damage.

### **699.05 Manufacturers.**

- A. Benches: Jamestown Advanced Products Corp., Pilot Rock, or an approved equal.

### **699.06 Materials.**

- A. Composite or Recycled Plastic. Modeled into 3"x4" nominal sized timbers with solid color formed throughout and with a U.V. stabilizer added for ultra-violet protection.
- B. Steel Frame, Grade A-36, Galvanized Coated
- C. Fasteners type, size, and length in accordance with manufacture's recommendations and as shown on plans.
- D. Concrete, Quikrete Mix 1101 or approved equal.

### **699.07 Installation.**

Install in accordance with manufacturer's recommendations and as shown on plans.

### **699.08 Measurement.**

Measure the 699 items listed in the bid schedule according to Subsection 109.02. Measure Benches by Each.

### **699.09 Payment.**

The accepted quantities will be paid at the contract price per unit of measurement of the Section 699 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this section.

## 701 - Cement

701.02\_National\_7\_10\_2017

Add the following to Subsection 701.02:

### **701.02 Masonry and Mortar Cement.**

Keep mortar in the original manufacturer's labeled containers until used. Protect as specified for Portland cement in 701.01. Do not use mortar after the expiration date shown on the container or 1 year from date of purchase, whichever date occurs first.

Store, mix, place and cure in accordance with the manufacturer's instructions; submit a copy in advance of use to the CO.

Furnish mortar that is a chemical action concrete of the magnesium ammonium phosphate family and requires no curing under ambient temperatures of 36° - 100° F. Require recommendation by its manufacturer specifically for use in prestressed concrete bridge member keyways that are to be part of the finished wearing and running surface of the bridge, subjected to normal roadway contaminants and conditions promoting wear of normal bridge deck concrete.

Typical properties of the mortar, when tested neat without aggregate, are as follows, except when noted:

- Compressive strength (ASTM C 109 modified) of 6000 psi at 24 hours at 72° F or above, and when used below 50° F, 5000 psi.
- Modulus of elasticity (ASTM C 469) at 7 and 28 days of 4177 ksi and 4554 ksi.
- Freeze-thaw durability (ASTM C 666, Procedure A Modified) of a relative dynamic modulus greater than 80 percent after 300 cycles.
- Scaling resistance to deicing chemicals (ASTM C 672) after 5 and 25 cycles at a rating of 0, shall show no surface scaling; after 50 cycles at a rating of 1.5 shall show only slight surface scaling.
- Sulfate resistance (ASTM C 1012) length change after 52 weeks shall be no greater than 0.9 percent.
- Coefficient of thermal expansion (CRD-C 39-81) when run with 1 inch x 1 inch x 11 inch bars and neat mixes without aggregate, shall be within 10 percent of 7150 psi/degree Fahrenheit.
- Flexural strength (ASTM C 78 Modified) of 3 inch x 4 inch x 16 inch prisms shall be 3.8 550 psi at 24 hours for the mortar only, and 670 psi with 3/8 inch pea gravel.

Submit independent tests for the mortar recommended for use from 50° - 100° F, when used to fill test specimens conforming to the Government's bridge box beam test keyway, showing the following results:

Lateral (horizontal) shear between adjacent members: Range of 14 k/ft of keyway

Vertical shear between adjacent members: 16 k/ft of keyway

Direct tension between adjacent members: 6 k/ft of keyway.

Submit independent tests for the mortar recommended for use from 36° - 50° F, when used to fill test specimens conforming to the Government's bridge box beam test keyway, showing the following results:

- Lateral (horizontal) shear between adjacent members: Range of 2.4 k/ft of keyway
- Vertical shear between adjacent members: 6 k/ft of keyway
- Direct tension between adjacent members: 4 k/ft of keyway.

Two products that meet these requirements are BASF/Master Builders Technologies Regular Set-45 [for use below 50° F] and Set-45 Hot Weather Formula [for use from 50° - 100° F].

Use Set-45 Hot Weather Formula in air temperatures from 50° - 100° F. Use Regular Set-45 only in air temperatures below 50° F. When used in temperatures below 36° F, use approved weather precautions designed to prevent the mortar from freezing. Except when used in bridge deck keyways and blockouts, Regular Set-45 may be extended by the addition of 20 pounds of washed and clean 3/8 inch minus pea gravel per 50 pound bag when placed in thicknesses over 1.5 inches, or when approved by the CO.

Unless using one of the two products described above, submit products proposed for use to the CO for approval, and accompany them with the manufacturer's submittals substantiating all requirements in this section, including (1) graphs or charts showing the time, temperature, humidity, and curing requirements to achieve mortar strengths equal to the adjacent concrete; and (2) complete recommendations for storage, mixing, application and curing procedures.