Thunder Creek Trail Bridge Fabrication & Installation
North Umpqua Ranger District, Umpqua National Forest, Oregon
Statement of Work and Request for Proposals (RFP)

Background and Statement of Work:
The National Forest Foundation (NFF), in partnership with the U.S. Forest Service Umpqua National Forest (USFS), is working to restore and replace recreation infrastructure that was damaged during the 2020 Archie Creek Fire. This project is to remove the wildfire-damaged Thunder Creek Trail Bridge and replace it with a new prefabricated steel bridge. This project will restore connectivity to the Tioga segment of the North Umpqua Trail.

The bridge is 4’ wide (clear) and center-of-bearing to center-of-bearing of 47'-6”. The trail bridge will be a Forest Service standard steel truss trail bridge design. Steel must be sourced, melted, and manufactured in the U.S. per the USDOT’s Buy America law. Work includes removal of existing damaged trail bridge; bridge approach construction; design, fabrication, and installation of new trail bridge superstructure; fabrication and installation of new concrete substructures; felling of hazard trees. Bridge installation will require a helicopter. Project needs to be completed by November 15, 2022.

General Specifications

(a) Description of Work – This RFP is for services related to removing the damaged trail bridge at Thunder Creek and replacing it with a new prefabricated steel bridge. The work includes the following:

1. Mobilization, including fire protection and equipment cleaning

2. Soil erosion and pollution control (Appendix B, Section 157), including:
   i. Plan preparation
   ii. Installation and removal of control measures

3. Removal of 15 individual trees at bridge site (Appendix B, Section 202)
   i. NFF and the USFS will designate trees to be felled for contractor safety and to protect integrity of bridge into the future
   ii. Most trees to be felled are approximately 13–20-inch diameter at breast height (DBH), with a couple less than 10-inch DBH and a couple larger than 24-inch DBH
   iii. When felling trees, fell them such that they lay laterally across the slope rather than pointing down toward the trail. Limb and leave felled trees in place.

4. Removal of existing trail bridge (Appendix A, Sheet 4 and Appendix B, Section 203)
   i. Demolish existing burned timber trail bridge and all hardware
   ii. Dispose of existing trail bridge legally off of government land
   iii. Prior to removal, utilize sill and backwall to establish survey control points
5. Embankment construction (Appendix A, Sheets 5 and 7 and Appendix B, Sections 204 and 209)
   i. Construction of new trail embankment
   ii. Includes structural excavation and backfill
   iii. On site materials can be utilized for this project element
   iv. Compaction placement method (f) (See Appendix B for definition)
   v. Excess or unsuitable material excavated shall be disposed of at waste areas near the project sites at locations approved by the NFF and the USFS within 100 feet from end of the trail bridge and at least 50 feet from streams.

6. Structural concrete, class A(AE) (Appendix A, Sheets 5, 6, 8, 9, 10 and Appendix B, Section 552)
   i. Construct and install 2 concrete grade beams per Appendix A
   ii. Estimated quantity is 2 cubic yards

7. Reinforcing steel, grade 60, for grade beams (Appendix A, Sheet 10 and Appendix B, Section 554)

8. Prefabricated bridge superstructure (Appendix A, Sheets 5-10 and Appendix B, Section 571)
   i. Under USDOT's Buy America Law, if the total steel or iron incorporated into a product exceeds $2,500, then sourcing, melting, and manufacturing must take place in the U.S. Contractor must provide heat mill certificates from vendors or manufacturers.

9. Temporary traffic control (Appendix B, Section 156)
   i. Includes temporary traffic control for unload and load at trailhead and helicopter operations

The Contractor shall identify which efforts and materials they can supply in terms of materials, labor, equipment, supplies, supervision, quality control, and incidentals required to complete the work described. The Contractor shall perform all work in a safe and conscientious manner.

(b) Project Location – This project is located on the North Umpqua Ranger District on the Umpqua National Forest. Latitude 43.310247, Longitude -122.847234. From Roseburg take Exit 124 off Interstate I-5 then Highway 138 East (North Umpqua Highway). Continue on Highway 138 for approximately 34 miles, turn right on to FS Rd 4711 and cross the bridge to Wright Creek Trailhead. From the trailhead hike west on Trail #1414 (North Umpqua Trail) for approximately 2.5 miles to Thunder Creek trail bridge.

(c) Work Schedule – The project must be completed by November 15, 2022. If project occurs during fire season, fire restrictions may result in limited hours of equipment operations at the work site. (See Appendix C for Fire Protection and Suppression Guidelines.) The Contractor shall submit a project work schedule to NFF for approval. Project implementation must occur during the following work windows:

1. Ground disturbing construction activity: July 15 – October 15, 2022
2. Chain saw and heavy equipment activity: July 16 – November 15, 2022
3. Helicopter activity: October 1 – November 15, 2022
Other Project Requirements and Specifications

(a) **Site information** -
1. The project site does not include water, electrical, housing services, or restrooms. Contractor may be able to camp near the project site on an area specified by the USFS. To do so, Contractor will need to submit an Industrial Camping Authorization form.
2. There is no cell service at the project site.

(b) **Staging areas** -
1. The Wright Creek Trailhead is available for use as a trail bridge delivery and staging site. The available space adjacent to FS Rd 4711 is approximately 12' at the narrowest x 66' running along FS Rd 4711. If this site is used the Contractor is responsible to develop, submit for approval, and implement a traffic control plan for the delivery and helicopter installation days.
2. There is a separate USFS North Umpqua Trail bridge contract planned on the neighboring Mott segment of the trail that will also use Wright Creek Trailhead for delivery and staging during the same work window as this project. The NFF and the USFS will work with both contractors to schedule the use of Wright Creek Trailhead.
3. The USFS has identified a potential helicopter staging site: Steamboat Helibase. The Contractor is responsible to request the use of the site for approval. Other activities such as fire suppression have preferential use of the site. In the case of emergency, the Contractor may be ordered to vacate the site with short notice.
4. The trail and suitable areas adjacent to the site may be utilized for temporary stockpiling of materials as approved by the NFF and the USFS.
5. Staging and stockpile sites at locations other than the project site are shown in Appendix A, Sheet 2.

(c) **Specifications** – Project work shall be accomplished in accordance with the following:
1. Detailed project specifications are included in Appendix B. These specifications are from the *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-14*.
2. FHWA Standard Specification 2014 U.S. Customary applies
3. Helicopter Activities: Maintain a flight path of a minimum of 350 feet above ground level except when picking or dropping loads. Submit the helicopter flight path for review and approval to ensure suitable habitat for the spotted owl is not compromised
4. Fire Precautions: If operating during fire season, the Contractor shall adhere to the Fire Protection and Suppression Guidelines (Appendix C).
5. Heritage Resource Considerations: If cultural resources are encountered during the project, earth disturbing activities in the vicinity must be suspended in accordance with federal regulations and the USFS must be notified.
6. Special Equipment Cleaning Requirements: All earth moving equipment (e.g., mini excavator) moved to the job site shall be cleaned of weeds and their seeds prior to each entrance onto the National Forest lands. Cleaning shall consist of the removal of all dirt, grease, debris, and materials that may harbor noxious weeds and their seeds. This may require the use of a pressure hose. Upon request by the NFF, equipment shall be made available for visual inspection by the Forest Service prior to entering Forest Service...
lands. Inspections will take place at mutually agreeable en-route locations in advance of entry onto National Forest lands. The Contractor shall take special care under this contract to prevent contamination of water at the work sites with any petroleum residues from mechanical equipment operations. This shall include daily inspection and cleaning as appropriate.

7. Erosion Control After September 15: No more than 0.2 hectare (0.5 acre) of ground disturbed by contract operations shall exist on the project between September 15 and May 1 without adequate surface erosion control measures in place. Seed and mulch applications required by the contract must be kept current and disturbed ground where work is not complete may require interim seed and mulch applications.

8. Road Use and Maintenance: The Contractor shall follow FP-14 Specifications 104.06 and 156 (see Appendix B), and is authorized to use the following roads for performance of work under this contract subject to the maintenance requirements and use limitations shown:
   i. Rd. 4711 MP 0.0 – 0.3
   ii. Rd. 38 P 0.0 – 0.7, 3803 MP 0.0 – 0.7 (Access Steamboat helibase)

The Contractor is authorized to use those currently open Forest Service roads providing the most direct route to or between the specified project sites for the purpose of access and haul.

If the Contractor requests use of a National Forest road or road segment not listed above, the Forest Service may authorize such use if not in conflict with the current Road Rules document. Authorization to use such additional roads may include maintenance requirements and use limitations.

The roads authorized for use will be subject to the following provisions:

i. The current National Forest Road Use Rules Document is applicable to all commercial road users. This document is available for inspection at the office of the Forest Supervisor and shall be applicable except when modified by provisions of this contract.

ii. Federal Regulations contained in 36 CFR 261.54 as applied to the area by an order issued under 36 CFR 261.50. These regulations authorized the Forest Service, as a sovereign act, to issue additional restrictions to those shown in the current Road Use Rules Document and will be posted on the road.

9. References to “CO” and “COR” in the appendices shall be understood as the NFF since the NFF is the contracting agent for this project.
(d) **Submittals** – Selected contractor shall provide the following to the NFF for approval prior to starting work:

<table>
<thead>
<tr>
<th>Item</th>
<th>Referenced by Contract clause or Specification No.</th>
<th>Time of Approval After Submittal</th>
</tr>
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<tbody>
<tr>
<td>Hazardous Spill Plan</td>
<td>Appendix B 107.10(b)</td>
<td>2 days</td>
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<tr>
<td>Quality Control Plan</td>
<td>Appendix B 153.02(a) &amp; (b) and 153.03</td>
<td>14 days</td>
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<tr>
<td>Soil Erosion and Sediment Control Plan</td>
<td>Appendix B 157.03, 157.04</td>
<td>30 days</td>
</tr>
<tr>
<td>Bridge Removal Plan</td>
<td>Appendix B 203.04(a)</td>
<td>30 days</td>
</tr>
<tr>
<td>Bearings</td>
<td>Appendix B 564.03</td>
<td>14 days</td>
</tr>
<tr>
<td>Bridge Preassembly Notification</td>
<td>Appendix B 571.08</td>
<td>14 days</td>
</tr>
<tr>
<td>Bridge Delivery Notification</td>
<td>Appendix B 571.06</td>
<td>14 days</td>
</tr>
<tr>
<td>Bridge components, hardware, fasteners list</td>
<td>Appendix B 571.08(f)</td>
<td>14 days</td>
</tr>
<tr>
<td>Bridge Erection Plan</td>
<td>Appendix A Sheet 9 of 10, General Notes, Erection Plan</td>
<td>14 days</td>
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<tr>
<td>Project Work Schedule</td>
<td>General Specifications, Section C</td>
<td>14 days</td>
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<tr>
<td>Safety Plan</td>
<td>Appendix B 107.08</td>
<td>14 days</td>
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<tr>
<td>Helicopter flight path</td>
<td>Other Project Requirements and Specifications, Section C-3</td>
<td>14 days</td>
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<tr>
<td>Fire Plan</td>
<td>Appendix C</td>
<td>14 days</td>
</tr>
<tr>
<td><em>Shop Drawings and Calculations for Temporary Works</em></td>
<td>Appendix B 104.03 and 562.04</td>
<td>21 days</td>
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<tr>
<td><em>Only required if the Contractor uses temporary works</em></td>
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<tr>
<td>Shop Drawings and Calculations for Prefabricated Bridge</td>
<td>Appendix B 104.03(a)(2)(b) &amp; (b)(1)(j), 571.03 &amp; 571.04 Appendix A Sheet 9 of 10, General Notes</td>
<td>21 Days</td>
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<tr>
<td>Instructions and Drawings</td>
<td>Appendix B 571.08(g)</td>
<td>14 days</td>
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<tr>
<td>As-Built Drawings</td>
<td>Appendix B 104.03(c)</td>
<td>N/A</td>
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<tr>
<td>Concrete mix design including admixtures</td>
<td>Appendix B 552.03</td>
<td>14 days</td>
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<td>Concrete quality control certification, including batch tickets and test results</td>
<td>Appendix B 552.09</td>
<td>14 days</td>
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<tr>
<td>Portland cement production certifications</td>
<td>Appendix B 552.20</td>
<td>14 days</td>
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<tr>
<td>Reinforcing steel production certifications</td>
<td>Appendix B 554.10</td>
<td>14 days</td>
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<tr>
<td>Bearing production certification</td>
<td>Appendix B 564.10</td>
<td>14 days</td>
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<tr>
<td>Certification wood species, grade, and conformance</td>
<td>Appendix B 571.08(a)</td>
<td>14 days</td>
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<tr>
<td>Certification of structural steel, fasteners, and hardware</td>
<td>Appendix B 571.08(c)</td>
<td>14 days</td>
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<tr>
<td>Certification of galvanizing process</td>
<td>Appendix B 571.08(d)</td>
<td>14 days</td>
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<tr>
<td>Steel Fabricator Certification</td>
<td>Appendix B 571.08(e)</td>
<td>14 days</td>
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<tr>
<td><em>Epoxy Anchors</em></td>
<td>Appendix B 571.10 or Appendix A Plan Sheet 10 of 10</td>
<td>15 days</td>
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</table>

*Only required if the Contractor elects to install new epoxy anchor bolts*
Insurance Requirements

Upon selection of the winning bid, chosen contractor will be asked to affirm that it has and shall maintain State minimum workers’ compensation insurance coverage for its employees, if any. The selected contractor shall also maintain broad form general liability, property damage, and automotive liability insurance in the minimum amount of $1,000,000 for bodily injury, death, or damage to property of any person and $2,000,000 for bodily injury, death, or damage to property of more than one person. The Contractor shall name NFF an Additional Named Insured and provide NFF with documentation evidencing such coverages.

Performance Security

Chosen contractor shall post cash, a letter of credit, bond, or other financial security that is easily convertible into cash in a form acceptable to the NFF in its sole determination in the amount of 5% of the amount due to contractor, not to exceed $250,000 dollars, to assure completion of the work required under this Agreement and payment of all amounts lawfully due to all persons supplying or furnishing to the Contractor or Contractor’s subcontractors with labor, laborers, materials, rental machinery, tools or equipment used or to perform the work. As work is completed in integrated component parts, inspected, approved and, if applicable, conveyed to NFF, the Performance Security shall be released in a proportional amount, unless a lesser amount of release is necessary to maintain 5% Performance Security.

Pricing Schedule

Contractor shall price work according to the schedule below. Prevailing wages are required per conditions of funding sources.

<table>
<thead>
<tr>
<th>Item No.*</th>
<th>Description</th>
<th>Unit</th>
<th>Est. Qty.</th>
<th>Unit Cost</th>
<th>Total Cost</th>
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<tbody>
<tr>
<td>15101</td>
<td>Mobilization</td>
<td>Lump Sum</td>
<td>All</td>
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<tr>
<td>15713</td>
<td>Soil erosion and pollution control</td>
<td>Lump Sum</td>
<td>All</td>
<td></td>
<td></td>
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<tr>
<td>20207</td>
<td>Removal of individual trees, disposal method (f)</td>
<td>Each</td>
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<td>20301</td>
<td>Removal of existing trail bridge, disposal method (a)</td>
<td>Lump Sum</td>
<td>All</td>
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<tr>
<td>20450</td>
<td>Embankment construction, compaction placement method (f)</td>
<td>Lump Sum</td>
<td>All</td>
<td></td>
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<tr>
<td>55201</td>
<td>Structural concrete, class A(AE)</td>
<td>*Cubic Yard</td>
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<tr>
<td>55402</td>
<td>Reinforcing steel, grade 60</td>
<td>Lump Sum</td>
<td>All</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57101</td>
<td>Pre-fabricated bridge superstructure</td>
<td>Each</td>
<td>1</td>
<td></td>
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<tr>
<td>63501</td>
<td>Temporary traffic control</td>
<td>Lump Sum</td>
<td>All</td>
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</table>

*Item numbers align with plans in Appendix A and specifications in Appendix B
Information Requested

If interested in this project, please provide a bid for the above statement of work including approach, work experience, and cost. Specifically, please include the following in your bid:

(a) Completed pricing schedule and total cost of project
(b) An explanation of your capacity and approach for this project including:
   a. Your expected project schedule including sequence of work items and approximate time to complete each item
   b. Assume there will be water flowing in the stream crossing. Provide a brief explanation of your erosion control practices associated with this work.
   c. List of equipment you will provide to complete the work (owned or rented)
   d. Description of the work you plan to subcontract out
(c) Brief explanation of previous work experience with fabrication and installation of trail bridges with helicopter transportation of materials
(d) Three references who can speak to your work on similar projects
(e) Heat mill certificates from vendors or manufacturers to certify that any steel or iron procured for this project will be sourced, melted, and manufactured in the U.S. (i.e., compliance with USDOT’s Buy America law).

This is a request for proposals only and quotations furnished are not offers. This request does not commit the National Forest Foundation to pay any costs incurred in the preparation of submission of the quotation or to contract for supplies or services.

Site Tours / Pre-Bid Meeting

There are no scheduled site tours or pre-bid meetings. However, bidders are encouraged to visit the site prior to submitting a bid and can schedule a phone or virtual meeting with the NFF and the USFS to ask questions about the project. Please contact Audrey Squires at asquires@nationalforests.org or 541.751.5121 for trail conditions and/or to schedule a meeting.

Bid Submission

Submit bids via email to asquires@nationalforests.org by Wednesday May 25, 2022 at 5pm.

Contractor Selection Process

The NFF will use the Evaluation Factors below to review each submitted bid. Based on the outcomes of that selection process, the NFF will notify successful and unsuccessful bidders by Friday June 3, 2022, and will prepare a separate contract document for the successful bidder.
## Evaluation Factors and Relative Importance

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<th>Level 3 Criteria</th>
<th>Level 2 Criteria</th>
<th>Level 1 Criteria</th>
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<td>• Cost</td>
<td>• Technical proposal / proposed approach to project</td>
<td>• Benefits to the local community</td>
</tr>
<tr>
<td>• Equipment and contractor capability</td>
<td>• Overall strategic benefits to meeting NFF goals and grant needs, requirements, and timelines</td>
<td>• Relationship to local community</td>
</tr>
<tr>
<td>• Timing of when contractor can begin and/or finish the project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Past performance, references, and USFS feedback</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Point of Contact

For questions about the project and the details of producing the bid, please contact:

Audrey Squires  
National Forest Foundation, Umpqua Restoration Program Coordinator  
541.751.5121  
[asquires@nationalforests.org](mailto:asquires@nationalforests.org)

## Equal Opportunity Provider

In accordance with Federal law and U.S. Department of Agriculture policy, the National Forest Foundation is prohibited from discriminating on the basis of race, color, national origin, sex, age, religion, political beliefs, or disability.
FOREST LOCATION

Oregon
DOUGLAS COUNTY
R06 PACIFIC NORTHWEST REGION
UMPQUA NATIONAL FOREST - NORTH ZONE
NORTH UMPQUA DISTRICT

THUNDER CREEK TRAIL BRIDGE REPLACEMENT
TRAIL NO. 1414 - M.P. 2.35

TRAVEL DIRECTIONS:
FROM UMPQUA NATIONAL FOREST SUPERVISOR'S OFFICE, 2900 NW STEWART PKWY, ROSEBURG OR
TURN LEFT ONTO NW STEWART PKWY AND TRAVEL 1.0 MILES TO NE STEPHENS ST. TURN RIGHT ONTO
NE STEPHENS ST AND TRAVEL 1.3 MILES TO OR-138 E/NE DIAMOND LAKE BLVD. TURN LEFT ONTO
OR-138 E/NE DIAMOND LAKE BLVD AND TRAVEL 33.9 MILES TO NF-4711. TURN RIGHT ONTO
NF-4711 AND CROSS BRIDGE TO WRIGHT CREEK TRAILHEAD. HIKE WESTERLY ON TRAIL #1414
APPROXIMATELY 2.5 MILES TO THE PROJECT SITE.
COORDINATES: 43.310247, -122.847234

RECOMMENDED BY:
DAVID ANDERSEN, DISTRICT RANGER

APPROVED:
STEVE MARCHI, UMPQUA N.F. RELMHH STAFF OFFICER

DEIGNED BY:
WILLIAM BUTLER, UMPQUA NATIONAL FOREST BRIDGE PROGRAM MANAGER

DATE: 4/28/22

INDEX OF SHEETS

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<th>DATE</th>
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<td>COVER SHEET</td>
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<td>PROJECT VICINITY MAP</td>
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<td>PREFABRICATED STEEL BOX TRAIL BRIDGE PLANNING AND CRITERIA</td>
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<td>9</td>
<td>GENERAL NOTES AND LAYOUT</td>
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<tr>
<td>10</td>
<td>BEARING AND SUBSTRUCTURE DETAILS</td>
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</table>

DESIGNED BY: WILLIAM BUTLER
REVIEWED BY: STEVE MARCHI
APPROVED:
NOTES:

1) THERE IS AN AWARDED CONTRACT TO REPLACE A CULVERT WITH A BRIDGE ON FS RD 4711 M.P. 0.3 AT THE WRIGHT CREEK CROSSING. THE ROAD WILL BE CLOSED FOR 6 TO 8 WEEKS DURING THE INSTREAM WORK WINDOW OF JULY 1, 2022 TO SEPTEMBER 15, 2022. COORDINATION WITH THE ROAD BRIDGE CONTRACTOR MAY BE REQUIRED.

2) THE WRIGHT CREEK TRAILHEAD IS AVAILABLE FOR USE AS A TRAIL BRIDGE DELIVERY AND STAGING SITE. THE AVAILABLE SPACE ADJACENT TO FS RD 4711 IS APPROXIMATELY 12' AT THE NARROWEST X 66' RUNNING ALONG FS RD 4711. IF THIS SITE IS USED THE CONTRACTOR IS RESPONSIBLE TO DEVELOP, SUBMIT FOR APPROVAL, AND IMPLEMENT A TRAFFIC CONTROL PLAN FOR THE DELIVERY AND HELICOPTER INSTALLATION DAYS IN CONFORMANCE WITH SECTION 156. THERE IS A SEPARATE TRAIL BRIDGE CONTRACT PLANNED THAT THE USE OF THE WRIGHT CREEK TRAILHEAD FOR DELIVERY AND STAGING IS INCLUDED. IF THE CONTRACT IS AWARDED, THE C.O. WILL WORK WITH BOTH CONTRACTORS TO SCHEDULE THE USE OF WRIGHT CREEK TRAILHEAD.

3) THE FOREST SERVICE HAS IDENTIFIED A POTENTIAL HELICOPTER STAGING SITE; STEAMBOAT HELIBASE. THE CONTRACTOR IS RESPONSIBLE TO REQUEST THE USE OF THE SITE FOR APPROVAL. OTHER ACTIVITIES SUCH AS FIRE SUPPRESSION HAVE PREFERENTIAL USE OF THE SITE. IN THE CASE OF EMERGENCY THE CONTRACTOR MAY BE ORDERED TO VACATE THE SITE WITH SHORT NOTICE.
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<tr>
<th>ITEM NUMBER</th>
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<th>PAY UNIT</th>
<th>ESTIMATED QUANTITY</th>
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<td>15101</td>
<td>MOBILIZATION</td>
<td>LUMP SUM</td>
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<td>FIRE PROTECTION &amp; EQUIPMENT CLEANING INDIRECT TO PAY ITEM</td>
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<td>15713</td>
<td>SOIL EROSION AND POLLUTION CONTROL</td>
<td>LUMP SUM</td>
<td>ALL</td>
<td>INCLUDES EROSION AND POLLUTION CONTROL PLAN PREPARATION, INSTALLATION, &amp; REMOVAL</td>
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<tr>
<td>20301</td>
<td>REMOVAL OF INDIVIDUAL TREES, DISPOSAL METHOD (f)</td>
<td>EACH</td>
<td>15</td>
<td>C.O. WILL DESIGNATE TREES TO BE FELL, FALL TREES SIDE HILL, LIMB, AND LEAVE</td>
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<tr>
<td>20321</td>
<td>REMOVAL OF EXISTING TRAIL BRIDGE, DISPOSAL METHOD (a) REMOVE FROM PROJECT</td>
<td>LUMP SUM</td>
<td>ALL</td>
<td>DISPOSE OF EXISTING TRAIL BRIDGE LEGALLY OFF OF GOVERNMENT LAND</td>
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<td>20450</td>
<td>EMBANKMENT CONSTRUCTION, COMPACTION PLACEMENT METHOD (f)</td>
<td>LUMP SUM</td>
<td>ALL</td>
<td>CONSTRUCTION OF NEW TRAIL EMBANKMENT, STRUCTURAL EXCAVATION &amp; BACKFILL INDIRECT TO THIS PAY ITEM</td>
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<td>52201</td>
<td>STRUCTURAL CONCRETE, CLASS A(A)</td>
<td>CUBIC YARD</td>
<td>2</td>
<td>2 - CONCRETE GRADE BEAMS</td>
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<td>55402</td>
<td>REINFORCING STEEL, GRADE 60</td>
<td>LUMP SUM</td>
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<td>REINFORCING STEEL FOR GRADE BEAMS</td>
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<td>57101</td>
<td>PREFABRICATED BRIDGE SUPERSTRUCTURE - DESIGN, FABRICATE, DELIVER, AND INSTALL</td>
<td>EACH</td>
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<td>SEE SHEETS 5, 6, 7, 8, 9, 10 OF 10</td>
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<tr>
<td>63501</td>
<td>TEMPORARY TRAFFIC CONTROL</td>
<td>LUMP SUM</td>
<td>ALL</td>
<td>INCLUDES TEMPORARY TRAFFIC CONTROL FOR UNLOAD &amp; LOAD AT TRAILHEAD AND HELICOPTER OPERATIONS</td>
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</table>

* DENOTES A CONTRACT QUANTITY
(2) - FIRE DAMAGED 7'-12" X 16'-5" X 4'-0" PRESSURE TREATED GLULAM STRINGERS TO BE REMOVED

PRESSURE TREATED WOOD SILL AND BACKWALL PLANKS TO BE REMOVED. SILL AND BACKWALL ARE SURVEY CONTROL. PRIOR TO REMOVAL, THE CONTRACTOR SHALL ESTABLISH CONTROL POINTS. SEE SHEET 3 OF 10 ELEVATION VIEW.

PRIOR TO REMOVAL THE CONTRACTOR SHALL ESTABLISH CONTROL POINTS. SEE SHEET 5 OF 10 ELEVATION VIEW.

EXISTING TRAIL BRIDGE TO BE REMOVED

EXISTING BRIDGE TO BE REMOVED

LOOKING FROM WEST TO EAST END TO S.

FIRE DAMAGED PRESSURE TREATED WOOD DIAPHRAGMS TO BE REMOVED. TYP.

PRESSURE TREATED WOOD DiAPHRAGMS TO BE REMOVED. TYP.

REMAINING FIRE DAMAGED RAIL SYSTEM COMPONENTS TO BE REMOVED

(4) REMAINING FIRE DAMAGED PRESSURE TREATED WOOD DECK PLANKS TO BE REMOVED

PRESSURE TREATED WOOD SILL AND BACKWALL PLANKS TO BE REMOVED. THE SILL IS BASIS FOR CENTERLINE OF NEW TRAIL BRIDGE. CONTRACTOR TO ESTABLISH CONTROL POINTS PRIOR TO REMOVAL.

EXISTING TRAIL BRIDGE TO BE DEMOLISHED

SCALE: 1'-0" = 1'-0"

THUNDER CREEK

NOTES:
1. PERFORM WORK IN ACCORDANCE WITH SECTION 203.
2. DEMOLISH EXISTING TRAIL BRIDGE AND ALL HARDWARE AND REMOVE FROM FOREST SERVICE LANDS PER SECTION 203.05(a).
3. COMPENSATION FOR THIS WORK IS UNDER PAY ITEM 20301.

NEW TRAIL BRIDGE CENTERLINE MATCH EXISTING TRAIL BRIDGE CENTERLINE. CONTRACTOR TO ESTABLISH AND MAINTAIN CONTROL POINTS PRIOR TO REMOVAL OF EXISTING TRAIL BRIDGE.

EXISTING BRIDGE TO BE REMOVED LOOKING FROM WEST TO EAST END. N.T.S.

SCALE: 1'-0" = 1'-0"

THUNDER CREEK

EXISTING TRAIL BRIDGE TO BE DEMOLISHED

EXISTING BRIDGE TO BE REMOVED

LOOKING FROM WEST TO EAST END TO S.

FIRE DAMAGED PRESSURE TREATED WOOD DIAPHRAGMS TO BE REMOVED. TYP.

PRESSURE TREATED WOOD DiAPHRAGMS TO BE REMOVED. TYP.

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EXISTING TRAIL BRIDGE TO BE DEMOLISHED

SCALE: 1'-0" = 1'-0"

THUNDER CREEK

EXISTING TRAIL BRIDGE TO BE DEMOLISHED

EXISTING BRIDGE TO BE REMOVED

LOOKING FROM WEST TO EAST END TO S.

FIRE DAMAGED PRESSURE TREATED WOOD DIAPHRAGMS TO BE REMOVED. TYP.

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REMAINING FIRE DAMAGED RAIL SYSTEM COMPONENTS TO BE REMOVED

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EXISTING TRAIL BRIDGE TO BE DEMOLISHED

SCALE: 1'-0" = 1'-0"

THUNDER CREEK

EXISTING TRAIL BRIDGE TO BE DEMOLISHED

EXISTING BRIDGE TO BE REMOVED

LOOKING FROM WEST TO EAST END TO S.

FIRE DAMAGED PRESSURE TREATED WOOD DIAPHRAGMS TO BE REMOVED. TYP.

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EXISTING TRAIL BRIDGE TO BE DEMOLISHED

SCALE: 1'-0" = 1'-0"

THUNDER CREEK

EXISTING TRAIL BRIDGE TO BE DEMOLISHED

EXISTING BRIDGE TO BE REMOVED

LOOKING FROM WEST TO EAST END TO S.

FIRE DAMAGED PRESSURE TREATED WOOD DIAPHRAGMS TO BE REMOVED. TYP.

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REMAINING FIRE DAMAGED RAIL SYSTEM COMPONENTS TO BE REMOVED

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EXISTING TRAIL BRIDGE TO BE DEMOLISHED

SCALE: 1'-0" = 1'-0"

THUNDER CREEK

EXISTING TRAIL BRIDGE TO BE DEMOLISHED

EXISTING BRIDGE TO BE REMOVED

LOOKING FROM WEST TO EAST END TO S.
NEW TRAIL BRIDGE PLAN VIEW

SCALE: 1" = 1'-0"

NEW TRAIL CENTERLINE MATCH EXISTING TRAIL CENTERLINE.
CONTRACTOR RESPONSIBLE TO ESTABLISH AND MAINTAIN CONTROL POINTS.

NEW TRAIL BRIDGE ELEVATION VIEW

SCALE: 1" = 1'-0"


STRUCTURE EXCAVATION & BACKFILL LEGEND:
- Structure Excavation: Per Section 204.10 and Foundation Preparation Per Section 208.07. If over excavated, excavated material with maximum particle size of 2 inches maybe used for foundation fill. Compact foundation fill per structure backfill. This sheet indirect payment under Pay Item 20450.
- Structure Backfill: Per Section 208.09. Backfill with material from excavation free of organic material and with maximum particle size of 6 inches. Use minimum lifts with a hand tamper until no visible deflection is observed is acceptable. Indirect payment under Pay Item 20450.

NEW TRAIL BRIDGE SUBSTRUCTURE, SEE SHEETS 6, 7, 8, 9, 10 OF 10.

EDGE OF NEW TRAIL EMBANKMENT AGAINST EXISTING TRAIL CUT BANK

EDGE OF EXISTING TRAIL

NEW TRAIL EDGE

EDGE OF NEW TRAIL EMBANKMENT AGAINST EXISTING TRAIL CUT BANK

NEW TRAIL BRIDGE CENTERLINE MATCH EXISTING TRAIL CENTERLINE.
CONTRACTOR RESPONSIBLE TO ESTABLISH AND MAINTAIN CONTROL POINTS.

NEW TRAIL BRIDGE CENTERLINE MATCH EXISTING TRAIL CENTERLINE.

NEW TRAIL BRIDGE CENTERLINE MATCH EXISTING TRAIL CENTERLINE.
CONTRACTOR RESPONSIBLE TO ESTABLISH AND MAINTAIN CONTROL POINTS.

NEW GRADE BEAM PER SHEET 10 OF 10 AS MODIFIED THIS SHEET.

BACKWALL AND GRADE BEAM SECTION

TOP OF DECK PLANKS

SUPERSTRUCTURE END VERTICAL

DECK PLANKS

SUPERSTRUCTURE BEARING PLATES

NEW 3/8" A36 GALVANIZED POWDER COATED STEEL BACKWALL PLATE PER DETAILS AND NOTES THIS SHEET AND WEST BACKWALL PLATE DETAIL SHEET 7 OF 10.

NEW GRADE BEAM PER SHEET 10 OF 10 AS MODIFIED THIS SHEET.

BACKWALL AND GRADE BEAM CROSS SECTION

SCALE: 1" = 1'-0"

BRIDGE MANUFACTURER PROVIDE ATTACHMENT CLIPS TO END OF BRIDGE. CLIPS TO ALLOW BACKWALL PLATE TO EXTEND BELOW BEARING PLATE.

4 - #4 REBAR X 7'-4" AT MID DEPTH. EACH SIDE.

4 - #6 REBAR HOOKS WITH 3" MINIMUM EXTENSIONS @ 1'-0" MAXIMUM SPACING_TO AVOID CONFLICTS WITH SUPERSTRUCTURE ANCHOR BOLTS AND GRADE BEAM ANCHORS.

3/4" Ø ANCHOR BOLTS. SEE SHEET 10 OF 10

COMPRESSIBLE JOINT FILLER

4 - 1" Ø HOLES FOR 3/4" Ø BOLTS. VERTICALLY PLACED AT 1/3 POINTS OF PLATE HEIGHT. PLACE SYMMETRICALLY TO AVOID CONFLICTS WITH SUPERSTRUCTURE ANCHOR BOLTS AND GRADE BEAM PLATE.

BACKWALL NOTES:

1) DESIGN AND FABRICATE BACKWALL PER SECTION 571.

2) GALVANIZE PER SECTION 717.07.

3) AFTER GALVANIZING POWDER COAT PER VOLUME 2 SSPC PAINTING MANUAL. SUBMIT COLOR SAMPLES FOR C.O. APPROVAL.

4 - #6 REBAR X 7'-4" AT MID DEPTH. EACH SIDE.

4 - #4 REBAR HOOPS WITH 3" MINIMUM EXTENSIONS @ 1'-0" MAXIMUM SPACING To AVOID CONFLICTS WITH SUPERSTRUCTURE ANCHOR BOLTS AND GRADE BEAM ANCHORS.

#4 REBAR HOOKS WITH 3" MINIMUM EXTENSIONS @ 1'-0" MAXIMUM SPACING To AVOID CONFLICTS WITH SUPERSTRUCTURE ANCHOR BOLTS AND GRADE BEAM ANCHORS.

BACKWALL AND GRADE BEAM CROSS SECTION

SCALE: 1" = 1'-0"

NEW 3/8" A36 GALVANIZED POWDER COATED STEEL BACKWALL PLATE PER DETAILS AND NOTES THIS SHEET AND WEST BACKWALL PLATE DETAIL SHEET 7 OF 10.

NEW GRADE BEAM PER SHEET 10 OF 10 AS MODIFIED THIS SHEET.

BACKWALL AND GRADE BEAM SECTION

TOP OF DECK PLANKS

SCALE: 1" = 1'-0"

IF THIS BAR DOES NOT MEASURE TO THE SCALE SHOWN THE DRAWING IS NOT TO SCALE.
**Backwall Notes:**

1. **Design and Fabricate Backwall Per Section 717.**
2. Use 2" steel plate conforming to Section 717.03.
3. Galvanize per Section 717.07.

**Provide 1" Clearance Between Bearing Plate and Backwall Plate.**

**East End Backwall Plate Details**

Scale: 1" = 1'-0"

1. Match top of backwall plate with top of backwall plate details on this sheet.
2. Follow the form angle by bending plate.
3. Provide attachment clips to end of bearing plate to extend below bearing plate.
4. Provide both backwall plates.

**West End Backwall Plate Details**

Scale: 1" = 1'-0"

1. Design and fabricate backwall per section 717.
2. Use 2" steel plate conforming to Section 717.03.
3. Galvanize per Section 717.07.

**Backwall Notes:**

1. **Design and Fabricate Backwall Per Section 717.**
2. Use 2" steel plate conforming to Section 717.03.
3. Galvanize per Section 717.07.

**Provide 1" Clearance Between Bearing Plate and Backwall Plate.**

**Typical Trail Cross Section B**

Scale: 1" = 1'-0"

- **Varies**
- See elevation view sheet 5 of 10

**Typical Trail Section A**

Scale: 1" = 1'-0"

- **1.5**
- **1**
- See plan view sheet 5 of 10

**Construct New Trail Embankment Per Notes This Sheet.**

**Pay Item 20450**

1. Trail embankment constructed per FSSS 204.10, this sheet, and Sheet 5 of 10, Pay Item 20450.
2. Construct trail embankment with material conforming to Section 704.05. Excavated material free of organic material with maximum 3" particle size will be accepted as meeting the requirements of Section 704.04.
3. Prepare foundation for embankment construction by removal of organic material from the surface of the existing trail bed and cut slopes.
4. Place material in maximum 6" loose lifts.
5. Compact each lift per FSSS 204.11(b), or with minimum three passes of a ripper behind vibratory plate compactor, or with hand tampers until no displacement of the soil is observed.
6. Smooth surface of compacted material with a smooth-continuous surface. No rocks shall protrude above the trail surface.

**Trail Embankment Construction Notes**

1. Trail embankment constructed per FSSS 204.10, this sheet, and Sheet 5 of 10, Pay Item 20450.
2. Construct trail embankment with material conforming to Section 704.05. Excavated material free of organic material with maximum 3" particle size will be accepted as meeting the requirements of Section 704.04.
3. Prepare foundation for embankment construction by removal of organic material from the surface of the existing trail bed and cut slopes.
4. Place material in maximum 6" loose lifts.
5. Compact each lift per FSSS 204.11(b), or with minimum three passes of a ripper behind vibratory plate compactor, or with hand tampers until no displacement of the soil is observed.
6. Smooth surface of compacted material with a smooth-continuous surface. No rocks shall protrude above the trail surface.
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<th>PEDESTRIAN LOAD</th>
<th>GROUND EARTH LOAD</th>
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**DECK TYPE:** STL = STEEL THROUGH TRUSS, FRP = FIBER REINFORCED POLYMER TRUSS, CONC = CONCRETE VOID SLAB

### RUNNING PLANK

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### BACKWALL

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### SAFETY RAILING AS REQUIRED

- SEE PROJECT DESIGN CRITERIA

### DESIGN HIGH WATER

- CLEARANCE

### ELEVATION

- NOT TO SCALE
- MAXIMUM GRADE = BEARING TO+ BEARING = 5%
- RUNNING PLANKS AND DECK PLANKS NOT SHOWN FOR CLARITY

### H-5 VEHICLE LOADING DIAGRAM

- 2000 LBS
- 8000 LBS

*REQUIRED FOR CLEAR WIDTHS OF 7'-0" OR MORE.

DEFINE CRITERIA FOR OTHER VEHICLES TO BE CONSIDERED DURING DESIGN BY WEIGHT, AXLES OR TRACKS, LENGTH, WIDTH, MODEL NO., AND OTHER PERTINENT INFORMATION.

 Approved by:  

[STAMP: DIRECTOR OF ENGINEERING]
GENERAL NOTES:

SPECIFICATIONS:
- **DESIGN**: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, CURRENT EDITION AND AASHTO LRFD GUIDE SPECIFICATIONS FOR THE DESIGN OF PEDESTRIAN BRIDGES, CURRENT EDITION AS NOTED.

CONSTRUCTION: STANDARD SPECIFICATIONS FOR CONSTRUCTION OF ROADS AND BRIDGES ON FEDERAL HIGHWAY PROJECTS (FPHP) AND STANDARD SPECIFICATIONS FOR CONSTRUCTION OF TRAILS AND TRAIL BRIDGES ON FEDERAL PROJECTS.

MATERIALS: STEEL & STEEL SUPERSTRUCTURE: PREQUALIFIED FOR STEEL SUPERSTRUCTURE MATERIALS BY THE CONTRACTING OFFICER AS SHOWN ON THE DRAWING SHEET. PLATES AND BARS OF WELDING STEEL CONFORMING TO AASHTO M260, GRADE 50; ASTM A36, OR ASTMA A572 GRADE 50. PROVIDE hdrs, timbers, and other pressure treated materials to conform to the ADOPTED PREQUALIFIED MATERIALS AND OTHER SPECIFICATIONS. USE WOOD HEDERS CONFORMING TO AASHTO M260, ASTM A92, GRADE 325, TYPE 1. USE UNPRESERVED MATERIALS FOR SUPPORT OF TIMBERS OR TIMBER MEMBERS AGAINST WOOD DESTROYING INSECTS.

STEEL FABRICATION: FABRICATE THE PREQUALIFIED STEEL SUPERSTRUCTURE IN A PLANT MEETING QUALITY REQUIREMENTS AS A CERTIFIED STEEL FABRICATION FACILITY. STEEL IN ACCORDANCE WITH API D AND 265 FOR THE GRACE OF STEEL AND INTERESTED USE OR SERVICE.

EJECTION PLAN: SUBMIT AN EJECTION PLAN FOR THE PREQUALIFIED STEEL SUPERSTRUCTURE TO THE C.O. FOR APPROVAL 14 DAYS BEFORE EJECTION.

PREQUALIFIED ALLOYS UNDER THE PROJECT DESIGN CRITERIA. TEMPORARY ATTACHMENT SUPPORT BELTS MAY BE PROVIDED FOR THE EJECTION OF THE PREQUALIFIED STEEL SUPERSTRUCTURE. TEMPORARY ATTACHMENT BELTS WILL BE IDENTIFIED IN THE DETAILED SPECIFICATIONS FOR EXTRACTABLE TIE BELTS. USE ALL MATERIALS TO CONSTRUCT THE TEMPORARY ATTACHMENT BELTS. SUBMIT DRAWINGS INDICATING TEMPORARY ATTACHMENT BELTS LOCATIONS AND DETAILS.

PREQUALIFIED ALLOYS UNDER THE PROJECT DESIGN CRITERIA. TEMPORARY ATTACHMENT SUPPORT BELTS MAY BE PROVIDED FOR THE EJECTION OF THE PREQUALIFIED STEEL SUPERSTRUCTURE. TEMPORARY ATTACHMENT BELTS WILL BE IDENTIFIED IN THE DETAILED SPECIFICATIONS FOR EXTRACTABLE TIE BELTS. USE ALL MATERIALS TO CONSTRUCT THE TEMPORARY ATTACHMENT BELTS. SUBMIT DRAWINGS INDICATING TEMPORARY ATTACHMENT BELTS LOCATIONS AND DETAILS.

MATERIALS:
- **DECK MEMBER**: UMBER - CONFORM TO THE REQUIREMENTS OF THE GRADING RULES AGENCY FOR THE SPECIES, TYPE, AND GRADE SPECIFIED BELOW. UNLESS SHOWN OTHERWISE, ACCEPTABLE GRADING RULES AGENCIES ARE WWPA OR WCLIB. GLULAM MEMBERS - CONFORM TO THE AMERICAN NATIONAL STANDARD, STANDARD SPECIFICATIONS FOR STRUCTURAL GLUED LAMINATED TIMBER OF SOFTWOOD SPECIES (ANSI 117) FOR THE COMBINATION, SPECIES, USE, AND APPEARANCE SPECIFIED. UNLESS SHOWN OTHERWISE, ACCEPTABLE GRADING RULES AGENCIES ARE WWPA OR WCLIB. GLULAM MEMBERS - CONFORM TO THE AMERICAN NATIONAL STANDARD, STANDARD SPECIFICATIONS FOR STRUCTURAL GLUED LAMINATED TIMBER OF SOFTWOOD SPECIES (ANSI 117) FOR THE COMBINATION, SPECIES, USE, AND APPEARANCE SPECIFIED.
- **DECK PLANK**: ALASKA YELLOW OR WESTERN RED CEDAR, FULL ROUGH SAWN NO. 2 DECKING, RUNNING PLANKS.
- **RAILS, POSTS**: ALASKA YELLOW OR WESTERN RED CEDAR, S4S, SELECT STRUCTURAL, UNDISTURBED, COMPETENT, UNTREATED/DECAY RESISTANT: ALASKA YELLOW OR WESTERN RED CEDAR, FULL ROUGH SAWN NO. 2

TREATMENT: SEE PROJECT CRITERIA FOR MEMBERS IDENTIFIED TO BE TREATED AND FOR TREATMENT TYPE. MEMBERS IN ACCORDANCE WITH THE CURRENT EDITION OF WESTERN WOOD PRESERVERS INSTITUTE (WWPI) “BEST MANAGEMENT PRACTICES FOR THE USE OF TREATED WOOD IN AQUATIC ENVIRONMENTS”.

FIELD TREATMENT: FURNISH COPPER NAPHTHENATE (2% SOLUTION) FOR FIELD TREATING OF WOOD. FOR FIELD TREATING ALL ABRASIONS AND FIELD CUTS - AS APPROVED BY THE CONTRACTING OFFICER - CAREFULLY TRIM MEMBERS AND TREAT USING THREE BRUSH COATS OF THE FIELD TREATMENT SOLUTION. WHERE APPROVED FIELD DRILLING OF BOLT OR NAIL HOLES IS REQUIRED OR ALLOWED, FILL THE HOLES WITH PRESERVATIVE PRIOR TO INSERTING THE FASTENERS.

THERMAL FABRICATION: SUBMIT SHOP DRAWINGS FOR ALL TIMBER BRIDGE COMPONENTS (EXCEPT TIMBER RUNNING PLANKS). SHOW ALL DIMENSIONS AND FABRICATION DETAILS FOR ALL CUT OR ERODED TIMBER. INDICATE ON SHOP DRAWINGS WHERE FIELD DRILLING OF HOLES IS REQUIRED OR RECOMMENDED.
NOTES:

CONCRETE: USE CLASS AA(A) FOR CONCRETE, f'c = 4500 PSI AT 28 DAYS WITH AN ENTRAINED AIR CONTENT OF 5% ± 1% OR AS REQUIRED BY THE DESIGN. PROVIDE ALL CONCRETE IN ACCORDANCE WITH AN APPROVED MIX DESIGN. CHAMFER ALL EXPOSED EDGES OF CONCRETE 3/4-INCH.

REINFORCING STEEL: USE REINFORCING STEEL OF THE DEFORMED TYPE CONFORMING TO AASHTO M31 (ASTM A615), GRADE 60. WITH CONCRETE COVER AS SHOWN OR A MINIMUM OF 2 INCHES WHERE NOT SHOWN, IN CONFORMANCE WITH AASHTO SPECIFICATIONS. CUT AND BEND STEEL IN ACCORDANCE WITH ACI 315.

CONCRETE GRADE BEAM: DETAILS SHOWN ON THIS SHEET PROVIDE MINIMUM SIZES AND REQUIREMENTS. PREPARE AND SUBMIT COMPLETE GRADE BEAM DETAILS SPECIFIC TO THE BRIDGE DESIGN WITH THE PROPOSED SUPERSTRUCTURE DESIGN AND SHOP DRAWINGS.

BACKFILL W/SUITABLE MATERIAL

ELASTOMERIC BEARING PAD
(50 DUROMETER)

SLOPE TOP SURFACE OF GRADE BEAM AS REQUIRED FOR UNIFORM BEARING. VERIFY CONFIGURATION WITH TRUSS FABRICATOR.

(2)-3/4"Ø A307 ANCHOR BOLTS AT EACH BEARING LOCATION MINIMUM. EMBED 12" MINIMUM INTO GRADE BEAM. PLACEMENT AND THREADED PROJECTION BY OTHERS.

(4)-#6 CONTINUOUS EACH FACE
EQUALLY SPACED
#4 HOOPS @ 12" ±
#4 CONTINUOUS AT EACH FACE

(2)-ANCHOR BOLTS MINIMUM AT EACH BEARING LOCATION SPACE #4 HOOPS @ 12" ±

(3)-3/4"Ø x 20" ANCHOR BOLTS AT EACH BEARING LOCATION MINIMUM. EMBED 12" MINIMUM INTO GRADE BEAM placEMENT AND THREADED PROJECTION BY OTHERS.

(4)-#6 CONTINUOUS EACH FACE
EQUALLY SPACED
#4 HOOPS @ 12" ±

ELEVATION - GRADE BEAM
12" CAST-IN-PLACE ANCHOR OR 7" EPOXY ANCHOR WHEN APPROVED BY CO.
NOT TO SCALE
APPENDIX B

SELECTION OF FP-14 APPLICABLE TO
THUNDER CREEK BRIDGE
FABRICATION & INSTALLATION
CONTRACT

Standard Specifications for Construction of
Roads and Bridges on Federal Highway Projects

FP-14

UNITED STATES DEPARTMENT OF TRANSPORTATION

Federal Highway Administration
PREFACE

These Standard Specifications for the Construction of Roads and Bridges on Federal Highway Projects are issued primarily for constructing roads and bridges on Federal Highway projects under the direct administration of the Federal Highway Administration. These specifications are cited as "FP-14" indicating "Federal Project" Standard Specifications issued in 2014 and contain both United States Customary and Metric units of measure.

The Forest Service, US Department of Agriculture has adopted FP-14 for construction of National Forest System Roads.
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Section 101. — TERMS, FORMAT, AND DEFINITIONS

101.01 Meaning of Terms. These specifications are generally written in the imperative mood. In sentences using the imperative mood, the subject, "the Contractor", is implied. Also implied in this language are "shall", "shall be", or similar words and phrases. In material specifications, the subject may also be the supplier, fabricator, or manufacturer supplying material, products, or equipment for use on the project.

Wherever "directed", "required", "prescribed", or "ordered" are used, the "direction", "requirement", "prescription", or "order" of the Contracting Officer is intended. Wherever something is to be "submitted", "submitting to", the Contracting Officer is intended. Similarly, wherever "approved", "acceptable", "suitable", "satisfactory", or similar words are used, the words mean "approved by", "acceptable to", or "satisfactory to" the Contracting Officer.

The word "will" generally pertains to decisions or actions of the Contracting Officer.

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

101.02 Specifications Format. These specifications are divided into 10 Divisions.

Division 100 consists of general contract requirements for which no direct payment is made. The requirements contained in Division 100 are applicable to all contracts.

Division 150 consists of project contract requirements that are applicable to all contracts. Work under Division 150 is paid for directly or indirectly according to Subsection 109.05 and the Section ordering the work. When there is no pay item in the bid schedule, no direct payment is made.

Divisions 200 through 600 consist of construction contract requirements for specific items of work. Work under these Divisions is paid for directly or indirectly according to Subsection 109.05 and the Section ordering the work. When there is no pay item in the bid schedule, no direct payment is made.

Division 700 contains the material requirements for Divisions 150 through 600. No direct payment is made in Division 700. Payment for material is included as part of the work required in Divisions 150 through 600.

The first three digits of the pay item number in the bid schedule identify the Section under which the work is performed.

101.03 Abbreviations. Whenever these abbreviations are used in the contract, they represent the following:

(a) Acronyms.

AASHTO — American Association of State Highway and Transportation Officials
ACI — American Concrete Institute
AGC — Associated General Contractors of America
AISC — American Institute of Steel Construction
AITC — American Institute of Timber Construction
ANSI — American National Standards Institute
APWA — American Public Works Association
ARTBA — American Road and Transportation Builders Association
ASME — American Society of Mechanical Engineers
ASTM — ASTM International
ATSSA — American Traffic Safety Services Association
AWPA — American Wood Protection Association
AWS — American Welding Society
AWWA — American Water Works Association
BMP — Best Management Practice
CFR — Code of Federal Regulations
CO — Contracting Officer and authorized representatives
CRSI — Concrete Reinforcing Steel Institute
EPA — Environmental Protection Agency
FAR — Federal Acquisition Regulations (48 CFR Chapter 1)
FHWA — Federal Highway Administration
FICA — Federal Insurance Contributions Act
FLH — Federal Lands Highway
FSS — Federal Specifications and Standards
FED-STD — Federal Standards
FUTA — Federal Unemployment Tax Act
ISO — International Organization for Standardization
ISSA — International Slurry Surfacing Association
JMF — Job-Mix Formula
MASH — Manual for Assessing Safety Hardware
MPI — Master Painters Institute
MSDS — Material Safety Data Sheet
MUTCD — Manual on Uniform Traffic Control Devices for Streets and Highways
NCHRP — National Cooperative Highway Research Program
NEMA — National Electrical Manufacturers Association
NIST — National Institute of Standards and Technology
OSHA — Occupational Safety and Health Administration
PCI — Precast/Prestressed Concrete Institute
PVC — Polyvinyl Chloride
PTI — Post-Tensioning Institute
SEP — Sand Equivalent Passing
SF — Standard Form
SI — International System of Units
SSPC — The Society for Protective Coatings
SWPPP — Storm Water Pollution Prevention Plan
TAR — Transportation Acquisition Regulations (48 CFR Chapter 12)
UL — Underwriter's Laboratory
U.S. — United States of America
USC — United States Code
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

(b) U.S. Customary unit abbreviations and symbols.

°F — degree Fahrenheit temperature
ft — feet length
ft² — square feet area
ft³ — cubic feet volume
in — inches length
in² — square inches area
in³ — cubic inches volume
lb — pound mass
mi — mile length
oz — ounces mass
psi — pounds per square inch pressure
T — ton (2000 lb) mass
yd — yards length
yd² — square yards area
yd³ — cubic yards volume
s — second  time
° — degree  plane angle
' — minute  plane angle
" — second  plane angle

(c) Metric unit abbreviations and symbols.

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<thead>
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<th>Description</th>
<th>Unit</th>
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<td>ampere</td>
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<td>cd</td>
<td>candela</td>
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</tr>
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<tr>
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<td>H</td>
<td>Henry</td>
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<tr>
<td>ha</td>
<td>hectare</td>
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<tr>
<td>Hz</td>
<td>hertz (s⁻¹)</td>
<td>frequency</td>
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<tr>
<td>J</td>
<td>joule (N•m)</td>
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<tr>
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<td>time</td>
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<tr>
<td>Pa</td>
<td>pascal (N/m²)</td>
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<td>V</td>
<td>volt (W/A)</td>
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<tr>
<td>W</td>
<td>watt (J/s)</td>
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<tr>
<td>Ω</td>
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<td>electric resistance</td>
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(d) Metric prefix symbols.

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<td>P</td>
<td>peta</td>
<td>10¹⁵</td>
</tr>
<tr>
<td>T</td>
<td>tera</td>
<td>10¹²</td>
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Section 101

G — giga $10^9$
M — mega $10^6$
k — kilo $10^3$
c — centi $10^{-2}$
m — milli $10^{-3}$
µ — micro $10^{-6}$
n — nano $10^{-9}$
p — pico $10^{-12}$
f — femto $10^{-15}$
a — atto $10^{-18}$

(e) **Slope notation (vertical : horizontal).** For slopes flatter than 1V:1H, express the slope as the ratio of one unit vertical to a number of units horizontal. For slopes steeper than 1V:1H, express the slope as the ratio of a number of units vertical to one unit horizontal.

(f) **Miscellaneous unit abbreviations.**

<table>
<thead>
<tr>
<th>Abbreviation</th>
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<tr>
<td>MP</td>
<td>milepost</td>
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<tr>
<td>ppm</td>
<td>parts per million</td>
</tr>
<tr>
<td>STA</td>
<td>station</td>
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</table>

101.04 **Definitions.** The following definitions apply to this contract:

**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.

**Award** — The written acceptance of a bid by the CO.

**Backfill** — Material used to replace or the act of replacing material removed during construction. Material placed or the act of placing material adjacent to structures.

**Base** — The layer or layers of material placed on a subbase or subgrade to support a surface course.

**Bid** — A written offer by a bidder to perform work at a quoted price.

**Bidder** — An individual or legal entity submitting a bid.

**Bid Guarantee** — A form of security assuring that the bidder will not withdraw a bid within the period specified for acceptance and will execute a written contract and furnish required bonds.

**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.

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

**Clear Zone** — The portion of the roadside, including the shoulder, available for the safe use by an errant vehicle in which the driver may regain control of the vehicle.

**Commercial Certification** — See Subsection 106.03.

**Construction Limits** — The limits on each side of the project that establish the area disturbed by construction operations and beyond which no disturbance is permitted. Typically the construction limits are the same as the clearing limits, except when additional clearing is required.

**Contract** — The written agreement between the Government and the Contractor setting forth the obligations of the parties for the performance of and payment for the prescribed work.

**Contracting Officer (CO)** — An official of the Government with the authority to enter into, administer, and terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the CO acting within the limits of their authority as delegated by the CO.

**Contract Modification** — A written change in the terms of the contract. Contract modifications are of the following forms:

  (a) **Administrative change.** A unilateral contract change, in writing, that does not affect the substantive rights of the parties (such as a change in the paying office or the appropriation data).

  (b) **Change order.** A written order, signed by the CO, directing the Contractor to make a change that FAR Clause 52.243-4 Changes authorizes the CO to order without the Contractor's consent.

  (c) **Supplemental agreement.** A contract modification that is accomplished by the signature of the CO (unilateral contract modification) or by the signature of the CO and the Contractor (bilateral contract modification).

**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”.

**Contract Time** — The specified time allowed for completion of contract work.

**Crashworthy** — A highway feature that has been successfully crash tested under MASH or the NCHRP Report 350, *Recommended Procedures for the Safety Performance Evaluation of Highway Features*, or accepted through analysis by FHWA based on similarity to other crashworthy features.

**Cross-Section** — A vertical section of the ground or structure at right angles to the centerline or baseline of the roadway or other work.

**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.
Day — A calendar day beginning and ending at midnight.

Density — Mass per unit volume of material. Specific gravity multiplied by the density of water.

Detour — A temporary rerouting of public traffic onto alternate existing roadways to avoid the work or part of the work.

Diversion — Defined as follows:

(a) A temporary rerouting of public traffic onto a temporary alignment within the project limits to bypass the work or a portion of the work.

(b) A temporary rerouting of water into a temporary channel or through a system of structures within the project limits to maintain water flow through or around the project.

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.


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


Highway, Street, or Road — A general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

Lane Mile (Lane Kilometer) — An area of pavement one mile (kilometer) long and one lane wide; not including turn lanes, turnouts, parking area lanes, or other auxiliary lanes.

Layer — See "lift".

Lift — Defined as follows:

(a) When placing and compacting soils, aggregates, or pavement; a lift is a single, continuous layer of material that receives the same compactive effort throughout during a single work operation.

(b) When installing culvert pipe less than or equal to 48 inches (1200 millimeter) in diameter; the backfill material placed on both sides of the pipe is considered to be contained in the same lift when the material is placed to the same elevation on both sides of the culvert, the compactive effort applied to one side of the culvert is the same as that applied to the other, and the compactive effort is applied to both sides of the pipe in a continuous operation.

Material — Substances specified or necessary to satisfactorily complete the contract work.

Measurement — The process of identifying the dimensions, quantity, or capacity of a pay item. See Section 109 for measurement methods, terms, and definitions.
Neat Line — A line defining the proposed or specified limits of an excavation or structure.

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

Pavement Structure — The combination of subbase, base, paving geotextiles, and surface courses placed on a subgrade to support and distribute the traffic load to the roadbed.

Pay Item — A specific item of work for which a unit and price is provided in the contract.

Payment Bond — The security executed by the Contractor and surety or sureties and furnished to the CO to ensure payments as required by law to persons supplying labor or material according to the contract.

Performance Bond — The security executed by the Contractor and surety or sureties furnished to the CO to guarantee completion of the contract work.

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

Plans — The contract plans furnished by the Government showing the location, type, dimensions, and details of the work.

Production Certification — See Subsection 106.03.

Professional Engineer — Engineers holding valid state licenses permitting them to offer engineering services directly to the public. Engineers that are experienced in the work for which they are responsible, take legal responsibility for their engineering designs, and are bound by a code of ethics to protect the public health.

Profile Grade — The trace of a vertical plane intersecting a particular surface of the proposed road construction located according to the plans, usually along the longitudinal centerline of the roadbed. Profile grade means either elevation or gradient of the trace according to the context.

Project — The specific section of the highway or other property on which construction is to be performed under the contract.

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

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.

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.

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.

Roadbed — The graded portion of a highway prepared as a foundation for the pavement structure and shoulders.
Section 101

Roadside — The area between the outside shoulder edge and the right-of-way limits. The area between roadways of a divided highway may also be considered roadside.

Roadway — In general, the portion of a highway, including shoulders, for vehicular use. A divided highway has two or more roadways. In construction specifications, the portion of a highway within the construction limits.

Roadway Prism — The volume defined by the area between the original terrain cross-section and the final design cross-section multiplied by the horizontal distance along the centerline of the roadway.

Roller Pass — One trip of a roller in one direction over one spot.

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.

Shoulder — A portion of the roadway contiguous with the traveled way that accommodates pedestrians, bicycles, stopped vehicles, and emergency use; as well as for lateral support of the subbase, base, and surface courses.

Sieve — See AASHTO M 92.

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

Special Contract Requirements (SCR) — Additions and revisions to the standard specifications applicable to an individual project.

Specifications — The written requirements for performing work.

Standard Forms (SF) — Numbered forms issued by the General Services Administration for use as contract documents.


Station — A precise location along a survey line.

Structures — Bridges, culverts, catch basins, drop inlets, retaining walls, cribbing, manholes, endwalls, buildings, sewers, service pipes, underdrains, foundation drains, and other constructed features that may be encountered in the work.

Subbase — The layer or layers of material placed on a subgrade to support a base.

Subcontract — The written agreement between the Contractor and an individual or legal entity prescribing the performance of a specific portion of the work.

Subcontractor — An individual or legal entity with which the Contractor sublets part of the work. This includes subcontractors in all tiers.
**Subgrade** — The top surface of a roadbed upon which the pavement structure, shoulders, and curbs are constructed.

**Substantial Completion** — The point at which the project is complete such that it can be safely and effectively used by the public without further delays, disruption, or other impediments. For conventional bridge and highway work, the point at which bridge deck, parapet, pavement structure, shoulder, drainage, sidewalk, major demolition, roadway obliteration, permanent signing and markings, traffic barrier, safety appurtenance, utility, and lighting work is complete.

**Substructure** — Components of a bridge below the bearings of simple and continuous spans, skewbacks of arches, and tops of footings of rigid frames including backwalls, wingwalls, and wing protection railings.

**Suitable Material** — Rock or earth material that will provide stable foundations, embankments, or roadbeds, and is free of organic matter, muck, frozen lumps, roots, sod, or other deleterious material. Suitable material may require drying or adding water, root picking, and other methods of manipulation before use. Suitable material includes the classifications of material for which the project was designed.

**Superintendent** — The Contractor's onsite representative who has authority to act for the Contractor and is responsible for directing and supervising construction operations on behalf of the Contractor.

**Superstructure** — The entire bridge, except the substructure.

**Surety** — An individual or corporation legally liable for the debt, default, or failure of a Contractor to satisfy a contract obligation.

**Surface Course** — The top layer or layers of a pavement structure designed to accommodate the traffic load and resist skidding, traffic abrasion, and weathering.

**Target Value** — A number established as a center for operating a given process. Once established, adjustments should be made in the process as necessary to maintain a central tendency about the target value. Test results obtained from a well-controlled process should cluster closely around the established target value and the mean of the test results should be equal to or nearly equal to the established target value.

**Traveled Way** — The portion of the roadway designated for the movement of vehicles, exclusive of shoulders.

**Unsuitable Material** — Material not capable of creating stable foundations, embankments, or roadbeds. Unsuitable material includes muck, sod, or soils with high organic contents.

**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.

**Work** — The furnishing of labor, material, equipment, and other incidentals necessary to complete the project according to the contract.
Figure 101-1—Illustration of road structure terms.
Section 103. — SCOPE OF WORK

103.01 Intent of Contract. The intent of the contract is to provide for the construction and completion of the work described. The precise details of performing the work are not described, except as considered essential for the successful completion of the work. Furnish labor, material, equipment, tools, transportation, and supplies necessary to complete the work according to the contract.
Section 104. — CONTROL OF WORK

104.03 Specifications and Drawings. Follow the requirements of FAR Clause 52.236-21 Specifications and Drawings for Construction.

(a) General. Review and submit documents required to construct the work for accuracy, completeness, and compliance with the contract for approval by the CO. Documents submitted without evidence of Contractor approval may be returned for resubmission. Time for approval starts over when documents are returned for revision or if additional information is requested by the CO. Do not perform work related to submitted documents or drawings before approval of the CO. Obtain written approval before changing or deviating from the approved drawings.

(1) Documents other than drawings. Documents other than drawings include descriptive literature, illustrations, schedules, performance and test data, and similar material submitted by the Contractor to certify or explain, in detail, specific portions of the work required by the contract. Unless otherwise indicated in the contract, submit 3 paper copies and an electronic copy for review. Allow 14 days for approval by the CO unless otherwise specified.

(2) Drawings. Drawings include:

(a) Layouts that show the relative position (vertical and horizontal as appropriate) of work to be performed;

(b) Fabrication details for manufactured items and assemblies;

(c) Installation and erection procedures;

(d) Details of post-tensioning and other systems;

(e) Detailed trench and excavation procedures that conform to OSHA requirements;

(f) Traffic control implementation drawings; and

(g) Methods for performing work near existing structures or other areas to be protected.

Show drawing dimensions in the same units as shown in the plans. Limit drawings to a maximum size of 24 by 36 inches (610 by 920 millimeters). Include on each drawing and calculation sheet, the project number, name, and other identification as shown in the contract.

Submit 3 paper sets of drawings, an electronic set of the drawings, and supporting calculations. Drawings will be reviewed in the order they are received. Allow 40 days for CO approval of railroad structure drawings and 30 days for approval of other drawings. Submit additional specific drawings for unique situations to clarify layout, construction details, or method when requested by the CO.

(b) Specific requirements for concrete and miscellaneous structures.

(1) Submit drawings for the following:

(a) Site-specific layouts for all wall types and gabion installations;

(b) Gabion and revet mattress details and installation procedures;

(c) Forms and falsework for cast-in-place non-bridge concrete structures and retaining walls
less than or equal to 6 feet (1.8 meters) in height;

(d) Fabrication drawings for bridge railings and parapets;

(e) Fabrication drawings for prestressed members;

(f) Fabrication and installation drawings for expansion joint assemblies;

(g) Fabrication drawings for bearing assemblies;

(h) Construction joint location and concrete deck placement sequences not according to the plans;

(i) Erection diagrams for Soil-Corrugated Metal Structure interaction systems (multi-plate structures);

(j) Structural steel fabrication drawings;

(k) Utility hangar details;

(l) Fabrication and installation drawings for precast items; and

(m) Site-specific layouts for rockeries.

(2) Submit drawings that bear the seal and signature of a professional engineer proficient in the pertinent design field for the following:

(a) Forms and falsework for cast-in-place concrete structures greater than 6 feet (1.8 meters) in height;

(b) Shoring systems and cofferdams greater than 6 feet (1.8 meters) in height;

(c) Shoring systems that support traffic loadings;

(d) Bridge concrete forms, including deck forms; except for railings, parapets, and components less than 6 feet (1.8 meters) in height;

(e) Containment structures for bridge work;

(f) Girder erection plans;

(g) Partial demolition of structural bridge elements;

(h) Post-tensioning systems;

(i) Concrete box culvert and headwall details;

(j) Reinforced soil slopes details;

(k) Ground anchors, soil nail, rock bolt, driven pile, drilled shaft, and micropile assembly details, layout, and installation and testing procedures;

(l) MSE and tie back wall details;

(m) Alternate retaining wall details; and

(n) Details and installation procedures for proprietary wall systems.

(3) Submit drawings that bear the seal and signature of a professional engineer who is proficient
in forms and falsework design and licensed in the state where the project will be constructed for
the following:

(a) Falsework for structures with spans exceeding 16 feet (4.8 meters);
(b) Falsework for structures with heights exceeding 14 feet (4.3 meters);
(c) Falsework for structures where traffic, other than workers involved in constructing the
structure, will travel under the structure; and
(d) Temporary bridge structures for public use.

(e) As-built drawings. Use one set of Government-provided plans exclusively for as-built drawings.
Use the color "red" to identify changes. Use approved methods to accurately and neatly record
changes. Include details and notes on additional information discovered during construction. Note
additions or revisions to the location, character, and dimensions of work. Strikeout details shown
that are not applicable to the completed work.

As work progresses, continuously update plan sheets to reflect the as-built details. Check and initial
plan sheets that were incorporated into the completed work without change. Include the following:

(1) Title sheet.

(a) "AS-BUILT DRAWINGS" (bold text);
(b) Name of Contractor;
(c) Name of CO’s on-site representative;
(d) Project completion date;
(e) Revisions to project length;
(f) Revisions to begin and end stations of project;
(h) Revisions to index to sheets;
(i) Revisions to curve widening table;
(j) Strikeout schedules or options not awarded;
(k) A note stating "Work was constructed as designed unless otherwise noted."; and
(l) Plan notes.

(2) Typical section sheets.

(a) Revisions in dimensions;
(b) Revisions in material;
(c) Revisions in station range;
(d) Revisions to begin and end stations of project; and
(e) Strikeout schedules or options not awarded.

(3) Summary of Quantities and tabulation sheets.
(a) Revisions to quantities, locations, notes/remarks, including totals;

(b) Strikeout unused pay items;

(c) Revisions to application rates; and

(d) Revisions to location, type, end treatments, riprap, and skew on the drainage summary.

(4) Plan and profile sheets. Note additions or revisions to the location, character, and dimensions of the following items:

(a) Plan.

(1) Alignment and curve and spiral information;

(2) Construction limits;

(3) Right-of-way;

(4) Road approaches;

(5) Sub-excavation and roadway obliteration;

(6) Underdrains;

(7) Trenches and drains;

(8) Channels and ditches;

(9) Monuments and permanent references;

(10) Constructed, relocated, or encountered utilities; and

(11) Walls.

(b) Profile.

(1) Grades, elevations, and stationing of points of intersection;

(2) Equations;

(3) Culvert diameter, length, type, and stationing;

(4) Culvert extension and length of existing culvert;

(5) Walls; and

(6) Guardrail, guardwall, and end treatment.

(5) Bridge sheets. Note additions or revisions to the location, character, and dimensions of the following items:

(a) Stationing of bridge ends;

(b) Elevations including footing, bearing pads, deck, and top of walls;

(c) Pile driving record with pile length, size, type, and tip elevation;

(d) Modifications or repairs to drilled shafts or micropiles;

(e) Micropile installation records with drilling duration and observations, drill log, final
location and inclination, final tip elevation, cut-off elevation, modification or repairs, grout pressures and quantities, and test records;

(f) Post-tensioning records including stressing sequence, jacking force, and duct size and layout;

(g) Construction and concrete placement sequences;

(h) Bearing details with orientation;

(i) Expansion joints including actual clearance with atmospheric temperature at time of setting joints; and

(j) Changes in plan or dimensions including changes in reinforcing.

(6) Miscellaneous sheets. Note additions or revisions to the location, character, and dimensions of the following items:

(a) Parking areas and turnouts;

(b) Curbs and sidewalks;

(c) Fencing;

(d) Landscaping and planting;

(e) Pavement markings;

(f) Signs;

(g) Permanent erosion control measures; and

(h) Plan notes.

(7) Standard and detail sheets. Note the additions or revisions to the character and dimensions of details.

Retain the drawings at the project site.

Keep the as-built drawings current and maintain a revision log of changes made. Meet with the CO to jointly review the as-built drawings and log for accuracy, completeness, and legibility before submission of each monthly invoice.

Submit the final as-built drawings and revision logs before the final inspection. Correct errors and omissions found during the final inspection and resubmit the final as-built drawings for approval within 7 days after the final inspection.

When the final as-built drawings are approved, submit the finalized set of as-built drawings and a single file, electronic color copy of the drawings. Submit the electronic copy in an approved format on a CD-R, DVD-R, or other approved electronic media. Include the latest version of the approved reader on the electronic media. Provide a resolution quality where color, text, and lines are clearly discernible.

104.05 Load Restrictions. Follow the requirements of FAR Clause 52.236-10 Operations and Storage Areas.
Comply with legal load restrictions when hauling material and equipment on public roads and bridges to and from the project. A special permit does not relieve the Contractor of liability for damage resulting from the moving of material or equipment.

Unless otherwise permitted, do not operate equipment or vehicles that exceed the legal load limits over new or existing structures, or pavements within the project; except those pavements to be removed during the same construction season.

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.
Section 105. — CONTROL OF MATERIAL

105.01 Source of Supply and Quality Requirements. Follow the requirements of FAR Clause 52.236-5 Material and Workmanship.

Select sources and submit acceptable material. Notify the CO of proposed sources before delivery to the project to expedite material inspection and testing. Do not incorporate material requiring submittal into the work until approved.

Material may be approved at the source of supply before delivery to the project. Approval of a material source does not constitute acceptance of material submitted from the source. If an approved source fails to supply acceptable material during the life of the project, further use of that source may be denied.

Submit samples of material for source quality verification testing for material required to conform to Sections 703, 704, and 705.

105.02 Material Sources.

(a) Government-provided sources. The Government will acquire the permits and rights to remove material from provided sources identified in the contract and to use such property for a plant site and stockpiles. Test reports and available historical material data will be furnished to the Contractor upon request.

Do not perform work within a source until a source development plan is approved. Allow 7 days for approval. Include the following as applicable:

(1) Requirements of written agreements;
(2) Requirements in Sections 107, 157, 204, 205, 624, and 625;
(3) Source development details;
(4) Restoration details; and
(5) Abandonment details.

Perform work necessary to produce acceptable material including work required by the approved source development plan.

The quality of material is generally acceptable. Variations in quality should be expected as it is not feasible to ascertain the quality of material for an entire deposit from exploratory samples. Determine the quantity, type of equipment, and work necessary and produce acceptable material to be incorporated into the work. Do not perform aggregate source quality tests listed in the Sampling, Testing, and Acceptance Requirements table of other Sections when using Government-provided sources. Perform quality control sampling and testing according to the approved Contractor Quality Control Plan in Section 153 and the applicable Sampling, Testing, and Acceptance Requirements tables included at the end of each Section. Allow the CO the opportunity to witness sampling and splitting of the test material.
(b) Government-provided material stockpile. The quality of the material in the stockpile has been preapproved unless otherwise noted and is considered acceptable for the application for which it has been designated. Perform quality control sampling and testing according to the approved Contractor Quality Control Plan in Section 153 and the applicable Sampling, Testing, and Acceptance Requirements table included at the end of each Section. Test results submitted will be for the Government’s information only. Allow the CO the opportunity to witness sampling and splitting of the test material.

(c) Contractor-located sources. The Contractor is responsible for Contractor-located material sources, including established commercial material sources. Use sources that fulfill the contract quantity and quality requirements. Determine the quantity, type of equipment, and work necessary to select and produce an acceptable material. Secure permits and clearances for use of the source and submit copies of the documents to the CO. Follow the environmental requirements of Subsection 107.10(d). Submit available historical data indicating acceptable material can be produced from the source. Perform quality control sampling and testing according to the approved Contractor Quality Control Plan in Section 153, aggregate source quality tests, and applicable Sampling, Testing, and Acceptance Requirements table included at the end of each Section. Allow the CO the opportunity to witness sampling and splitting of the test material.

105.03 Material Source Management. Notify the CO at least 14 days before starting operations in the source. Develop and operate according to the approved source development plan for Government-provided sources or written agreement for Contractor-located sources.

Before developing a material source, measure the sediment content of bodies of water adjacent to the work area that will receive drainage from the work area. Perform erosion and sediment control according to the source development plan and the "Storm Water Pollution Prevention Plan (SWPPP)" or "Erosion Control Plan".

Do not remove material measured in-place from borrow sources or Government-provided stockpiles until initial ground survey measurements have been taken according to Subsection 204.16(b) and approved. Perform final ground survey measurements according to Subsection 204.16(b).

Dispose of rejected material in an approved manner.

105.04 Handling and Storing Material. Handle and store material to preserve its quality and fitness for the work. Stored material approved before storage may again be inspected before use in the work. Locate stored material to facilitate prompt inspection.

Use only approved portions of the right-of-way for storing material or equipment. Provide additional space as needed. Do not use private property for storage without written permission of the owner or lessee. Submit copies of agreements and documents.

Provide security for stored material.

Restore Government-provided storage sites to their original condition.
105.05 Use of Material Found in the Work. Stone, gravel, sand, or other material found in the excavation may be used for another pay item when approved. If material found in the excavation is used for another pay item, material will be paid both as excavation and as the other pay item for which it is used. Replace excavation used with acceptable material at no cost to the Government. Excavate or remove material only from within the grading limits, as indicated by the slope and grade lines.

The right to use and process material found in the work excludes the use and processing of material for nongovernment contract work, except for the disposal of waste material. 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.

105.06 Material Source Restoration. Restore Government-provided sources according to the approved source development plan. Restack the unused portion of the Government-provided stockpiles upon completion of the work at no cost to the Government. Do not measure restoration of material sources for payment.
Section 106. — ACCEPTANCE OF WORK

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;
Section 106

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.

106.03 Certification. For material manufactured off-site, use a manufacturer with an ISO 9000 certification or an effective testing and inspection system. Require the manufacturer to clearly mark the material or packaging with a unique product identification or specification standard to which it is produced.

Other than references in or to the FAR or Federal Law, when these Standard Specifications or Special Contract Requirements reference certifications, certificates or certified documents, equipment or individuals; these references refer to documentation of non-regulatory, peripheral contract requirements that are required to be validated by an individual or organization having unique knowledge or qualifications to perform such validation.
Check certifications before incorporating the material into the work to ensure that the requirements of the contract have been met. Mark the certifications with the following information:

- Project number and name;
- Pay item number and description;
- Contractor’s signature; and
- Date.

Material accepted by certification may be sampled and tested. If material is determined not to conform with the contract, the material will be rejected whether in place or not.

One of the following certifications may be required:

(a) **Production certification.** Material requiring a production certification is identified in the Acceptance Subsection of each Section. Submit a production certification from the manufacturer for each shipment of material. Include the following:

1. Date and place of manufacture;
2. Lot number or other means of cross-referencing to the manufacturer’s inspection and testing system; and
3. Substantiating evidence that the material conforms to the contract quality requirements as required by FAR 46.105(a)(4), including the following:
   1. Test results on material from the same lot and documentation of the inspection and testing system;
   2. A statement from the manufacturer that the material complies with the contract; and
   3. Manufacturer’s signature or other means of demonstrating accountability for the certification.

(b) **Commercial certification.** Submit one commercial certification for similar material from the same manufacturer.

A commercial certification is a manufacturer’s or Contractor's representation that the material complies with the contract. The representation may be labels, catalog data, stamped specification standards, or supplier's certifications indicating the material is produced to a commercial standard or specification.

106.04 **Measured or Tested Conformance.** Perform necessary measurements and tests to ensure work complies with the contract.

Use prevailing industry standards in the absence of contract requirements or tolerances.

Submit measurements, tests, and supporting data for acceptance.

106.05 **Statistical Evaluation of Work and Determination of Pay Factor.** Statistical evaluation of work is a method of analyzing inspection or test results to determine conformity with the contract. The work will be accepted as follows:
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(a) General. For work evaluated based on statistical evaluation, both the Government and Contractor assume some risk.

The Government's risk is the probability that work of a rejectable quality level is accepted. The Contractor's risk is either the probability that work produced at an acceptable quality level (AQL) is rejected (\(\alpha\)) or the probability that the work produced at the AQL is accepted at less than the contract unit bid price (\(\alpha_{100}\)).

Acceptable quality level is the lowest percentage of work within the specification limits that is considered acceptable for payment at contract unit bid price. There are two categories:

- Category I is based on an AQL of 95 percent.
- Category II is based on an AQL of 90 percent.

In both cases, the Contractor's risk (\(\alpha_{100}\)) is 5 percent and the risk of rejection (\(\alpha\)) is significantly lower.

As an incentive to produce uniform quality work and to offset the Contractor's risk, a final payment greater than the contract unit bid price may be obtained under certain conditions.

The quality characteristics to be evaluated, sampling frequency, sampling location, test methods, and category are listed in the Acceptance Subsection of each Section. The following applies:

1. **Lot size.** A lot is a discrete quantity of work to which the statistical evaluation procedure is applied. A lot normally represents the total quantity of work produced. More than one lot may occur if changes in the target values, material sources, or job-mix formula are requested in writing and approved.

2. **Sampling frequency.** The frequency rate shown normally requires at least 5 samples. The minimum required to perform a statistical evaluation is 3 samples. The maximum obtainable pay factor with 3, 4, or 5 samples is 1.01. At least 8 samples are required to obtain a 1.05 pay factor.

If the sampling frequencies and quantity of work would otherwise result in fewer than 8 samples; submit a written request to increase the sampling frequency to provide for at least 8 samples. Submit the request to increase the sampling frequency at least 48 hours before beginning production. An increase in the sampling frequency may result in a reduced pay factor.

3. **Sampling location.** The exact location of sampling will be determined by the CO based on random numbers.

4. **Specification limits.** The specification limits for the quality characteristics are listed in the contract for the work in question.

(b) Acceptance. The work in the lot will be paid for at a final pay factor when all inspections or test results are completed and evaluated.

Before determining the final pay factor, the work may be incorporated into the project provided the current pay factor does not fall below 0.90. If a lot is concluded with fewer than 3 samples, the material will be evaluated under Subsection 106.04.

If the current pay factor of a lot falls below 0.90, end production. Production may resume after the Contractor takes effective and acceptable actions to improve the quality of the production.
A lot containing an unsatisfactory percentage of non-specification material (less than 1.00 pay factor) is accepted provided the lowest single pay factor has not fallen into the reject portion of Table 106-2.

A lot containing an unsatisfactory percentage of non-specification material with the lowest single pay factor falling into the reject portion of Table 106-2 is rejected. Remove rejected material from the work.

When approved, it is permissible to voluntarily remove non-specification material and replace it with new material to avoid or minimize a pay factor of less than 1.00. New material will be sampled, tested, and evaluated according to this Subsection.

Any quantity of material may be rejected based on visual inspection or test results. Do not incorporate rejected material in the work. The results of tests run on rejected material will be excluded from the lot.

(c) Statistical evaluation. The Variability-Unknown/Standard Deviation Method will be used to determine the estimated percentage of the lot that is within specification limits.

The estimated percentage of work that is within the specification limits for each quality characteristic will be determined as follows:

1. Calculate the arithmetic mean (\( \bar{x} \)) of the test values: 
   \[ \bar{x} = \frac{\sum x}{n} \]
   where: \( \sum \) = summation of:
   - \( x \) = individual test value
   - \( n \) = total number of test values

2. Calculate the standard deviations:
   \[ s = \sqrt{\frac{n \sum(x^2) - (\sum x)^2}{n(n-1)}} \]
   where: \( \sum(x^2) \) = summation of the squares of individual test values
   \( (\sum x)^2 \) = summation of the individual test values squared

3. Calculate the upper quality index (\( Q_U \)): 
   \[ Q_U = \frac{USL - \bar{x}}{s} \]
   where: \( USL \) = upper specification limit
   Note: The \( USL \) is equal to the contract specification limit or the target value plus the allowable deviation.

4. Calculate the lower quality index (\( Q_L \)): 
   \[ Q_L = \frac{\bar{x} - LSL}{s} \]
   where: \( LSL \) = lower specification limit
   Note: The \( LSL \) is equal to the contract specification limit or the target value minus the allowable deviation.

5. From Table 106-1, determine \( P_U \) (the estimated percentage of work within the \( USL \)). \( P_U \) corresponds to a given \( Q_U \). If a \( USL \) is not specified, \( P_U \) is 100.
Section 106

(6) From Table 106-1, determine $P_L$ (the estimated percentage of work within the lot within the LSL). $P_L$ corresponds to a given $Q_L$. If an LSL is not specified, $P_L$ is 100.

(7) Calculate the total estimated percentage of work within the USL and LSL:

$$P_U + P_L - 100$$

(8) Repeat steps 1 through 7 for each quality characteristic listed for statistical evaluation.
<table>
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<th>Estimated Percent within Specification Limits (Pu or Pl)</th>
<th>Upper Quality Index QU or Lower Quality Index QL</th>
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<td>64 0.48 0.41 0.39 0.38 0.37 0.37 0.36 0.36 0.36</td>
<td>63 0.45 0.38 0.36 0.35 0.34 0.34 0.34 0.33 0.33</td>
</tr>
<tr>
<td>62 0.41 0.35 0.33 0.32 0.32 0.31 0.31 0.31 0.30</td>
<td>61 0.38 0.30 0.30 0.30 0.29 0.28 0.28 0.28 0.28</td>
</tr>
<tr>
<td>60 0.34 0.28 0.28 0.25 0.25 0.25 0.25 0.25 0.25</td>
<td>59 0.31 0.27 0.25 0.23 0.23 0.23 0.23 0.23 0.23</td>
</tr>
<tr>
<td>58 0.30 0.25 0.23 0.20 0.20 0.20 0.20 0.20 0.20</td>
<td>57 0.25 0.20 0.18 0.18 0.18 0.18 0.18 0.18 0.18</td>
</tr>
<tr>
<td>56 0.20 0.18 0.16 0.15 0.15 0.15 0.15 0.15 0.15</td>
<td>55 0.18 0.15 0.13 0.13 0.13 0.13 0.13 0.13 0.13</td>
</tr>
<tr>
<td>54 0.15 0.13 0.10 0.10 0.10 0.10 0.10 0.10 0.10</td>
<td>53 0.10 0.10 0.08 0.08 0.08 0.08 0.08 0.08 0.08</td>
</tr>
<tr>
<td>52 0.08 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05</td>
<td>51 0.05 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03</td>
</tr>
<tr>
<td>50 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00</td>
<td>49 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00</td>
</tr>
</tbody>
</table>

If the value of QU or QL does not correspond to a value in the table, use the next lower Q value. If QU or QL are negative values, Pu or Pl is equal to 100 minus the table value for Pu or Pl.
Table 106-1 (continued)
Estimated Percent of Work Within Specification Limits

<table>
<thead>
<tr>
<th>Estimated Percent within Specification Limits (P_U or P_L)</th>
<th>Upper Quality Index Q_U or Lower Quality Index Q_L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=15 to n=17</td>
</tr>
<tr>
<td>100</td>
<td>2.34</td>
</tr>
<tr>
<td>99</td>
<td>2.04</td>
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<tr>
<td>98</td>
<td>1.87</td>
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<tr>
<td>97</td>
<td>1.75</td>
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<td>96</td>
<td>1.65</td>
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<tr>
<td>95</td>
<td>1.56</td>
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<tr>
<td>94</td>
<td>1.49</td>
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<td>93</td>
<td>1.42</td>
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<td>92</td>
<td>1.36</td>
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<td>91</td>
<td>1.30</td>
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<tr>
<td>90</td>
<td>1.25</td>
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<tr>
<td>89</td>
<td>1.20</td>
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<tr>
<td>88</td>
<td>1.15</td>
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<td>87</td>
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<tr>
<td>85</td>
<td>1.02</td>
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<td>84</td>
<td>0.98</td>
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<tr>
<td>83</td>
<td>0.94</td>
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<td>82</td>
<td>0.91</td>
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<tr>
<td>81</td>
<td>0.87</td>
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<td>80</td>
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<tr>
<td>74</td>
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<td>73</td>
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<tr>
<td>72</td>
<td>0.58</td>
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<tr>
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<tr>
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<tr>
<td>64</td>
<td>0.36</td>
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<tr>
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<tr>
<td>60</td>
<td>0.25</td>
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<tr>
<td>59</td>
<td>0.23</td>
</tr>
<tr>
<td>58</td>
<td>0.20</td>
</tr>
<tr>
<td>57</td>
<td>0.18</td>
</tr>
<tr>
<td>56</td>
<td>0.15</td>
</tr>
<tr>
<td>55</td>
<td>0.13</td>
</tr>
<tr>
<td>54</td>
<td>0.10</td>
</tr>
<tr>
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<td>0.08</td>
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<tr>
<td>52</td>
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<td>0.03</td>
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<tr>
<td>50</td>
<td>0.00</td>
</tr>
</tbody>
</table>

If the value of Q_U or Q_L does not correspond to a value in the table, use the next lower Q value. If Q_U or Q_L are negative values, P_U or P_L is equal to 100 minus the table value for P_U or P_L.
## Table 106-2 Pay Factors

<table>
<thead>
<tr>
<th>PAY FACTOR</th>
<th>Minimum Required Percent of Work Within Specification Limits for a Given Pay Factor ((P_U + P_L) - 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
</tr>
<tr>
<td>n=3</td>
<td></td>
</tr>
<tr>
<td>n=4</td>
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<td>n=5</td>
<td></td>
</tr>
<tr>
<td>n=6</td>
<td></td>
</tr>
<tr>
<td>n=7</td>
<td></td>
</tr>
<tr>
<td>n=8</td>
<td></td>
</tr>
<tr>
<td>n=9</td>
<td></td>
</tr>
<tr>
<td>n=10 to n=11</td>
<td></td>
</tr>
<tr>
<td>n=12 to n=14</td>
<td></td>
</tr>
<tr>
<td>n=15 to n=17</td>
<td></td>
</tr>
<tr>
<td>n=18 to n=22</td>
<td></td>
</tr>
<tr>
<td>n=23 to n=29</td>
<td></td>
</tr>
<tr>
<td>n=30 to n=42</td>
<td></td>
</tr>
<tr>
<td>n=43 to n=66</td>
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</tr>
<tr>
<td>n=67 to ∞</td>
<td></td>
</tr>
<tr>
<td>1.05</td>
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<tr>
<td>1.04</td>
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<td>1.03</td>
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<td>1.02</td>
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<td>0.99</td>
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<td>0.97</td>
<td></td>
</tr>
<tr>
<td>0.96</td>
<td></td>
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<tr>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>0.94</td>
<td></td>
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<tr>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td>0.92</td>
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</tr>
<tr>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td>0.90</td>
<td></td>
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<tr>
<td>0.89</td>
<td></td>
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<tr>
<td>0.88</td>
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</tr>
<tr>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td>0.86</td>
<td></td>
</tr>
</tbody>
</table>

If the value of \((P_U + P_L) - 100\) does not correspond to a \((P_U + P_L) - 100\) value in this table, use the next smaller \((P_U + P_L) - 100\) value.
Table 106-2 Pay Factors (continued)

<table>
<thead>
<tr>
<th>PAY FACTOR</th>
<th>Minimum Required Percent of Work Within Specification Limits for a Given Pay Factor ((P_U + P_L) - 100)</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n=3</td>
</tr>
<tr>
<td>0.85</td>
<td>0.90</td>
<td>n=4</td>
</tr>
<tr>
<td>0.84</td>
<td>0.89</td>
<td>n=5</td>
</tr>
<tr>
<td>0.83</td>
<td>0.88</td>
<td>n=6</td>
</tr>
<tr>
<td>0.82</td>
<td>0.87</td>
<td>n=7</td>
</tr>
<tr>
<td>0.81</td>
<td>0.86</td>
<td>n=8</td>
</tr>
<tr>
<td>0.80</td>
<td>0.85</td>
<td>n=9</td>
</tr>
<tr>
<td>0.79</td>
<td>0.84</td>
<td>n=10 to</td>
</tr>
<tr>
<td>0.78</td>
<td>0.83</td>
<td>n=11</td>
</tr>
<tr>
<td>0.77</td>
<td>0.82</td>
<td>n=12 to</td>
</tr>
<tr>
<td>0.76</td>
<td>0.81</td>
<td>n=14</td>
</tr>
<tr>
<td>0.75</td>
<td>0.80</td>
<td>n=15 to</td>
</tr>
<tr>
<td>REJECT</td>
<td>0.79</td>
<td>n=17</td>
</tr>
<tr>
<td>0.78</td>
<td>0.78</td>
<td>n=18 to</td>
</tr>
<tr>
<td>0.77</td>
<td>0.77</td>
<td>n=22</td>
</tr>
<tr>
<td>0.76</td>
<td>0.76</td>
<td>n=19</td>
</tr>
<tr>
<td>0.75</td>
<td>0.75</td>
<td>n=23</td>
</tr>
</tbody>
</table>

Values Less Than Those Shown Above

If the value of \((P_U + P_L) - 100\) does not correspond to a \((P_U + P_L) - 100\) value in this table, use the next smaller \((P_U + P_L) - 100\) value.
(d) **Pay factor determination (value of the work).** The pay factor for a lot will be determined as follows:

1. The pay factor for each quality characteristic will be determined from Table 106-2 using the total number of test values and the total estimated percentage within the specification limits from Subsection 106.05(c)(7).

2. When all quality characteristics for a lot are Category I, the lot pay factor is based on the lowest single pay factor for any Category I quality characteristic. The maximum obtainable pay factor is 1.05.

3. When quality characteristics for a lot are both Category I and II, the lot pay factor is based on the following:
   
   (a) When all Category II quality characteristics are 1.00, the lot payment is based on the lowest single pay factor for all Category I characteristics. The maximum obtainable pay factor is 1.05.

   (b) When any Category II quality characteristic is less than 1.00, the lot payment is based on the lowest single pay factor for any Category I or II quality characteristic.

4. When all quality characteristics for a lot are Category II, the lot pay factor is based on the lowest single pay factor for any Category II quality characteristic. The maximum obtainable pay factor is 1.00.

5. Adjusted payment for material in a lot will be made at a price determined by multiplying the contract unit bid price by the lot pay factor as determined above, or as described in the Payment Subsection of the Section ordering the work.

**106.06 Inspection at the Plant.** Work may be inspected at the point of production or fabrication. Manufacturing plants may be inspected for compliance with specified manufacturing methods. Material samples may be obtained for laboratory testing for compliance with quality requirements. Allow full entry at all times to the parts of the plant producing the work.

**106.07 Partial and Final Acceptance.** Maintain the work during construction and until the project is accepted. Repair damage caused by the Contractor before final acceptance of the entire project at no cost to the Government. See FAR Clause 52.236-11 Use and Possession Prior to Completion.

(a) **Partial acceptance.** When a segment of the project is completed, a final inspection of that segment may be requested. If the segment is complete and in compliance, it may be accepted. If accepted, the CO may relieve the Contractor of further responsibility for maintaining accepted work.

When public traffic is accommodated through construction and begins using sections of roadway as they are completed, continue maintenance of such sections until final acceptance.
(b) **Final acceptance.** Notify the CO when the entire project is complete to schedule an inspection. If work is determined to be complete, the inspection will constitute the final inspection. The Contractor will be notified in writing of final acceptance as of the date of the final inspection. Final acceptance relieves the Contractor of further responsibility for the maintenance of the project.

If the inspection discloses unsatisfactory work, the CO will provide to the Contractor a list of the work that is incomplete or requires correction. Immediately complete or correct the work. Submit notification when the work has been completed as provided above.
Section 107. — LEGAL RELATIONS
AND RESPONSIBILITY TO THE PUBLIC

107.01 Laws to be Observed. Follow the requirements of FAR Clause 52.236-7 Permits and Responsibilities.

Comply with applicable laws, ordinances, safety codes, regulations, orders, and decrees. Protect and indemnify the Government and its representatives against claim or liability arising from or based on the alleged violation of the same.

Comply with permits and agreements obtained by the Government for performing the work that is included in the contract. Obtain additional permits or agreements and modifications to Government-obtained permits or agreements that are required by the Contractor's methods of operation. Submit copies of permits and agreements.

107.02 Protection and Restoration of Property and Landscape. Follow the requirements of FAR Clause 52.236-9 Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements.

Preserve public and private property. Protect monuments established for perpetuating horizontal, vertical, cadastral, or boundary control. When necessary to destroy a monument, reestablish the monument according to applicable state statute or by the direction of the agency or individual who established the monument.

Do not disturb the area beyond the construction limits. Replace trees, shrubs, or vegetated areas damaged by construction operations as directed and at no cost to the Government. Remove damaged limbs of existing trees by an approved arborist.

Do not excavate, remove, damage, alter, or deface archeological or paleontological remains or specimens. Control the actions of employees and subcontractors on the project to ensure that protected sites are not disturbed or damaged. Should these items be encountered, suspend operations at the discovery site, notify the CO and continue operations in other areas. The CO will inform the Contractor when operations may resume at the discovery site.

When utilities are to be relocated or adjusted, the Government will notify utility owners affected by the relocations or adjustments.

Before beginning work in an area, contact the local utility locating service to mark the utilities. Protect utilities from construction operations. Cooperate with utility owners to expedite the relocation or adjustment of their utilities to minimize interruption of service and duplication of work.

If utility services are interrupted as a result of damage by the construction, immediately notify the utility owner, the CO, and other proper authorities. Cooperate with them until service is restored. Do not work around fire hydrants until provisions for continued service are made and approved by the local fire authority.

Notify the CO if utility work is required. Compensation for the work will be provided under applicable clauses of the contract. Satisfactorily repair damage due to the fault or negligence of the Contractor at no cost to the Government.
Section 107

Repair of damage to underground utilities not shown in the plans or identified before construction, and not caused by the fault or negligence of the Contractor will be paid for by the Government.

107.03 Bulletin Board. Furnish a weatherproof bulletin board of suitable size and construction for continuous display of posters and other information required by the contract. Erect and maintain the bulletin board at a conspicuously accessible location on the project and remove and dispose of it after project final acceptance.

Display the following documents on the bulletin board:

(a) Equal Employment Opportunity Commission (EEOC), Equal Opportunity Is The Law poster according to FAR Clause 52.222-26 Equal Opportunity;

(b) FHWA Form 1022, Notice that the project is subject to Title 18, U.S. Criminal Code, Section 1020 poster;

(c) Department of Labor, Wage and Hour Division (WHD), WHD 1321, Employee Rights Under The Davis-Bacon Act poster (regarding proper pay);

(d) Department of Labor, OSHA, Job Health and Safety: It’s The Law poster, according to Title 29, Code of Federal Regulations, Part 1903;

(e) "General Wage Decision" contained in the contract;

(f) Company equal employment opportunity policy, according to FAR Clause 52.222-27, Affirmative Action Compliance Requirements for Construction;

(g) Emergency telephone numbers (in areas where 911 is not available), according to Title 29, Code of Federal Regulation, Part 1926.50(f);

(h) WHD Publication, Employee Rights and Responsibilities Under the Family and Medical Leave Act poster according to Title 29, Code of Federal Regulation, Part 825.300(a);

(i) WHD 1462, Employee Polygraph Protection Act poster; and

(j) National Labor Relations Board (NLRA), Employee Rights Under The National Labor Relations Act poster according to Executive Order 13496.

107.04 Railroad Protection. The Government will obtain the necessary permits and agreements from the railroad for specified work for relocating railroads or for work at railroad crossings. Make arrangements for other work that, due to the method of operation, may also impact the railroad. Submit copies of permits and agreements.

Do not interfere with railroad operations. If the construction damages railroad property, reimburse the railroad for damages, or at the railroad's option, repair the damage at no cost to the Government.

Do not cross railroad tracks, with vehicles or equipment, except at existing and open public grade crossings or railroad approved temporary grade crossings. If there is a need for a temporary grade crossing, make the necessary arrangements with the railroad for its construction, protection, and removal. Reimburse the railroad for temporary grade crossing work or at the railroad's option, perform the work.
107.06 Contractor's Responsibility for Work. Assume responsibility for all work until final acceptance, except as provided in Subsection 106.07. This includes periods of suspended work. Protect the work against injury, loss, or damage from all causes whether arising from the execution or non-execution of the work.

Maintain public traffic according to Section 156.

Rebuild, repair, restore, and make good losses, injuries, or damages to any portion of the work. This includes losses, injuries, or damages caused by vandalism, theft, accommodation of public traffic, and weather that occurs during the contract.

The Government will only be responsible for costs attributable to repairing or replacing damaged work caused by declared enemies and terrorists of the Government and cataclysmic natural phenomenon (such as tornados, earthquakes, major floods, and other officially declared natural disasters). The Government will not be responsible for delay costs, impact costs, or extended overhead costs.


107.08 Sanitation, Health, and Safety. Follow the requirements of FAR Clause 52.236-13 Accident Prevention.

Observe rules and regulations of Federal, state, and local health officials. Do not allow workers to work in surroundings or under conditions that are unsanitary, hazardous, or dangerous.

Admit OSHA inspectors or other legally responsible officials involved in safety and health administration to the project work site upon presentation of proper credentials.

Report accidents on forms furnished by the Government or with prior approval, on forms used to report accidents to other agencies or insurance carriers. Maintain an OSHA Form 300, Log of Work-Related Injuries and Illnesses and make it available for inspection.

Install a reverse signal alarm audible above the surrounding noise level on motorized vehicles having an obstructed view and on earth-moving and compaction equipment.

107.09 Legal Relationship of the Parties. In the performance of the contract, the Contractor is an independent contractor. The Contractor's independent contractor status does not limit the Government's general rights under the contract. No Government employee or a business organization owned or substantially owned or controlled by one or more Government employees may be a Contractor.

107.10 Environmental Protection.

(a) Federal Water Pollution Control Act (Clean Water Act) 33 USC § 1251 et seq.

(1) Do not operate equipment or discharge material within the boundaries of wetlands and the waters of the United States as defined by the federal and state regulatory agencies. Permits are issued by the U.S. Army Corps of Engineers according to 33 USC § 1344 and delegated by the agency having jurisdiction. If an unauthorized discharge occurs:

(a) Prevent further contamination;

(b) Notify appropriate authorities and the CO; and
(c) Mitigate damages.

(2) Construct and maintain barriers in work areas and in material sources to prevent sediment, petroleum products, chemicals, and other liquids and solids from entering wetlands or waters of the United States. Remove and properly dispose of barrier collected material.

(3) Do not revise terms or conditions of permits without the approval of the issuing agency.

(b) Oil and hazardous substances. Submit a "Spill Prevention, Control, and Countermeasure (SPCC) Plan" if required at least 2 days before beginning work.

If a SPCC plan is not required, submit a hazardous spill plan at least 2 days before beginning work. Describe preventative measures including the location of refueling and storage facilities and the handling of hazardous material. Describe actions to be taken in case of a spill.

Do not use equipment with leaking fluids. Repair equipment fluid leaks immediately. Keep absorbent material manufactured for containment and cleanup of hazardous material on the job site.

Notify the CO of hazardous spills.
(c) **Dirt, plant, and foreign material.** Remove dirt, plant, and foreign material from vehicles and equipment before mobilizing to work site. Prevent introduction of noxious weeds and non-native plant species into the work site. Follow applicable Federal land management agency requirements and state requirements. Maintain cleaning and inspection records.

(d) **Clearances for Contractor-selected, noncommercial areas.** Contractor-selected, noncommercial areas include material sources, disposal sites, waste areas, haul roads, and staging areas located outside project construction limits and permitted commercial areas. Permitted commercial areas are enterprises or developed areas providing same type material or use over the last 2 years with appropriate permits.

Before using a Contractor-selected, noncommercial areas, submit the following:

1. **(1) Description, schedule, and map of area.**
2. **(2) Documentation of compliance with applicable laws and regulations.**
3. **(3) Owner approval for the area use.** When use of Federal land is proposed, submit an approval letter or special use permit from the applicable Federal land management agency.
4. **(4) Legal compliance for the area use.** Submit documentation showing compliance with applicable tribal, state and local laws including permits or other approvals issued for the area use.

107.11 **Protection of Forests, Parks, and Public Lands.** Comply with regulations of the state fire marshal, conservation commission, Federal land management agency, or other authority having jurisdiction governing the protection of land including or adjacent to the project.
Section 109. — MEASUREMENT AND PAYMENT

109.01 Measurement of Work. Take and record measurements and perform calculations to determine pay quantities for invoicing for work performed. Take or convert measurements of work according to U.S. Customary (Metric) measure.

Unless otherwise specified, measure when the work is in-place and complete according to the contract. Measure the actual work performed, except do not measure work outside the design limits or other adjusted or specified limits (staked limits). Measure structures to the lines according to the plans or to approved lines adjusted to fit field conditions.

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

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Level of Precision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Foot</td>
<td>1</td>
</tr>
<tr>
<td>Exception--Timber, Steel, and concrete Piles</td>
<td>0.1</td>
</tr>
<tr>
<td>Station</td>
<td>0.1</td>
</tr>
<tr>
<td>Mile</td>
<td>0.01</td>
</tr>
<tr>
<td>Square Foot</td>
<td>0.1</td>
</tr>
<tr>
<td>Square Yard</td>
<td>0.1</td>
</tr>
<tr>
<td>Each</td>
<td>1</td>
</tr>
<tr>
<td>Acre</td>
<td>0.01</td>
</tr>
<tr>
<td>Gallon</td>
<td>1</td>
</tr>
<tr>
<td>M-Gals.</td>
<td>0.1</td>
</tr>
<tr>
<td>Cubic Yard</td>
<td>1</td>
</tr>
<tr>
<td>Exception--Structure Excavation; Sheathing Materials; Bedding, Bed Course, and Backfill Materials; Gabions;</td>
<td>0.1</td>
</tr>
<tr>
<td>Exception--Concrete; Masonry</td>
<td>0.01</td>
</tr>
<tr>
<td>Pound</td>
<td>1</td>
</tr>
<tr>
<td>Ton</td>
<td>0.1</td>
</tr>
<tr>
<td>Exception--Calcium Chloride; Sodium Chloride; Hydrated Lime; Bituminous Materials; Pavements; Bed Course Materials</td>
<td>0.01</td>
</tr>
<tr>
<td>Hour</td>
<td>0.1</td>
</tr>
<tr>
<td>MFBM</td>
<td>0.01</td>
</tr>
<tr>
<td>Station Yard</td>
<td>1</td>
</tr>
<tr>
<td>Cubic Yard Mile</td>
<td>1</td>
</tr>
<tr>
<td>Ton Mile</td>
<td>1</td>
</tr>
</tbody>
</table>
Decimal precision for measurement is one decimal beyond accuracy of quantities for payment.

Remeasure quantities if it has been determined that a portion of the work is acceptable, but has not been completed to the lines, grades, and dimensions shown in the plans or established by the CO.

Submit measurement notes within 24 hours of completing work that is in-place and complete according to the contract. For on-going work, submit measurement notes daily. When work is not complete, identify the measurement as being an interim measurement. Submit the final measurement when the installation is completed. Measurement notes form the basis of the Government’s receiving report; see Subsection 109.08(d). For lump sum pay items, submit documentation to support invoiced progress payment on a monthly basis.

Use an acceptable format for measurement records. As a minimum, include the following information:

(a) Project number and name;
(b) Pay item number and description;
(c) Date the work was performed;
(d) Location of the work;
(e) Measured quantity;
(f) Calculations made to arrive at the quantity;
(g) Supporting sketches and details as needed to clearly define the work performed and the quantity measured;
(h) Names of persons measuring the work;
(i) Identification as to whether the measurement is interim or final; and
(j) Signed certification statement by the persons taking the measurements and performing the calculations, that the measurements and calculations are correct.

109.02 Measurement Terms and Definitions. Unless otherwise specified, the following terms are defined as follows:

(a) Acre (Hectare). 43,560 square feet (10,000 square meters). Make longitudinal and transverse measurements for area computations horizontally. Do not make deductions from the area computation for individual fixtures having an area of 500 square feet (50 square meters) or less.

(b) Contract quantity. The quantity to be paid is the quantity listed in the bid schedule. The contract quantity will be adjusted for authorized changes that affect the quantity or for errors made in computing this quantity. If there is evidence that a quantity specified as a contract quantity is incorrect, submit calculations, drawings, or other evidence indicating why the quantity is in error and request in writing that the quantity be adjusted. Contract quantities will be adjusted only when there are errors in the original design of 15% or more.

(c) Cubic yard (Cubic meter).
Section 109

(1) **Cubic yard (Cubic meter) in-place.** Measure solid volumes by a method approved by the CO or by the average end area method as follows:

(a) Take cross-sections of the original ground and use design or staked templates to determine end areas. Do not measure work outside of the lines or slopes established by the CO;

(b) If a portion of the work is acceptable, but is not completed to the established lines and slopes; retake cross-sections or comparable measurements of that portion of the work. Use the remeasurements to calculate new end areas; and

(c) Compute the quantity using the average end areas multiplied by the horizontal distance along a centerline or reference line between the end areas. Deduct quantities outside the designed or staked limits.

(2) **Cubic yard (Cubic meter) in the hauling vehicle.** Measure the cubic yard (cubic meter) volume in the hauling vehicle using three-dimensional measurements at the point of delivery. Use vehicles bearing a legible identification mark with the body shaped so the actual contents may be readily and accurately determined. Before use, mutually agree in writing on the volume of material to be hauled by each vehicle. Vehicles carrying less than the agreed volume may be rejected or accepted at the reduced volume.
Level selected loads. If leveling reveals the vehicle was hauling less than the approved volume, reduce the quantity of all material received since the last leveled load by the same ratio as the current leveled load volume is to the agreed volume. Payment will not be made for material in excess of the agreed volume.

Material measured in the hauling vehicle may be weighed and converted to cubic yards (cubic meters) for payment purposes if the conversion factors are mutually agreed to in writing.

(3) **Cubic yard (Cubic meter) in the structure.** Measure according to the lines of the structure as shown in the plans, except as altered by the CO to fit field conditions. Make no deduction for the volume occupied by reinforcing steel, anchors, weep holes, piling, or pipes less than 8 inches (200 millimeters) in diameter.

(4) **Cubic yard (Cubic meter) by metering.** Use an approved metering system.

(d) **Day.** A calendar day beginning and ending at midnight. Round portions of a day up to the full day.

(e) **Each.** One entire unit. Measure the actual number of units completed and accepted.

(f) **Gallon (Liter).** The quantity may be measured by the following methods:

   (1) Measured volume container.

   (2) Metered volume. Use an approved metering system.

   (3) Commercially-packaged volumes.

   (4) Measured by mass. Use an approved weighing device.

When asphalt material is measured by the gallon (liter), measure the volume at 60 °F (15 °C) or correct the volume to 60 °F (15 °C) using recognized standard correction factors.

(g) **Hour.** 60 minutes. Measure the actual number of hours ordered by the CO and performed by the Contractor. Round portions of an hour up to the next half hour. Measure time in excess of 40 hours per week at the same rate as the first 40 hours.

(h) **Linear foot (Meter).** As applicable, measure the work along its length from end-to-end; parallel to the base or foundation; along the top; along the front face; or along the invert. Do not measure overlaps.

(i) **Lump sum.** Do not measure directly. The bid amount is complete payment for all work described in the contract and necessary to complete the work for that pay item. The quantity is designated as "All". Estimated quantities of lump sum work shown in the contract are approximate.

(j) **M-gallon.** 1,000 gallons. Measure according to Subsection 109.02(f).

(k) **Mile (Kilometer).** 5,280 linear feet (1000 meters). Measure horizontally along the centerline of each roadway, approach road, or ramp.

(l) **Month.** A month as defined by the Gregorian calendar. Measure portions of a month by prorating based on the total days worked.
Section 109

(m) **Pound (Kilogram).** Measure according to Subsection 109.03. If sacked or packaged material is furnished, the net weight as packed by the manufacturer may be used.

(n) **Slurry unit.** Approximately 1,000 gallons (4000 liters) of water plus the specified material. Four (ten) slurry units contain material to cover one acre (hectare). Measure according to Subsection 109.02(f).

(o) **Square foot and Square yard (Square meter).** 1 square yard equals 9 square feet. Measurements for area computations will be made horizontally or vertically to the surface being measured. No deductions from the area computation will be made for individual fixtures having area of 9 square feet (1 square meter) or less.

(p) **Thousand board feet measure, MFBM.** 1000 board feet. Measurement equal to 1,000 feet of wood that is 12 inches wide and 1 inch thick.

(q) **Ton (Metric ton).** 2,000 pounds avoirdupois (1000 kilograms). Measure according to Subsection 109.03.

No adjustment in a contract price will be made for variations in quantity due to differences in the specific gravity or moisture content.

Use net-certified scale masses or masses based on certified volumes in the case of rail shipments as a basis of measurement subject to correction when asphalt material is lost from the car or the distributor, wasted, or otherwise not incorporated in the work. When asphalt material is shipped by truck or transport, net-certified masses, subject to correction for loss or foaming, may be used for computing quantities.

When emulsified asphalt is converted from volume to mass, use a factor of 240 gallons per ton (1000 liters per metric ton) regardless of temperature.

When asphalt binder for asphalt concrete pavement is stored in tanks devoted exclusively to the project, base quantities on invoices. When asphalt binder for asphalt concrete pavement is not stored in tanks devoted exclusively to the project or when the validity of the quantity requested for payment is in question; base quantities on the asphalt content determined by testing.

(r) **Week.** A 7 day period beginning and ending at the same designated time. Measure portions of a week by prorating based on the total days worked.

109.03 **Weighing Procedures and Devices.** Batch masses may be acceptable for determination of pay quantities when an approved automatic weighing, cycling, and monitoring system is included as part of the batching equipment.

When a weighing device is determined to indicate less than true mass; no additional payment will be made for material previously weighed and recorded. When a weighing device is determined to indicate more than true mass; material received after the last previously correct weighing accuracy test will be reduced by the percentage of error in excess of 0.5 percent.

When material is proportioned or measured and paid for by mass, provide one of the following:

(a) **Commercial weighing system.** Use permanently-installed and certified commercial scales.
(b) **Invoices.** If bulk material is shipped by truck or rail and is not passed through a mixing plant, submit a supplier's invoice with net mass or volume converted to mass. Periodic check weighing may be required.

(c) **Project weighing system.** Furnish, erect, and maintain acceptable automatic digital scales. Provide scales that record mass at least to the nearest 100 pounds (50 kilograms). Maintain the scale accuracy to within 0.5 percent of the correct mass throughout the range of use.

Do not use spring balances.

Install and maintain platform scales with the platform level with rigid bulkheads at each end. Make the platform of sufficient length to permit simultaneous weighing of all axle loads of the hauling vehicle. Coupled vehicles may be weighed separately or together according to Subsection 2.20, paragraph UR.3.3, *Single-Draft Vehicle Weighing* of NIST Handbook 44, *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices*.

Install and maintain belt-conveyor scales according to Subsection 2.21, *Belt-Conveyor Scale Systems* of NIST Handbook 44.

Before production on the project, after relocation, and at least once per year; have the weighing portion of the system checked and certified by the State Bureau of Weights and Measures or a private scale service certified by the Bureau of Weights and Measures. Seal the system to prevent tampering or other adjustment after certification.

Attach an automatic printer to the scale that is programmed or otherwise equipped to prevent manual override of all mass information. For weighed pay quantities, program the printer to provide the following information for each weighing:

1. Project number and name;
2. Pay item number and description;
3. Date;
4. Time;
5. Ticket number;
6. Haul unit number;
7. Net mass in load at least to the nearest 100 pounds (50 kilograms);
8. Subtotal net mass for each haul unit since the beginning of the shift; and
9. Accumulated total net mass for all haul units since the beginning of the shift.

If a printer malfunctions or breaks down, the Contractor may manually weigh and record masses for up to 48 hours provided the method of weighing meets other contract requirements.

Furnish competent scale operators to operate the system.

When platform scales are used, weigh empty haul units at least twice per day.
Use an approved format for the mass records. Submit the original records and a written certification as to the accuracy of the masses at the end of each shift.

**109.04 Receiving Procedures.** When the method of measurement requires weighing or volume measurement in the hauling vehicle, furnish a person to direct the spreading and distribution of material and to record the location and placement of the material on the project. During the placement, maintain a record of each delivery and document it in an acceptable manner. Include the following as applicable:

(a) Project number and name;

(b) Pay item number and description;

(c) Location where placed;

(d) Date;

(e) Load number;

(f) Truck identification;

(g) Time of arrival;

(h) Mass or volume; and

(i) Spread person's signature.

Use an approved format for the delivery records. Submit the original records and a written certification of the delivery of the material at the end of each shift.

**109.05 Scope of Payment.** Payment for contract work is provided, either directly or indirectly, under the pay items listed in the bid schedule.

(a) **Direct payment.** Payment is provided directly under a pay item listed in the bid schedule when one of the following applies:

(1) The work is measured in the Measurement Subsection of the Section ordering the work and the bid schedule contains a pay item for the work from the Section ordering the work.

(2) The Measurement Subsection of the Section ordering the work, references another Section for measuring the work and the bid schedule contains a pay item for the work from the referenced Section.

(b) **Indirect payment.** Work for which direct payment is not provided is a subsidiary obligation of the Contractor. Payment for such work is indirectly included under other pay items listed in the bid schedule. This includes instances when the Section ordering the work references another Section for performing the work and the work is not referenced in the Measurement Subsection of the Section ordering the work.

Compensation provided by the pay items included in the bid schedule is full payment for performing contract work in a complete and acceptable manner. Risk, loss, damage, or expense arising out of the nature or prosecution of the work is included in the compensation provided by the pay items.
Work measured and paid for under one pay item will not be paid for under other pay items.

The quantities listed in the bid schedule are approximate unless designated as a contract quantity. Limit pay quantities to the quantities staked, ordered, or otherwise authorized before performing the work. Payment will be made for the actual quantities of work performed and accepted or material furnished according to the contract. No payment will be made for work performed in excess of that staked, ordered, or otherwise authorized.
DIVISION 150
PROJECT
REQUIREMENTS
Section 153.—CONTRACTOR QUALITY CONTROL

Description

153.01 This work consists of planning and implementing a construction quality process to ensure work conforms to the contract. This work also includes quality control inspection and documentation, and process control sampling and testing. See FAR Clause 52.246-12 Inspection of Construction.

Construction Requirements

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 testing.

153.03 Quality Control Plan (QCP). Develop a QCP addressing all contract work categories. A category consists of related work items performed in one operation (such as excavation, drainage, and paving). Include the work of subcontractors, major material suppliers, and structural and geotechnical services suppliers.

For each category, include the following:

(a) **Quality control personnel.** Furnish the name, authority, responsibilities, and qualifications of the quality control manager and other personnel directly involved in inspection and testing. Conform to Subsection 153.02.

(b) **Quality control procedures.** Describe the inspection, testing, and other activities to be performed for each phase of work in Subsection 153.04. Include methods, schedules, equipment, and laboratory facilities. Conform to Subsections 153.04 and 153.05.

List the material to be tested by:

(1) Pay item;

(2) Applicable requirements of the Sampling, Testing, and Acceptance Requirements tables;
(3) Persons responsible for performing the sampling and testing;

(4) Laboratory testing facilities to be used for process control and project testing; and

(5) Proposed reporting formats.

As a minimum perform process control testing according to the Sampling, Testing, and Acceptance Requirements tables included at the end of each Section where applicable.

(c) Records. Describe the reporting format for inspection, testing, certification, and daily reports. Conform to Subsections 153.06 and 153.07.

At least 14 days before the start of work, submit the QCP for approval. Do not perform work on a work category unless the quality control for that category is accepted. Approval does not imply that the QCP will result in contract compliance.

Revise the QCP when contract quality requirements are not achieved and when changes occur in the contract, work progress, or personnel.

153.04 Prosecution of Work. Complete the following:

(a) Preparatory phase.

(1) Before starting each work category, hold a preparatory phase meeting. Include the project superintendent, work foreman, CO, QCM, and appropriate subcontractors. Be prepared to discuss the following:

(a) Contract requirements for the work, including acceptance procedures, schedule, and control strip;

(b) Process and equipment for constructing the work; and

(c) Plan for inspection, process control, testing, measuring, and reporting the work.

(2) Review and coordinate certifications, submittals, plans, drawings, and permits.

(3) Verify the capabilities of equipment, material, and personnel. Provide training as necessary.

(4) Establish a detailed testing schedule based on the production schedule.

(5) Ensure preparatory testing and inspection is accomplished.

(6) Review accuracy of the surveying and staking.

(b) Start-up phase.

(1) Hold a start-up meeting to review the contract, the construction processes, and the inspection, testing, and reporting requirements with the personnel performing the work. Include the project superintendent, inspectors, testers, CO, and QCM. Explain procedures that will be followed if defective work is identified.

(2) Inspect, test, and report start-up work according to the QCP and ensure the work conforms to the contract.

(c) Production phase.
(1) Inspect, test, and report according to the QCP and evaluate the acceptability of the work produced.

(2) Identify and correct deficiencies.

(3) Request Government inspection and acceptance.

**153.05 Sampling and Testing.** Inspect commercial laboratory equipment within 45 days of project use.

Have mobile laboratory equipment inspected and calibrated after the laboratory is moved to the project and every time it is moved thereafter. Keep laboratory facilities clean and maintain equipment in proper working condition. Certify that equipment conforms to testing requirements and submit evidence of current calibrations.

Allow the CO unrestricted access to the laboratory for inspection and review. When requested by the CO, provide additional inspections and tests to demonstrate sampling and testing proficiency. Submit proficiency sample test results within 48 hours of sample receipt.

Perform quality control sampling and testing according to the QCP and the sampling, testing, and acceptance requirements table in applicable sections.

When no sampling frequencies are specified, submit the proposed sampling and testing frequencies.

**153.06 Certifications.** Obtain, review, and verify certifications for work. Submit certifications when required.
Section 153

153.07 **Records and Control Charts.** Maintain complete testing and inspection records by pay item number and make them accessible to the CO.

153.08 **Acceptance.** The Contractor's quality control system will be evaluated under Subsection 106.02 based on its demonstrated effectiveness to ensure work conforms to the contract.

**Measurement and Payment**

153.09 Do not measure Contractor quality control for payment. See Subsection 109.05.
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 <number> minutes at any one time followed by an open period of no less than <number> 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>
<thead>
<tr>
<th>Road Number</th>
<th>From Terminus</th>
<th>To Terminus</th>
<th>Maximum Consecutive Days of Closure</th>
<th>Minimum Consecutive Days Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;number&gt;</td>
<td>&lt;MP or description&gt;</td>
<td>&lt;MP or description&gt;</td>
<td>&lt;number&gt;</td>
<td>&lt;number&gt;</td>
</tr>
</tbody>
</table>

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.
Section 157. — SOIL EROSION AND SEDIMENT CONTROL

Description

157.01 This work consists of furnishing, constructing, and maintaining soil erosion and sediment control devices to eliminate or minimize pollutants in stormwater discharges from the project.

Material

157.02 Conform to the following Subsections:

- Backfill material
- Concrete masonry unit
- Fertilizer
- Fiber rolls and socks
- Floating turbidity curtains
- Gravel bags
- Mulch
- Plastic lining
- Prefabricated filter insert
- Riprap
- Rock mulch
- Sandbags
- Sediment filter bags
- Seed
- Separation and stabilization geotextile and geotextile filter
- Silt fence
- Tackifiers
- Temporary culvert pipe
- Temporary plastic fence
- Temporary rolled erosion control products
- Turf reinforcement mats
- Water

Construction Requirements

157.03 Qualifications. Submit the following for approval at least 14 days before earth disturbing operations begin:

(a) Names of personnel responsible for soil erosion and sediment control; and

(b) A résumé for each individual describing their knowledge and experience providing erosion and sediment control and pollution prevention on highway or road construction projects for at least 5 years. Include certifications in those states where applicable.

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
Section 157

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.

157.05 Controls and Limitations on Work. Before grubbing or grading construct sediment controls around the perimeter of the project including filter barriers, diversion, and settling structures.

Limit the combined grubbing and grading operations areas to 8 acres (3.2 hectares) of exposed soil at one time.

Construct and implement soil erosion and sediment control measures as follows:

(a) Construct temporary controls in incremental stages as construction proceeds;

(b) Construct temporary slope drains, diversion channels, and earth berms to protect disturbed areas and slopes;

(c) When a soil disturbing activity within a portion of the project is complete, apply permanent measures to the finished slopes and ditches within 14 days;

(d) When a soil disturbing activity within a portion of the project has temporarily ceased, apply temporary measures within 14 days;

(e) Construct outlet protection as soon as culverts or other structures are complete;

(f) Construct and maintain soil erosion and sediment controls on and around soil stockpiles;

(g) Following each day’s grading operations, shape earthwork to minimize and control erosion from stormwater runoff; and

(h) Maintain stabilized construction exits to minimize tracking of soil onto existing roads.

157.06 Filter Barriers. Construct silt fence, berms, and fiber rolls and socks to reduce the velocity of runoff to allow sediment to settle.

157.07 Sediment Retention Structures. Construct sediment retention structures of the following types:

(a) Temporary sediment traps. Construct temporary sediment traps to detain runoff from disturbed areas and settle out sediment. Provide outlet protection.

(b) Sediment basins. Construct sediment basins to store runoff and settle out sediment for large drainage areas. Excavate and construct sediment basins according to Section 204. Construct riser pipes according to Section 602. Provide outlet protection.

157.08 Outlet Protection. Construct riprap aprons or basins to reduce water velocity and prevent scour at the outlet of permanent and temporary erosion and sediment control measures. Construct riprap according to Section 251.

157.10 Diversions. Construct temporary channels, temporary culverts, earth berms, or sandbags to divert water around disturbed areas and slopes. Use temporary channels, temporary culverts, pumps, sandbags, or other methods to divert the flow of live streams for permanent culvert installations and other work. Stabilize channels according to Subsection 157.11. Provide outlet protection.

157.11 Waterway and Slope Protection and Stabilization. Use the following:

(a) Plastic lining. Use plastic lining to protect underlying soil from erosion. Place the plastic lining loosely on a smooth soil surface free of projections or depressions that may cause the liner to puncture or tear. Lap transverse joints at least 3 feet (1 meter) in the direction of flow. Do not use longitudinal joints. Anchor the lining in place using riprap, gravel bags, or sandbags.

(b) Riprap. Construct riprap for channel lining according to Section 251.

(c) Check dams. Construct riprap, gravel bags, sandbags, fiber rolls and socks, or earth berms for temporary check dams to reduce the velocity of runoff in ditches and swales.

(d) Rolled erosion control products. Use rolled erosion control products to stabilize waterways and slopes before or after temporary or permanent seeding. Install according to Section 629.

(e) Temporary slope drains. Use drainpipe, riprap, or plastic lined waterway for temporary slope drains to channel runoff down slopes. Channel water into the slope drain with an earth berm, gravel bag, or sandbag headwall constructed at the top of a cut or fill. Anchor slope drains to the slope. Provide outlet protection.

(f) Floating turbidity curtains. Install floating turbidity curtains within a body of water to minimize the migration of silt laden water out of the construction area.

157.12 Temporary Soil Stabilization. Control soil erosion on unprotected slopes. Use the following:

(a) Temporary cover. Use mulch, plastic, rolled erosion control product, or tackifier. Apply according to the manufacturer’s recommendations or as approved by the CO.

(b) Temporary turf establishment. Apply seed and mulch for soil erosion protection at the rates shown in Table 157-1. Protect and care for seeded areas, including watering, until permanent turf establishment is in place.
Table 157-1
Application Rates for Temporary Turf Establishment

<table>
<thead>
<tr>
<th>Material</th>
<th>Application Rate</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>pounds/acre</td>
<td>kilograms/hectares</td>
</tr>
<tr>
<td>Seed</td>
<td>45 (50)</td>
<td></td>
</tr>
</tbody>
</table>
| Wood fiber or grass straw cellulose fiber mulch| 1500 (1700)      | (1) Mulch applied using hydraulic method according to Subsection 625.08(b). For other mulch products and application methods, use the manufacturer’s rate as approved by the CO.

157.13 Permanent Soil Stabilization. Control erosion on completed permanent slopes. Use the following:

(a) Turf establishment. Apply seed, fertilizer, and mulch according to Section 625.

(b) Plants, trees, shrubs, vines, groundcovers, and other plants. Furnish and plant trees, shrubs, vines, groundcovers, and other plants according to Section 626.

(c) Sod. Furnish and place sod of perennial turf-forming grasses according to Section 627.

(d) Rock mulch. Furnish and place rock on finished surfaces.

157.14 Inspection and Reporting. Inspect erosion and sediment control measures using approved personnel. When there are no contract permits, conduct erosion and sediment control inspections at least once every 7 days.

Within 24 hours after each inspection, submit an inspection report to the CO. Include the following:

(a) Date and time of the inspection;

(b) Names and titles of persons making the inspection;

(c) Summary of the inspection;

(d) Weather since the last inspection or since the start of work, if the first inspection. For each storm event, include the beginning date and time, duration, rainfall quantity in inches (millimeters), and whether discharge occurred;

(e) Weather and description of discharges occurring during the inspection;

(f) Locations of discharges or other pollutants from the site;

(g) Locations of erosion and sediment control measures that need maintenance;

(h) Locations of erosion and sediment control measures that failed to operate as designated or proved inadequate for a particular location;

(i) Locations where additional erosion and sediment control measures are needed; and

(j) Other necessary corrective actions including action taken, locations, dates, and times.
157.15 Maintenance and Cleanup. Maintain temporary erosion and sediment control measures in working condition until the project is complete or the measures are no longer needed. Remove sediment trapped in perimeter protection control measures before deposits reach 50 percent of the above ground height. Remove sediment from sediment retention structures when their capacity is reduced to 50 percent of design capacity. Use removed sediment in the work if acceptable or dispose of it according to Subsection 204.14.

Replace erosion and sediment control measures that cannot be maintained and those that are damaged by construction operations.

Remove and dispose of temporary erosion and sediment control measures when vegetation is satisfactorily established and drainage ditches and channels are lined and stabilized. Remove and dispose of erosion and sediment control measures according to Subsection 203.05.

Restore the ground to its natural or intended condition and provide permanent erosion control measures.

157.16 Acceptance. Material for erosion and sediment control measures will be evaluated under Subsections 106.02 and 106.03.

Construction, maintenance, and removal of erosion and sediment control measures will be evaluated under Subsections 106.02 and 106.04.

Separation and stabilization geotextile and geotextile filter will be evaluated under Section 207.

Measurement

157.17 Measure the Section 157 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable.

Measure temporary soil stabilization on the ground surface. When measurement is by the pound (kilogram), weigh the seed in pounds (kilograms).

Measure excavation for diversion channels and sediment basins under Section 204.

Measure riprap under Section 251.

Measure permanent paved waterways under Section 608.

Measure permanent turf establishment under Section 625.

Measure plants, trees, shrubs, vines, groundcovers, and other plants under Section 626.

Measure sod under Section 627.

Measure rolled erosion control products under Section 629.

Do not measure replacement items.
Payment

157.18 The accepted quantities will be paid at the contract price per unit of measurement for the Section 157 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Progress payments for erosion control measures or devices will be paid as follows:

(a) 25 percent of the pay item amount will be paid upon installation.

(b) An additional 50 percent of the pay item amount will be prorated based on total work complete.

(c) The remaining portion of the pay item amount will be paid when the temporary erosion control measure is removed from the project or at final acceptance.
DIVISION 200
EARTHWORK
Section 202. — ADDITIONAL CLEARING AND GRUBBING

Description

202.01 This work consists of clearing and grubbing outside the clearing limits specified in Section 201. This work also includes scalloping clearing lines, clearing vistas, thinning vegetation, special clearing and grubbing, and the removal of individual trees and stumps.

202.02 Definitions.

(a) **Selective clearing.** Clearing where some trees and vegetation is designated to remain.

(b) **Selective clearing and grubbing.** Clearing and grubbing where some trees and vegetation is designated to remain.

(c) **Special clearing and grubbing.** Clearing and grubbing where all trees and vegetation are removed.

(d) **Removal of individual trees or stumps.** Removing individual trees or stumps outside the clearing limits designated in Section 201 or outside areas designated in Subsection 202.02 (a) through (c).

Construction Requirements

202.03 General. Clear and grub according to Section 201, except as modified herein. Do not push, pull, or fall trees into trees designated to remain. Remove designated debris by methods that prevent damage to vegetation not designated to be removed. Dispose of clearing and grubbing debris according to Subsection 203.05.

202.04 Selective Clearing. Clear and dispose of trees, snags, brush, downed timber, and other vegetation designated to be removed.

202.05 Selective Clearing and Grubbing. Clear, grub, and dispose of trees, snags, brush, downed timber, stumps, roots, buried logs, moss, turf, grass, and other vegetation designated to be removed.

202.06 Special Clearing and Grubbing. Clear, grub, and dispose of trees, snags, brush, downed timber, stumps, roots, buried logs, moss, turf, grass, and other vegetation.

202.07 Removal of Individual Trees or Stumps. Remove and dispose of designated trees or stumps. Cut trees to within 6 inches (150 millimeters) of the ground.

202.08 Acceptance. Additional clearing and grubbing work will be evaluated under Subsection 106.02.
Measurement

202.09 Measure the Section 202 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

When measuring removal of individual trees by the square foot (square meter), measure the average diameter at the cutoff.

Do not measure trees less than 6 inches (150 millimeters) in diameter at the cutoff.

Payment

202.10 The accepted quantities will be paid at the contract price per unit of measurement for the Section 202 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.
Section 203 — REMOVAL OF STRUCTURES AND OBSTRUCTIONS

Description

203.01 This work consists of salvaging, removing, and disposing of buildings, fences, structures, pavements, culverts, utilities, curbs, sidewalks, and other obstructions.

Material

203.02 Conform to the following Section and Subsection:

<table>
<thead>
<tr>
<th>Material</th>
<th>704.03</th>
<th>601</th>
</tr>
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<tbody>
<tr>
<td>Backfill material</td>
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<tr>
<td>Minor concrete</td>
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</tbody>
</table>

Construction Requirements

203.03 Salvaging Material. Salvage with reasonable care material designated to be salvaged. Salvage in readily transportable sections or pieces. Replace or repair members, pins, nuts, plates, and related hardware damaged, lost, or destroyed during the salvage operation. Securely attach parts to adjacent members or pack them in sturdy boxes with the contents clearly marked.

Match mark members of salvaged structures. Submit one set of drawings according to Section 104 identifying the members and their respective match marks.

Stockpile salvaged material at a designated area on the project.

203.04 Removing Material.

(a) Submittals. Submit a bridge removal plan at least 30 days before beginning bridge removal for approval. Include the following:

(1) Methods and equipment to be used;

(2) Measures to be used for protecting the environment, public, adjacent property, and workers; and

(3) Methods to keep debris out of the stream and streambed.

(b) General. Saw cut sidewalks, curbs, pavements, and structures when partial removal is required.

Construct structurally adequate debris shields to contain debris within the construction limits. Do not allow debris to enter waterways, travel lanes open to public traffic, or areas designated not to be disturbed.

Handle material with lead paint contamination according to Subsection 563.05.

Raze and remove buildings, foundations, pavements, culverts, sidewalks, curbs, fences, structures, and other obstructions interfering with the work and not designated to remain.
Remove structures and obstructions in the roadbed to 36 inches (900 millimeters) below subgrade elevation. Remove structures and obstructions outside the roadbed to 24 inches (600 millimeters) below finished ground or to the natural stream bottom.

Abandon existing manholes, inlets, catch basins, and spring boxes according to Subsection 604.08.

When abandoning an existing culvert pipe, remove the upstream and downstream portion of the culvert to within 48 inches (1200 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.

Except in excavation areas, backfill and compact cavities left by structure removal with backfill material to the lines and grades of the finished ground. Backfill excavated areas according to Subsection 209.09. Compact backfill according to Subsection 209.10.

(c) Concrete removal in repair areas. Saw cut ¾ inch (19 millimeters) deep along boundaries of repair areas. Use power-driven hand tools to remove existing concrete. Do not damage concrete designated to remain in place.

Where the bond between existing concrete and reinforcing steel is destroyed, remove concrete adjacent to the steel to provide at least ¾-inch (19-millimeter) clearance for the new concrete to bond to the reinforcing steel. Use care to prevent damage to remaining concrete when achieving the final surface.

Clean exposed concrete surfaces that will be in contact with repair material. Provide a residue free surface.

(d) Reinforcing steel. Do not cut or damage reinforcing steel designated to remain in place. Repair or replace damaged bars. Replace deteriorated bars as directed by the CO.

Clean exposed reinforcing steel of coatings or residue that inhibits bonding with the new concrete.

Protect the steel from corrosion and contamination. If the steel becomes corroded or contaminated, reclean the steel before placing concrete.

203.05 Disposing of Material. Dispose of debris, unsuitable material, and excess material as follows:

(a) Remove from project. Recycle or dispose of material legally off the project. Submit a statement documenting the nature and quantity of material processed or sold for recycling. Otherwise, submit a signed copy of the disposal agreement before disposal begins.

(b) Burn. Obtain necessary burning permits. Submit a copy of the burning permits before burning begins.

Burn using high intensity burning processes that produce few emissions. Provide a watchperson during the burning operations.

When burning is complete, extinguish the fire so no smoldering debris remains. Dispose of unburned material according to Subsection 203.05(a).
(c) Bury. Bury debris in trenches or pits in approved areas within the right-of-way when approved. Do not bury debris inside the roadway prism limits, beneath drainage ditches, or in areas subject to free-flowing water.

Place debris in alternating layers of 48 inches (1200 millimeters) of debris covered with 24 inches (600 millimeters) of earth material. Distribute stumps, logs, and other large pieces to form a dense mass and minimize air voids. Cover the top layer of buried debris with at least 12 inches (300 millimeters) of compacted earth. Grade and shape the area. Seed and mulch disposal areas on Government property according to Section 625.

(d) Hazardous material. Submit a copy of disposal permits. Dispose of material according to Federal, state, and local regulations.

Dispose of lead contaminated steel either by transporting to an approved scrap facility for recycling or remelt; or remove and dispose of lead contamination in an appropriate waste facility.

(1) Disposal plan. Submit a detailed disposal plan that includes how material will be handled, loaded, and transported to the disposal facility. Include the name and address of the facility where the material will be taken. Describe steps that will be taken to ensure that lead contamination will be contained throughout the process. Measures may include additional steps or precautions when lifting and handling the steel on site.

(2) Transport and delivery. Include the material safety data sheet (MSDS) with the material to the disposal facility. Ensure that loads transported from the site are adequately contained and covered to prevent dispersion en route to the disposal facility. Submit a copy of the receiving report from the disposal facility specifically acknowledging that the material being delivered is contaminated with lead paint.

(3) Lead paint removal. If the Contractor chooses to salvage the steel members, the paint may be removed subject to the following requirements:

(a) Remove lead contaminated paint in an appropriate containment facility;

(b) Comply with the requirements as listed in Subsection 563.05; and

(c) Manifest and dispose of lead contaminated waste according to the requirements of 40 CFR 260 through 268 – Resource Conservation and Recovery Act (RCRA).

203.06 Acceptance. Removal of structures and obstructions will be evaluated under Subsection 106.02.

Backfilling and compacting cavities left by structures will be evaluated under Section 209.

Minor concrete will be evaluated under Section 601.

Measurement

203.07 Measure the Section 203 pay items listed in the bid schedule according to Subsection 109.02.
Payment

203.08 The accepted quantities will be paid at the contract price per unit of measurement for the Section 203 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.
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:

<table>
<thead>
<tr>
<th>Material</th>
<th>Subsection</th>
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<tbody>
<tr>
<td>Topping</td>
<td>704.05</td>
</tr>
<tr>
<td>Unclassified borrow</td>
<td>704.06</td>
</tr>
<tr>
<td>Water</td>
<td>725.01(c)</td>
</tr>
</tbody>
</table>
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 3/4H 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:
Section 203

(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 sheepfoot 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) Sheepfoot, 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.
Section 203

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:
Section 203

(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 overburden. 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>
<thead>
<tr>
<th>Material or Product (Subsection)</th>
<th>Type of Acceptance (Subsection)</th>
<th>Characteristic</th>
<th>Category</th>
<th>Test Methods Specifications</th>
<th>Sampling Frequency</th>
<th>Point of Sampling</th>
<th>Split Sample</th>
<th>Reporting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topping (704.05)</td>
<td>Measured and tested for conformance (106.04 &amp; 105)</td>
<td>Classification(1)</td>
<td>–</td>
<td>AASHTO M 145</td>
<td>1 per soil type and source of material</td>
<td>Processed material</td>
<td>Yes</td>
<td>Before using in work</td>
</tr>
<tr>
<td>Unclassified borrow (704.06)</td>
<td>&quot;</td>
<td>&quot;</td>
<td>–</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topping (704.05) and (204.11(a))</td>
<td>Measured and tested for conformance (106.04)</td>
<td>Moisture-density</td>
<td>–</td>
<td>T 99, Method C(2)</td>
<td>1 per soil type, but not less than 1 per each 13,000 yd³ (10,000 m³)</td>
<td>Processed material</td>
<td>Yes</td>
<td>Before using in work</td>
</tr>
<tr>
<td></td>
<td>Density</td>
<td>–</td>
<td></td>
<td>AASHTO T 310 or other approved procedures</td>
<td>1 per 3500 yd² (3000 m²), but not less than 3 per layer</td>
<td>In-place</td>
<td>No</td>
<td>Before placement of next layer</td>
</tr>
</tbody>
</table>
### Table 204-1
Sampling, Testing, and Acceptance Requirements

<table>
<thead>
<tr>
<th>Material or Product (Subsection)</th>
<th>Type of Acceptance (Subsection)</th>
<th>Characteristic</th>
<th>Category</th>
<th>Test Methods Specifications</th>
<th>Sampling Frequency</th>
<th>Point of Sampling</th>
<th>Split Sample</th>
<th>Reporting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unclassified borrow (704.06) and (204.11(a))</td>
<td>&quot;</td>
<td>Moisture-density</td>
<td>–</td>
<td>T 99, Method C(2)</td>
<td>1 per soil type, but not less than 1 per each 13,000 yd³ (10,000 m³) 1 per 3500 yd² (3000 m²), but not less than 3 per layer</td>
<td>Processed material</td>
<td>Yes</td>
<td>Before using in work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Density</td>
<td>–</td>
<td>AASHTO T 310 or other approved procedures</td>
<td>In-place</td>
<td>No</td>
<td>Before placement of next layer</td>
<td></td>
</tr>
</tbody>
</table>

### Production (continued)

| Earth embankment (204.11(a)) | Measured and tested for conformance (106.04) | Classification | Moisture-density | AASHTO T 99, Method C(2) | 1 per soil type, but not less than 1 per each 13,000 yd³ (10,000 m³) 1 per 3500 yd² (3000 m²), but not less than 3 per layer | Source of material | Yes | Before using in work |
| Earth embankment (204.11(a)) | Measured and tested for conformance (106.04) | Classification | Moisture-density | AASHTO T 99, Method C(2) | 1 per soil type, but not less than 1 per each 13,000 yd³ (10,000 m³) 1 per 3500 yd² (3000 m²), but not less than 3 per layer | Source of material | Yes | Before using in work |
| | | Density | – | AASHTO T 310 or other approved procedures | In-place | No | Before placement of next layer |
### Table 204-1
Sampling, Testing, and Acceptance Requirements

<table>
<thead>
<tr>
<th>Material or Product (Subsection)</th>
<th>Type of Acceptance (Subsection)</th>
<th>Characteristic</th>
<th>Category</th>
<th>Test Methods Specifications</th>
<th>Sampling Frequency</th>
<th>Point of Sampling</th>
<th>Split Sample</th>
<th>Reporting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top of subgrade (204.11(a))</td>
<td>&quot;</td>
<td>Density</td>
<td>--</td>
<td>AASHTO T 310 or other approved procedures</td>
<td>1 per 2500 yd² (2000 m²), but not less than 3 per layer</td>
<td>In-place</td>
<td>No</td>
<td>Before placement of next layer</td>
</tr>
</tbody>
</table>

**Finished Product**

| Roadbed (204.13) | Measured and tested for conformance (106.04) | Final line & grade | -- | Field measured | Determined by the CO | Determine d 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**

<table>
<thead>
<tr>
<th>Location Description</th>
<th>Tolerance Class (a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Roadbed width (ft)</td>
<td>+0.5</td>
</tr>
<tr>
<td>Subgrade elevation (ft)</td>
<td>+0.1</td>
</tr>
<tr>
<td>Centerline alignment (ft)</td>
<td>+0.2</td>
</tr>
<tr>
<td>Slopes, excavation, and embankment (% slope(b))</td>
<td>+3</td>
</tr>
</tbody>
</table>

(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.
### Table 204-1

**Sampling, Testing, and Acceptance Requirements**

<table>
<thead>
<tr>
<th>Material or Product (Subsection)</th>
<th>Type of Acceptance (Subsection)</th>
<th>Characteristic</th>
<th>Category</th>
<th>Test Methods Specifications</th>
<th>Sampling Frequency</th>
<th>Point of Sampling</th>
<th>Split Sample</th>
<th>Reporting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topping (704.05)</td>
<td>Measured and tested for conformance (106.04 &amp; 105)</td>
<td>Classification(1)</td>
<td>–</td>
<td>AASHTO M 145</td>
<td>1 per soil type and source of material</td>
<td>Source of material</td>
<td>Yes</td>
<td>Before using in work</td>
</tr>
<tr>
<td>Unclassified borrow (704.06)</td>
<td>&quot;</td>
<td>&quot;</td>
<td>–</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>Select borrow (704.07)</td>
<td>&quot;</td>
<td>&quot;</td>
<td>Gradation</td>
<td>&quot; AASHTO T 27 &amp; T 11</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;</td>
<td>&quot;</td>
<td>Liquid limit</td>
<td>&quot; AASHTO R 58 &amp; T 89, Method A</td>
<td>&quot;</td>
<td>&quot;</td>
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<td>&quot;</td>
</tr>
<tr>
<td>Material or Product (Subsection)</td>
<td>Type of Acceptance (Subsection)</td>
<td>Characteristic</td>
<td>Category</td>
<td>Test Methods Specifications</td>
<td>Sampling Frequency</td>
<td>Point of Sampling</td>
<td>Split Sample</td>
<td>Reporting Time</td>
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<tr>
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</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topping (704.05)</td>
<td>Measured and tested for conformance (106.04)</td>
<td>Moisture-density</td>
<td>–</td>
<td>AASHTO T 180, Method D(2) or T 99, Method C(2)</td>
<td>1 per soil type, but not less than 1 per each 13,000 yd³ (10,000 m³)</td>
<td>Processed material</td>
<td>Yes</td>
<td>Before using in work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Density</td>
<td>–</td>
<td>AASHTO T 310 or other approved procedures</td>
<td>1 per 3500 yd² (3000 m²), but not less than 1 per layer</td>
<td>In-place</td>
<td>No</td>
<td>Before placement of next layer</td>
</tr>
<tr>
<td>Unclassified borrow (704.06)</td>
<td>&quot;</td>
<td>Moisture-density</td>
<td>–</td>
<td>AASHTO T 180, Method D(2) or T 99, Method C(2)</td>
<td>1 per soil type, but not less than 1 per each 13,000 yd³ (10,000 m³)</td>
<td>Processed material</td>
<td>Yes</td>
<td>Before using in work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Density</td>
<td>–</td>
<td>AASHTO T 310 or other approved procedures</td>
<td>1 per 3500 yd² (3000 m²), but not less than 1 per layer</td>
<td>In-place</td>
<td>No</td>
<td>Before placement of next layer</td>
</tr>
<tr>
<td>Material or Product (Subsection)</td>
<td>Type of Acceptance (Subsection)</td>
<td>Characteristic</td>
<td>Category</td>
<td>Test Methods Specifications</td>
<td>Sampling Frequency</td>
<td>Point of Sampling</td>
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<td>---------------------------------</td>
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</tr>
<tr>
<td>Select borrow (704.07)</td>
<td>Measured and tested for conformance (106.04)</td>
<td>Classification</td>
<td>–</td>
<td>AASHTO M 145</td>
<td>1 per soil type, but not less than 1 for each day of production</td>
<td>Processed material</td>
<td>Yes</td>
<td>Before using in work</td>
</tr>
<tr>
<td>Gradation</td>
<td></td>
<td>–</td>
<td></td>
<td>AASHTO T 27 &amp; T 11</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>Liquid limit</td>
<td></td>
<td>–</td>
<td></td>
<td>AASHTO R 58 &amp; T 89, Method A</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>Moisture-density</td>
<td></td>
<td>–</td>
<td></td>
<td>AASHTO T 180, Method D&lt;sup&gt;(2)&lt;/sup&gt; or T 99, Method C&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>1 per soil type, but not less than 1 per each 13,000 yd&lt;sup&gt;3&lt;/sup&gt; (10,000 m&lt;sup&gt;3&lt;/sup&gt;)</td>
<td>In-place</td>
<td>No</td>
<td>Before placement of next layer</td>
</tr>
<tr>
<td>Density</td>
<td></td>
<td>–</td>
<td></td>
<td>AASHTO T 310 or other approved procedures</td>
<td>1 per 3500 yd&lt;sup&gt;2&lt;/sup&gt; (3000 m&lt;sup&gt;2&lt;/sup&gt;), but not less than 1 per layer</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

<sup>(2)</sup> Method A or Method C, as determined by the producer.
### Table 204-1 (continued)
**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 |
|----------------------------------|----------------------------------|----------------|----------|----------------------------|--------------------|------------------|--------------|----------------|----------------|
| Earth embankment (204.11)        | 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 | – | AASHTO T 180, Method D(2) or T 99, Method C(2) | 1 per soil type, but not less than 1 per each 13,000 yd³ (10,000 m³) | In-place | No | Before placement of next layer |
|                                  |                                  | Density | – | AASHTO T 310 or other approved procedures | 1 per 3500 yd² (3000 m²), but not less than 1 per layer | In-place | No | Before placement of next layer |
| Top of subgrade (204.11)         | "                                | Density | – | AASHTO T 310 or other approved procedures | 1 per 2500 yd² (2000 m²), but not less than 1 per layer | In-place | No | Before placement of next layer |
|                                  |                                  | 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.
Section 209. — STRUCTURE EXCAVATION AND BACKFILL

Description

209.01 This work consists of excavating material for the construction of structures, except those specifically designated under Section 208. This work also includes preserving channels, shoring and bracing, sealing foundations, dewatering, preparing foundations, bedding, and backfilling.

Material

209.02 Conform to the following Sections and Subsections:

- Backfill material 704.03
- Bedding material 704.02
- Foundation fill 704.01
- Lean concrete backfill 614
- Structural concrete, Class S (Seal) 552
- Unclassified borrow 704.06

Construction Requirements

209.03 General. Clear the area of vegetation and obstructions according to Sections 201 and 203.

Excavate trenches or foundation pits according to Subsection 208.03. Excavate to foundation grade without disturbing the trench or foundation surface. Foundation grade is the elevation at the bottom of the bedding for installing the structure.

209.04 Channel Preservation. Preserve channels according to Subsection 208.04, except excavate inside separations such as dikes or sandbags.

209.05 Foundation Seal. When foundation seals are necessary, construct a foundation seal according to Subsection 208.06.

209.06 Dewatering. When dewatering is necessary, dewater according to Subsection 208.07.

209.07 Foundation Preparation. Excavate unsuitable material when encountered at foundation grade as directed by the CO.

Where a footing is required to be keyed into undisturbed material, prepare foundation and construct footing according to Subsection 208.08(c).

Backfill and compact with foundation fill according to Subsection 208.08(d).

209.08 Bedding. Place bedding as follows:

(a) For box culverts and structures other than pipe culverts. Construct bedding when specified. Place and grade bedding material in compacted layers not exceeding 6 inches (150 millimeters) in depth. Compact each layer according to Subsection 209.10.
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(b) For pipe culverts. Level the foundation. Place uncompacted bedding material over the foundation in a layer of uniform thickness. Lay a 4-inch (100-millimeter) thickness of bedding for pipes with diameters of 12 to 54 inches (300 to 1350 millimeters). Lay a 6-inch (150-millimeter) thickness of bedding for pipe with diameters larger than 54 inches (1350 millimeters). Recess the bedding to receive the joints for pipes with belled joints. Place the culvert on the uncompacted bedding layer and backfill according to Subsection 209.09(b).

209.09 Backfill. Backfill as follows:

(a) General. Place backfill layers evenly on all sides of the structure. Extend each layer to the limits of the excavation or natural ground.

Place backfill material in compacted layers not exceeding 6 inches (150 millimeters) in depth.

Do not place backfill material against concrete until 80 percent of the design strength is achieved.

Compact each layer according to Subsection 209.10.

(b) Pipe culverts. Backfill according to one of the following:

(1) Pipe culverts. Place and compact backfill material in evenly balanced layers on each side of the pipe to a height of 12 inches (300 millimeters) above the top of the pipe culvert.

Complete backfilling to the top of the trench. Place and compact backfill material in the trench in layers not exceeding 6 inches (150 millimeters) in depth according to Subsection 209.10.

(2) Pipe culverts with lean concrete backfill. Place and anchor pipe to prevent floating and movement. Backfill using lean concrete according to Section 614.

(c) Structural plate structures. Place and compact backfill material to a height of 12 inches (300 millimeters) above the top of the structural plate structure. When applicable, complete backfilling and compacting according to Subsection 204.10.

(d) Repair existing pavement areas. See Subsection 418.04.

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
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\( \text{(c)} \) 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.

\( \text{(2)} \) 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).

\( \text{(3)} \) 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.

\( \text{(b)} \) 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 sheepfoot 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:

- 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.
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(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.

209.11 Acceptance. See Table 209-1 for sampling, testing, and acceptance requirements.

Material for backfill, bedding, and foundation fill will be evaluated under Subsections 106.02 and 106.04, except lean concrete for bedding or backfill will be evaluated according to Section 614.

Structural excavation and backfill work will be evaluated under Subsections 106.02 and 106.04.

Shoring and bracing will be evaluated under Subsections 106.02 and 106.04.

Clearing and removal of obstructions will be evaluated under Sections 201 and 203.

Seal concrete will be evaluated under Section 552.

Measurement and Payment

209.12 Do not measure structure excavation and backfill for payment. See Subsection 109.05.

Measure foundation fill under Section 208.

Do not measure excavation and concrete for cofferdam seals for payment.
## Table 209-1  
**Sampling, Testing, and Acceptance Requirements**

<table>
<thead>
<tr>
<th>Material or Product (Subsection)</th>
<th>Type of Acceptance (Subsection)</th>
<th>Characteristic</th>
<th>Category</th>
<th>Test Methods Specifications</th>
<th>Sampling Frequency</th>
<th>Point of Sampling</th>
<th>Split Sample</th>
<th>Reporting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backfill material(^{(1)}) (704.03)</td>
<td>Measured and tested for conformance (106.04 &amp; 105)</td>
<td>Classification</td>
<td>–</td>
<td>AASHTO M 145&lt;br&gt;AASHTO T 27 &amp; T 11</td>
<td>1 per soil type</td>
<td>Source of material</td>
<td>Yes</td>
<td>Before using in work</td>
</tr>
<tr>
<td>Bedding material(^{(1)}) (704.02)</td>
<td>&quot;</td>
<td>&quot;</td>
<td>–</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>Foundation fill(^{(1)}) (704.01)</td>
<td>&quot;</td>
<td>Classification</td>
<td>–</td>
<td>AASHTO M 145&lt;br&gt;AASHTO T 27 &amp; T 11</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>Unclassified borrow(^{(1)}) (704.06)</td>
<td>&quot;</td>
<td>Classification</td>
<td>–</td>
<td>AASHTO M 145</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
</tr>
</tbody>
</table>
## Table 209-1 (continued)
### Sampling, Testing, and Acceptance Requirements

<table>
<thead>
<tr>
<th>Material or Product (Subsection)</th>
<th>Type of Acceptance (Subsection)</th>
<th>Characteristic</th>
<th>Category</th>
<th>Test Methods Specifications</th>
<th>Sampling Frequency</th>
<th>Point of Sampling</th>
<th>Split Sample</th>
<th>Reporting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Backfill material (704.03)</td>
<td>Measured and tested for conformance (106.04)</td>
<td>Moisture-density</td>
<td>−</td>
<td>AASHTO T 99, Method C(2)</td>
<td>1 per soil type</td>
<td>Source of material</td>
<td>Yes</td>
<td>Before using in work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Density</td>
<td>−</td>
<td>AASHTO T 310 or other approved procedures</td>
<td>2 per lift</td>
<td>In-place</td>
<td>No</td>
<td>Before placing next layer</td>
</tr>
<tr>
<td>Bedding material (704.02)</td>
<td>&quot;</td>
<td>Moisture-density</td>
<td>−</td>
<td>AASHTO T 99, Method C(2)</td>
<td>1 per soil type</td>
<td>Source of material</td>
<td>Yes</td>
<td>Before using in work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Density</td>
<td>−</td>
<td>AASHTO T 310 or other approved procedures</td>
<td>2 per lift</td>
<td>In-place</td>
<td>No</td>
<td>Before placing next layer</td>
</tr>
<tr>
<td>Foundation fill (704.01)</td>
<td>&quot;</td>
<td>Moisture-density</td>
<td>−</td>
<td>AASHTO T 99, Method C(2)</td>
<td>1 per soil type</td>
<td>Source of material</td>
<td>Yes</td>
<td>Before using in work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Density</td>
<td>−</td>
<td>AASHTO T 310 or other approved procedures</td>
<td>2 per lift</td>
<td>In-place</td>
<td>No</td>
<td>Before placing next layer</td>
</tr>
<tr>
<td>Unclassified borrow (704.06)</td>
<td>&quot;</td>
<td>Moisture-density</td>
<td>−</td>
<td>AASHTO T 99, Method C(2)</td>
<td>1 per soil type</td>
<td>Source of material</td>
<td>Yes</td>
<td>Before using in work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Density</td>
<td>−</td>
<td>AASHTO T 310 or other approved procedures</td>
<td>2 per lift</td>
<td>In-place</td>
<td>No</td>
<td>Before placing next layer</td>
</tr>
</tbody>
</table>

(1) Not required when using Government-provided source.
(2) Minimum of 5 points per proctor.
DIVISION 550
BRIDGE CONSTRUCTION
Section 552. — STRUCTURAL CONCRETE

Description

552.01 This work consists of furnishing, placing, finishing, and curing concrete in bridges, culverts, and other structures.

Structural concrete class is designated in the plans according to Table 552-1.

Material

552.02 Conform to the following Section and Subsections:

- Coarse aggregate for concrete
- Color coating
- Concrete curing material and admixtures
- Elastomeric bearing (pads)
- Epoxy resin adhesives
- Fine aggregate for concrete
- Hydraulic cement
- Non-shrink grout
- Pozzolans
- Preformed polychloroprene elastomeric joint seal for bridges
- Reinforcing fibers
- Sealants, fillers, and seals
- Water

Construction Requirements

552.03 Composition (Concrete Mix Design). Design and produce concrete mixtures that conform to Tables 552-1, 552-2, and 552-3 as required for the class specified. Determine design strength values according to Chapter 5 of ACI 318, Building Code Requirements for Structural Concrete and Commentary.
Table 552-1
Composition of Concrete

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

(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.

Table 552-2
Air Content for Air Entrained Concrete (1)

<table>
<thead>
<tr>
<th>Nominal Maximum Aggregate Size (2)</th>
<th>Minimum Air Content (3) (%)</th>
<th>Maximum Air Content (3) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1½ inch (37.5 mm)</td>
<td>4.0</td>
<td>7.0</td>
</tr>
<tr>
<td>1 inch (25 mm)</td>
<td>4.5</td>
<td>7.5</td>
</tr>
<tr>
<td>¾ inch (19 mm)</td>
<td>4.5</td>
<td>7.5</td>
</tr>
<tr>
<td>½ inch (12.5 mm)</td>
<td>5.5</td>
<td>8.5</td>
</tr>
</tbody>
</table>

(1) The minimum air content values in the table may be reduced by up to 1.0 percent for concrete with f’c greater than 5000 pounds per square inch (34.5 megapascals).
(2) Meet the requirements of AASHTO M 43, Table 1 – Standard Sizes of Processed Aggregate.
(3) For P(AE) concrete, reduce the as-delivered minimum air content by 1.0 percent and use a maximum air content of 6.0 percent.
Table 552-3

Cementitious Material Requirements for Concrete

<table>
<thead>
<tr>
<th>Cementitious Material</th>
<th>Maximum Percent of Total Cementitious Material by Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fly ash or other pozzolans, AASHTO M 295</td>
<td>25</td>
</tr>
<tr>
<td>Slag, AASHTO M 302</td>
<td>50</td>
</tr>
<tr>
<td>Silica fume, AASHTO M 307</td>
<td>10</td>
</tr>
<tr>
<td>Total fly ash or other pozzolans, slag, and silica fume</td>
<td>50 (1)</td>
</tr>
<tr>
<td>Total fly ash or other pozzolans and silica fume</td>
<td>35 (1)</td>
</tr>
</tbody>
</table>

(1) Limit fly ash or other pozzolans to no more than 25 percent of the total mass of cementitious material and limit silica fume to no more than 10 percent of the total mass of cementitious material.

Submit concrete mix designs on FHWA Form 1608, 552 Structural Concrete Mix Design Submittal.

Verify mixture design with trial mixes prepared according to ACI 318 from proposed sources or with previous concrete production data for the mixture design submitted from proposed sources. Submit written concrete mix designs for approval at least 36 days before production. Include the following in each mix design submittal:

(a) Project identification;

(b) Name and address of Contractor and concrete producer;

(c) Mix design designation;

(d) Class of concrete and intended use;

(e) Material proportions;

(f) Name and location of material sources for aggregate, cement, admixtures, and water;

(g) Type of cement and other cementitious material if used. Fly ash, ground granulated blast-furnace slag, or silica fume may partially replace cement in the mix. Follow the cement replacement limits in Table 552-3;

(h) Cement content in pounds per cubic yard (kilograms per cubic meter) of concrete;

(i) The saturated surface dry batch mass of the coarse and fine aggregate in pounds per cubic yard (kilograms per cubic meter) of concrete;

(j) Water content in pounds per cubic yard (kilograms per cubic meter) of concrete;

(k) Water/cementitious material ratio. The water/cementitious material ratio for modified concrete is the ratio of the mass of water to the combined masses of hydraulic cement and cement substitute;
(l) Dosage of admixtures. Provide a qualified person from the admixture manufacturer to help establish the proper dosage when requested by the CO. Do not mix chemical admixtures together in a mix unless they are compatible. Furnish supporting documentation of compatibility from the manufacturers.

(1) **Air-entraining admixtures.** Entrained air may be obtained with either air-entraining hydraulic cement or air-entraining admixture.

(2) **Set accelerating admixtures.** Do not use chloride accelerators. Do not use set accelerating admixtures in prestressed concrete applications.

(3) **Hydration stabilizing admixtures.** Hydration stabilizing admixtures may be used to extend the allowable delivery time for concrete. Base the dosage on the time needed to delay the initial set of the concrete for delivery and discharge on the job. Include the design discharge time limit in the dosage submittal. The maximum allowable design discharge time is 3½ hours;

(m) Fine and coarse aggregate quality;

(n) Sieve analysis of fine and coarse aggregate;

(o) Absorption of fine and coarse aggregate;

(p) Bulk specific gravity (dry and saturated surface dry) of fine and coarse aggregate;

(q) Dry rodded density of coarse aggregate in pounds per cubic foot (kilograms per cubic meter.);

(r) Fineness modulus (FM) of fine aggregate;

(s) Material certifications for cementitious material, admixtures, and aggregate;

(t) Target values for concrete slump with and without high-range water reducers;

(u) Target values for concrete air content. Include the proposed range of air content for concrete to be incorporated into the work. Describe the methods by which air content will be monitored and controlled;

(v) Concrete density;

(w) Specified design strength ($f'_{c,d}$) and required average strength ($f'_{c,r}$) for the concrete mixture at 28 days as determined by the process described in Chapter 5 of ACI 318. This process and associated calculations are outlined on FHWA Form 1608, pages 4 and 5. Pending 28-day strength results, a mix design may be approved on the basis that 7-day compressive strength results meet or exceed 85 percent of the required average strength ($f'_{c,r}$) at 28 days;

(x) Compressive strengths test results at 7 and 28 days according to Table 552-9, note (3); and

(y) Material samples if requested.

Do not begin production until the mix design is approved by the CO.

Furnish a new mix design for approval if there is a change in a source of material or when the fineness modulus of the fine aggregate changes by more than 0.20.
Section 552

552.04 Handling and Storing Material. Handle and store material in a manner that prevents segregation, contamination, or other harmful effects. Do not use cement and fly ash containing evidence of moisture contamination. Store and handle aggregate in a manner that ensures uniform moisture content at the time of batching.

552.05 Measuring Material. Batch the concrete according to the approved mix design and the following tolerances:

(a) Cement  ±1 percent
(b) Water  ±1 percent
(c) Aggregate  ±2 percent
(d) Additive  ±3 percent

552.06 Batching Plant, Mixers, and Agitators. Use a batching plant, mixer, and agitator conforming to AASHTO M 157.

552.07 Mixing. Mix the concrete in a central-mix plant or in truck mixers. Operate equipment within manufacturer’s recommended capacity. Produce concrete of uniform consistency.

(a) Central-mix plant. Dispense liquid admixtures through a controlled flowmeter. Use dispensers with sufficient capacity to measure, at one time, the full quantity of admixture required for each batch. If more than one admixture is used, dispense each with separate equipment.

Charge the coarse aggregate, one-third of the water, and all air-entraining admixture into the mixer first, then add remainder of the material.

Mix for at least 50 seconds. Begin mixing time after all cement and aggregate are in the drum. Add the remaining water during the first quarter of the mixing time. Add 4 seconds to the mixing time if timing starts the instant the skip reaches its maximum raised position. Transfer time in multiple-drum mixers is included in mixing time. Mixing time ends when the discharge chute opens.

Remove the contents of an individual mixer before a succeeding batch is charged into the drum.

(b) Truck mixer. Do not use mixers with blades worn 1 inch (25 millimeters) or more below the original manufactured height. Do not use mixers and agitators with accumulated hard concrete or mortar in the mixing drum.

Add admixtures to the mix water before or during mixing.

Charge the batch into the drum so a portion of the mixing water enters before the cement.

Mix each batch of concrete according to AASHTO M 157.

552.08 Delivery. Produce and deliver concrete to permit a continuous placement with no concrete achieving initial set before the remaining concrete being placed adjacent to it. Deliver, handle, and place concrete so as to minimize rehandling of the concrete and prevent damage to the structure.

Do not place concrete that has developed an initial set. Do not re-temper concrete by adding water.
If a hydration stabilizing admixture is approved for use in the concrete mix, deliver and place the concrete within the approved design discharge time limit. Limit the slump loss to no more than 2 inches (50 millimeters) during the stabilization period. An approved and compatible hydration activator may be used at the discharge site to ensure proper placement and testing.

(a) **Truck mixer/agitator.** Use the agitating speed for rotation after mixing. When a truck mixer or truck agitator is used to transport concrete that is completely mixed in a stationary central construction mixer, mix during transportation at manufacturer’s recommended agitating speed. Do not exceed 100 total revolutions at mixing speed, including both initial mixing and remixing.

If the concrete has not obtained an initial set, water and admixtures in the approved mix design may be added one time at the project to obtain the required slump or air content. Limit the total of water in the mix so as not to exceed the maximum water/cementitious material ratio of the approved mix design. Remix the concrete and added water or admixtures with 30 revolutions at mixing speed. After the initial introduction of mixing water to cement or cement to aggregates, complete the remixing within the time specified in Table 552-4. After the beginning of the addition of the cement, complete the discharge of the concrete within the time specified in Table 552-5.

<table>
<thead>
<tr>
<th>Cement Type (1)</th>
<th>Admixtures</th>
<th>Remixing Time Limit (hour)</th>
<th>Discharge Time Limit (hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I, IA, II, IIA, V, or approved blended hydraulic cement</td>
<td>None</td>
<td>0.75</td>
<td>1.00</td>
</tr>
<tr>
<td>Type I, IA, II, IIA, V, or approved blended hydraulic cement</td>
<td>AASHTO M 194, Type B, D, or G</td>
<td>1.25</td>
<td>1.50</td>
</tr>
<tr>
<td>Type I, IA, II, IIA, V, or approved blended hydraulic cement</td>
<td>Hydration stabilizer</td>
<td>3.00</td>
<td>Approved design discharge time limit, 3.50 maximum</td>
</tr>
<tr>
<td>Type III</td>
<td>None</td>
<td>0.50</td>
<td>0.75</td>
</tr>
<tr>
<td>Type III</td>
<td>AASHTO M 194, Type B, D, or G</td>
<td>1.00</td>
<td>1.25</td>
</tr>
</tbody>
</table>

(1) AASHTO M 85 or AASHTO M 240 as applicable.

(b) **Non-agitating equipment.** Non-agitating equipment may be used to deliver concrete if the concrete discharge is completed within 20 minutes from the beginning of the addition of the cement to the mixing drum. Use equipment with smooth, mortar tight, metal containers capable of discharging the concrete at a controlled rate without segregation. Provide covers when needed for protection.
Section 552

552.09 Quality Control of Mix. Submit and follow a quality control plan according to Sections 153 and 154 as applicable and the following:

(a) Mixing. Designate a certified concrete technician at the mixing plant to be responsible for the mixing operations and quality control including:

1. Proper storage and handling of components of the mix;
2. Proper maintenance and cleanliness of plant, trucks, and other equipment;
3. Sampling and testing according to Table 552-9;
4. Adjusting the mix proportions to maintain the required water/cementitious material ratio;
5. Computing batch masses for each day's production;
6. Checking of the plant's calibration; and
7. Completing batch tickets. Include the following:
   (a) Concrete supplier;
   (b) Ticket serial number;
   (c) Date and truck number;
   (d) Contractor;
   (e) Structure or location of placement;
   (f) Mix-design and concrete class;
   (g) Component quantities and concrete total volume;
   (h) Moisture corrections for aggregate moisture;
   (i) Total water in mix at plant;
   (j) Time of batching and time at which discharge must be completed;
   (k) Maximum water that may be added to the mix at the project; and
   (l) If a hydration stabilizing admixture is used, the slump at the plant after adding the stabilizer.

Provide equipment necessary for the above tests and controls. Furnish copies of work sheets for (3), (4), (5), and (7) above as they are completed.

(b) Delivery and sampling. Designate at least one certified concrete technician at the project to be responsible for concrete delivery, discharge, and sampling including:

1. Verifying adjustments to the mix comply with the specifications before discharge;
2. Completing the batch ticket for each load by, recording the apparent water/cementitious material ratio and the time;
3. Sampling and testing according to Table 552-9; and
(4) If hydration stabilizing admixture is used, determining the slump before placement. Do not use concrete with a slump loss of more than 2 inches (50 millimeters) as compared to the slump recorded at the batch plant.

552.10 Temperature and Weather Conditions. Maintain the temperature of the concrete mixture just before placement between 50 and 90°F (10 and 32°C), except for bridge decks between 50 and 80°F (10 and 27°C).

(a) Cold weather. Cold weather is defined as a period when for more than 3 consecutive days the following conditions exist:

(1) Average of the highest and the lowest temperatures occurring during the period from midnight to midnight is less than 40°F (5°C); and

(2) Air temperature is not greater than 50°F (10°C) for more than one-half in a 24-hour period.

When cold weather is reasonably expected or has occurred within 7 days of anticipated concrete placement; submit a detailed plan for the producing, transporting, placing, protecting, curing, and temperature monitoring of concrete during cold weather. ACI 306, Guide to Cold Weather Concreting may be used for guidance in developing the plan. Include procedures for accommodating abrupt changes in weather conditions. Do not start placement until the plan is accepted. Allow at least 3 day for review and approval of the plan.

Have material and equipment required for protection available at the project before commencing cold weather concreting.

Remove snow, ice, and frost from the surfaces, including reinforcement and subgrade, against which the concrete is to be placed. Heat surfaces that come into contact with fresh concrete to at least 35°F (2°C) and maintain the temperature of these surfaces at 35°F (2°C) or above during concrete placement.

Place heaters and direct ducts so as not to cause concrete drying or fire hazards. Vent exhaust flue gases from combustion heating units to the outside of enclosures. Heat the concrete components in a manner that is not detrimental to the mix. Do not heat cement or permit the cement to come into contact with aggregates that are hotter than 100°F (40°C). Do not heat aggregates with a direct flame or on sheet metal over fire. Do not heat fine aggregate by direct steam. Do not add salts to prevent freezing.

Protect concrete for at least 72 hours according to Table 552-5. Protect concrete exposed in the final construction for at least 7 days according to Table 552-5.

Furnish and place continuously recording surface temperature measuring devices that are accurate within ±2°F (±1°C).

At the end of the protection period, allow the concrete to cool gradually over 24 hours at a rate not to exceed the maximum values shown in Table 552-5. Remove protection when the concrete surface temperature is within 25°F (15°C) of the ambient air temperature.
Table 552-5
Cold Weather Concrete Surface Temperatures

<table>
<thead>
<tr>
<th>Minimum Section Size Dimension</th>
<th>&lt; 12inches (&lt; 300 mm)</th>
<th>12 – 36 inches (300 – 900 mm)</th>
<th>36 – 72 inches (900 – 1800 mm)</th>
<th>&gt; 72 inches (&gt; 1800 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum temperature of concrete during protection period</td>
<td>55 °F (13 °C)</td>
<td>50 °F (10 °C)</td>
<td>45 °F (7 °C)</td>
<td>40 °F (5 °C)</td>
</tr>
<tr>
<td>Maximum allowable temperature drop in a 24-hour period after end of protection</td>
<td>50 °F (28 °C)</td>
<td>40 °F (22 °C)</td>
<td>30 °F (17 °C)</td>
<td>20 °F (11 °C)</td>
</tr>
</tbody>
</table>

(b) Hot weather. Hot weather is defined as any time during the concrete placement when the ambient temperature at the work site is above 90 °F (35 °C).

Cool surfaces that come in contact with the mix to below 90 °F (35 °C) by covering with wet burlap or cotton mats, fog spraying with water, covering with protective housing, or by other approved methods.

During placement, maintain concrete temperature by using any combination of the following:

1. Shade the material storage areas or production equipment;
2. Cool aggregate by sprinkling; and
3. Cool aggregate and water by refrigeration or replacing a portion or all of the mix water with flaked or crushed ice to the extent that the ice completely melts during mixing of the concrete.

(c) Evaporation. When placing concrete in bridge decks or other exposed slabs, limit expected evaporation rate to less than 0.1 pound per square foot (0.5 kilograms per square meter) per hour as determined by Figure 552-1.

When necessary, take one or more of the following actions:

1. Construct windbreaks or enclosures to effectively reduce the wind velocity throughout the area of placement;
2. Use fog sprayers upwind of the placement operation to effectively increase the relative humidity; and
3. Reduce the temperature of the concrete according to Subsection 552.10(b).

(d) Rain. Protect the concrete from rain during and after placement.

552.11 Handling and Placing Concrete. Perform the work under Section 208, except for work under Section 258. Construct reinforcing steel, structural steel, bearing devices, joint material, and miscellaneous items according to the appropriate Sections.
(a) General. Design and construct falsework and forms according to Section 562. Remove mortar, debris, and foreign material from the forms and reinforcing steel. Do not place concrete until the forms, embedded material, and the adequacy of the foundation material have been inspected. Thoroughly moisten the forms and subgrade immediately before concrete is placed against them. Use an approved form release agent to produce a minimum of staining, air holes, and hydration discoloration.

Handle, place, and consolidate concrete by methods that do not cause segregation and will result in dense homogeneous concrete that is free of voids and rock pockets. Do not displace reinforcing steel or other material that is to be embedded in the concrete during concrete placement. Do not retemper concrete by adding water to the mix. Use temporary form spreader devices until concrete placement precludes their need.

**Figure 552-1**

**Evaporation Rate of Surface Moisture**

Note: Example shown by dashed lines is for an air temperature of 65 °F (18 °C), relative humidity of 45 percent, concrete temperature of 65 °F (18 °C), and a wind velocity of 15 miles (24 kilometers) per hour. This results in a rate of evaporation of 0.13 pounds per square foot (0.63 kilograms per square meter) per hour.
Place concrete continuously without interruption between planned construction or expansion joints. Control the delivery rate, placing sequence, and construction methods to ensure fresh concrete is always placed and consolidated against previously placed pre-initial set concrete. Do not allow time between the placement of successive batches to exceed 30 minutes.

Do not damage previously placed concrete or break the bond between the concrete and reinforcing steel. Keep workers off fresh concrete. Do not support platforms for workers and equipment directly on reinforcing steel. Once the concrete is set, do not disturb the forms or reinforcing bars that project from the concrete until it is of sufficient strength to resist damage.

(b) Sequence of placement.

(1) Substructures. Do not place loads on finished bents, piers, or abutments until concrete cylinder tests from the same concrete cured under the same conditions as the substructure element indicate that the concrete has at least 80 percent of its required 28-day compressive strength.

(2) Vertical members. For vertical members less than 15 feet (4.5 meters) in height, allow the concrete to set for at least 30 minutes before placing integral horizontal members. For vertical members over 15 feet (4.5 meters) in height, allow the concrete to set for at least 12 hours. Do not transfer loads from horizontal members until the concrete has reached the specified strength and has been in place at least 7 days.

Do not mount friction collars or falsework brackets on vertical members until the concrete has cured for at least 7 days or has reached specified strength.

(3) Superstructures. Place concrete in the superstructure only after the substructure forms are stripped to allow inspection of the supporting concrete.

For concrete placed in T-beams or deck girders with depths greater than 48 inches (1200 millimeters), allow 5 days cure time for the stem concrete before placement of the top or deck slab.

For box girders, place the bottom slab and stems in one or separate placements. Do not place the top slab until the stems have 5 days cure time.

(4) Arches. Place concrete for arches in alternate lateral sections to minimize shrinkage stresses. Take into account deflections of the arch centering. Place other sections symmetrically with respect to the center of the bridge span. Where wide barrel arches require a longitudinal joint, place concrete on each side of such joint independently of the centering to avoid relative settlements. Bond the sections together with suitable keys or dowels.

(5) Box culverts. Place the box culvert base slab and allow 24 hours before the remainder of the culvert is constructed.

(6) Precast elements. Place and consolidate concrete so that shrinkage cracks are not produced in the member.

(c) Placing methods. Use equipment of sufficient capacity that is designed and operated to prevent mix segregation and mortar loss. Do not use equipment that causes vibrations that could damage the freshly-placed concrete. Do not use equipment with aluminum parts that come in contact with the concrete. Remove set or dried mortar from inside surfaces of placing equipment.
Place concrete as near as possible to its final position. Consolidate concrete in horizontal layers greater than 18 inches (450 millimeters) thick. Do not exceed the vibrator capacity to consolidate and merge the new layer with the previous layer. Do not place concrete at a rate that exceeds the design loading of the forms.

Do not drop unconfined concrete more than 5 feet (1.5 meters). Concrete may be confined by using a tube fitted with a hopper head or other approved device that prevents mix segregation and mortar spattering. This does not apply to cast-in-place piling or drilled shaft when concrete placement is completed before initial set occurs in the bottom of the piling.

Operate concrete pumps so that a continuous stream of concrete without air pockets is delivered at the tube discharge.

(d) Consolidation. Provide sufficient hand-held internal concrete vibrators or mechanical vibrator gangs suitable for the conditions of concrete placement. Use vibrators conforming to Table 552-6. Provide rubber-coated vibrators when epoxy-coated reinforcement is used.

Provide a spare vibrator at the site in case of breakdown. Use external form vibrators only when the forms have been designed for external vibration and when internal vibration is not possible.

<table>
<thead>
<tr>
<th>Head Diameter</th>
<th>Frequency (vibrations/minute)</th>
<th>Radius of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾ – 1½ inches</td>
<td>9,000 – 15,000</td>
<td>3 – 6 inches</td>
</tr>
<tr>
<td>(20 to 40 mm)</td>
<td></td>
<td>(75 – 150 mm)</td>
</tr>
<tr>
<td>1¼ – 2½ inches</td>
<td>8,500 – 12,500</td>
<td>5 – 10 inches</td>
</tr>
<tr>
<td>(30 – 65 mm)</td>
<td></td>
<td>(130 – 250 mm)</td>
</tr>
<tr>
<td>2 – 3½ inches</td>
<td>8,000 – 12,000</td>
<td>7 – 14 inches</td>
</tr>
<tr>
<td>(50 – 90 mm)</td>
<td></td>
<td>(180 – 350 mm)</td>
</tr>
</tbody>
</table>

Consolidate concrete by mechanical vibration immediately after placement. Manipulate vibrators to thoroughly work the concrete around reinforcement, embedded fixtures, corners, and angles in the forms. Do not cause segregation. Do not consolidate concrete placed underwater. Supplement vibration with spading, as necessary, to ensure smooth surfaces and dense concrete along form surfaces, in corners, and at locations impossible to reach with the vibrators.

Vibrate the concrete at the point of deposit and at uniformly spaced points not farther apart than one and one-half times the radius over which the vibration is visibly effective. Insert vibrators so that the affected vibrated areas overlap. Do not use vibrators to move concrete. Insert vibrators vertically and slowly withdraw from the concrete. Vibrate with sufficient duration and intensity to thoroughly consolidate the concrete, but not to cause segregation. Do not vibrate at one point long enough to cause localized areas of grout to form. Do not vibrate reinforcement.

(e) Underwater placement. Underwater placement of concrete is permitted only for concrete mixtures designed for underwater placement according to Subsection 552.03. Use tremies, concrete pumps, or other approved methods for placement.
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(1) Tremies. Use watertight tremies, with a sufficient to ensure that aggregate-induced blockages will not occur. Use multiple tremies as required. Make tremies capable of being rapidly lowered to retard or stop the flow of concrete.

Seal the discharge end and fill the tremie tube with concrete at the start of concrete placement. Keep the tremie tube full of concrete to the bottom during placement. If water enters the tube, withdraw the tremie and reseal the discharge end. Maintain continuous concrete flow until the placement is completed.

(2) Concrete pumps. Use pumps with a device at the end of the discharge tube to seal out water while the tube is first being filled with concrete. When concrete flow is started, keep the end of the discharge tube full of concrete and below the surface of the deposited concrete until placement has been completed.

Place underwater concrete continuously from start to finish in a dense mass. Place each succeeding layer of concrete before the preceding layer has taken initial set using more than one tremie or pump if necessary. Keep the concrete surface as horizontal as practical. Do not disturb after placement. Maintain still water at the point of deposit.

Dewater after test specimens cured under similar conditions indicate that the concrete has sufficient strength to resist the expected loads. Remove laitance or other unsatisfactory material from the exposed concrete.

(f) Concrete railings and parapets. Use smooth, tight-fitting, rigid forms. Neatly miter corners. Place concrete railings and parapets after the falsework for the supporting span is released. Remove forms without damaging the concrete. Finish corners to be true, clean-cut, and without cracks, spalls, or other defects.

Cast precast railing members in mortar-tight forms. Remove precast members from molds as soon as the concrete has sufficient strength to be self-supporting. Protect edges and corners from chipping, cracking, and other damage. Cure according to Subsection 552.15(b). The curing period may be shortened when approved; use moist heat, Type III portland cement, or water reducing agents.

552.12 Construction Joints. Provide construction joints at locations shown in the plans. Obtain approval for additional construction joints.

Extend reinforcing steel uninterrupted through construction joints. Embed lap splices or mechanical splices within the concrete. Do not use dowels. At horizontal construction joints, place gauge strips inside the forms along exposed faces to produce straight joint lines.

When the joint is between fresh and newly hardened concrete, rough float the first placement to thoroughly consolidate the surface and leave the surface in a roughened condition. Clean the joint surface of laitance, curing compound, and other foreign material. Use an abrasive blast or other approved method to expose the aggregate on the joint surface. Re-tighten forms where the joint overlaps the first placement. Immediately before placing new concrete, flush the joint surface with water and allow it to dry to a surface dry condition.

When the joint is between existing concrete and a new placement, abrasive blast clean or use other approved methods to remove laitance and foreign material, to expose clean aggregate, and to roughen the joint surface. Before concrete placement, apply approved bonding products to the joint surface according to the manufacturer’s recommendation.
552.13 Expansion and Contraction Joints.

(a) **Open joints.** Form open joints with a wooden strip, metal plate, or other approved material. Remove the joint forming material without chipping or breaking the corners of the concrete. Do not extend reinforcement across an open joint.

(b) **Filled joints.** Cut pre-molded expansion joint filler to the shape and size of the surface being jointed. Secure the joint filler on one surface of the joint using galvanized nails or other acceptable means. Splice according to the manufacturer’s recommendations. After form removal, remove and neatly cut concrete or mortar that has sealed across the joint. Fill joint gaps \(\frac{1}{8}\) inch (3 millimeters) or wider with approved filler. Place necessary dowels, load transfer devices, and other devices as shown in the plans or as directed.

(c) **Steel joints.** Fabricate plates, angles, or other structural shapes accurately to conform to the concrete surface. Set joint opening to conform to the ambient temperature at the time of concrete placement. Securely fasten the joints to keep them in correct position. Maintain an unobstructed joint opening during concrete placement.

(d) **Compression joint seals.** Use one-piece compression joint seals for transverse joints and the longest practical length for longitudinal joints. Clean and dry joints and remove spalls and irregularities. Apply a lubricant adhesive as a covering film to both sides of the seal immediately before installation. Compress the seal and place it in the joint as recommended by the manufacturer. Make sure the seal is in full contact with the joint walls throughout its length.

Remove and discard seals that are twisted, curled, nicked or improperly formed. Remove and reinstall joint seals that elongate more than 5 percent of their original length when compressed. Remove excess lubricant-adhesive before it dries.

(e) **Elastomeric expansion joint seal.** Install the joint according to the manufacturer’s recommendations and according to the plans.

552.14 Finishing Plastic Concrete. Strike off concrete surfaces that are not placed against forms. Float finish the concrete surface. Remove laitance or thin grout. Carefully tool non-chamfered edges with an edger. Leave edges of joint filler exposed.

Protect the surface from rain damage.

Provide at least two non-sagging and non-vibrating work bridges capable of supporting the workers and equipment during placement, finishing, and curing operations. Place the work bridges at a reasonable height above the concrete surface to not impede worker performance and not touch the finished or fresh concrete surface.

(a) **Striking off and floating.** For bridge decks or top slabs of structures serving as finished pavements, use an approved power driven finishing machine equipped with a screed that oscillates in a transverse direction. Use hand-finishing methods for irregular areas when approved.

Strike off surfaces. Do not support rails within the limits of the concrete placement without approval.
Set rails or headers on non-yielding supports so the finishing equipment operates without interruption over entire surface being finished. Extend rails beyond both ends of the scheduled concrete placement a sufficient distance to enable finishing machine to finish the concrete being placed.

Set rails the entire length of continuous girder structures before placing deck concrete.

Adjust rails, headers, and strike-off equipment to the required profile and cross-section allowing for anticipated settlement, camber, and deflection of falsework.

Before beginning delivery and placement of concrete, operate the finishing machine over the entire area to be finished to check for excessive rail deflections, deck thickness, reinforcing steel cover, and to verify proper operation of equipment. Make necessary corrections before concrete placement begins.

After placing the concrete, operate finishing machine over the concrete as needed to obtain the required profile and cross-section. Keep a slight roll of excess concrete in front of the cutting edge of the screed at all times. Maintain this excess of concrete to the end of the pour or form and then remove and waste it. Adjust rails or headers as necessary to correct for unanticipated settlement or deflection.

Remove rail supports embedded in the concrete to at least 2 inches (50 millimeters) below the finished surface. Clean the voids of dust and debris using compressed air or other means. Apply approved bonding material in the voids. Fill the voids with fresh concrete of the same type and property as previously placed. Finish the surface with a float, roller or other approved device as necessary to remove local irregularities.

Remove excess water, laitance, or foreign material brought to the surface using a squeegee or straightedge drawn from the center of the slab towards either edge. Do not apply water to the surface of the concrete during finishing operations.

(b) Straightedging. Check slab and sidewalk surfaces. Check the entire surface parallel to the centerline of the bridge with a 10-foot (3-meter) metal straightedge. Overlap the straightedge at least half the length of the previous straightedge placement.

Correct deviations in excess of ⅛ inch (3 millimeters) from the testing edge of the straightedge. For deck surfaces that are to receive an overlay, correct deviations in excess of ¼ inch (6 millimeters).

(c) Texturing. Finish after floating or at a time when finishing operations will not displace aggregate. Produce a skid-resistant surface texture on driving surfaces by grooving. Use one of the following or a combination finishes for other surfaces as required.

(1) Grooved finish. Use a float having a single row of fins or an approved machine designed specifically for sawing grooves in concrete pavements. Space fins ½ to ¾ inch (13 to 20 millimeters) on centers. Make the grooves ¼ to ⅜ inch (2 to 5 millimeters) wide and ¼ to ⅜ inch (3 to 5 millimeters) deep. Groove perpendicular to the centerline without tearing the concrete surface or loosening surface aggregate.

If grooves are sawn, cut the grooves approximately ¼ inch (6 millimeters) wide at a spacing of ½ to 1 inch (13 to 25 millimeters).

On bridge decks, discontinue grooving 12 inches (300 millimeters) from curb face and provide a longitudinal troweled finish on the surface of gutters.
(2) Sidewalk finish. Strike off the surface using a strike board and then float the surface. Use an edging tool on edges and expansion joints. Broom the surface using a broom with stiff bristles, broom perpendicular to the centerline from edge to edge with adjacent strokes slightly overlapped. Produce regular corrugations not over ⅛ inch (3 millimeters) in depth without tearing the concrete. Correct porous spots, irregularities, depressions, small pockets, and rough spots while the concrete is plastic. Groove contraction joints at the required interval using an approved grooving tool.

(3) Troweled and brushed finish. Use a steel trowel to produce a slick, smooth surface free of bleed water. Brush the surface with a fine brush using parallel strokes.

(4) Exposed aggregate finish. Strike off the surface using a strike board and then float the surface. Use an edging tool on transverse and longitudinal joints that are against forms or existing pavement. Do not edge transverse joints in a continuous lane pour or longitudinal joints in a continuous dual lane pour.

Broom the surface as soon as the concrete hardens sufficiently to prevent particles of gravel from being dislodged. Use stiff brushes approved by the CO. Exercise care to prevent marring of the surface and cracking or chipping of slab edges or joints. Apply a light spray of retardant to the unfinished surface to facilitate this work if approved.

Broom transversely across the pavement. Pull the loosened semi-stiff mortar off the pavement. Remove the mortar from adjacent pavements. Then broom parallel to the pavement centerline. Continue this operation until a sufficient quantity of coarse aggregate is exposed. Other methods of aggregate exposure, such as using a water spray attachment on a special exposed aggregate broom, will be permitted if satisfactory results are demonstrated.

After curing according to Subsection 552.15(b) or (c), wash the surface with water and brush to remove laitance and cement from the exposed coarse aggregate.

(d) Surface underneath bearings. Finish bearing surfaces to within ⅛ inch (5 millimeters) of plan elevation.

When a masonry plate is to be set:

(1) Directly on the concrete or on filler material less than ⅛ inch (5 millimeters) thick; finish the surface with a float to an elevation slightly above plan elevation. Grind the surface as necessary to provide a full and even bearing after the concrete has set.

(2) On filler material between ¼ and ½ inch (6 to 13 millimeters) thick; finish the surface with a steel trowel. Finish or grind the surface so that it does not vary from a straightedge in any direction by more than ¼ inch (6 millimeters).

(3) On filler material greater than ½ inch (13 millimeters) thick or when an elastomeric bearing pad is to be used; finish the surface to a plane surface free of ridges.

When required under a masonry plate or elastomeric bearing pad, use nonshrink grout. Proprietary products may be used with approval.

(e) Surface underneath waterproofing membrane deck seal. Finish to a smooth surface, free of ridges and other projections.
552.15 Curing Concrete. Begin curing immediately after the free surface water has evaporated and the finishing is complete. If the surface of the concrete begins to dry before the selected cure method can be implemented, keep concrete surface moist using a fog spray without damaging the surface.

Keep surfaces to be rubbed moist after forms are removed. Cure immediately following the first rub.

Cure the top surfaces of bridge decks using the liquid membrane curing compound method combined with the water method. Apply liquid membrane curing compound immediately after finishing. Apply the water cure within 4 hours after finishing.

Cure concrete uninterrupted for at least 7 days. If pozzolans in excess of 10 percent by mass of the hydraulic cement is used in the mix, cure uninterrupted for at least 10 days.

(a) Forms in-place method. For formed surfaces, leave the forms in-place without loosening. If forms are removed during the curing period to facilitate rubbing, only strip forms from those areas able to be rubbed during the same shift. During rubbing, keep the surface of the exposed concrete moist. After the rubbing is complete, continue curing process using the water method for the remainder of the curing period.

(b) Water method. Keep the concrete surface continuously wet by ponding, spraying, or covering with material that is kept continuously and thoroughly wet. Covering material may consist of cotton mats, multiple layers of burlap, or other approved material that does not discolor or otherwise damage the concrete.

Cover the covering material with a waterproof sheet material that prevents moisture loss from the concrete. Use the widest sheets practical. Lap adjacent sheets at least 6 inches (150 millimeters), and tightly seal seams with pressure sensitive tape, mastic, glue, or other approved methods. Secure material so that wind does not displace it. Immediately repair sheets that are broken or damaged.

(c) Liquid membrane curing compound method. Do not use the liquid membrane method on surfaces to receive a rubbed finish. Use on construction joint surfaces is permitted only if the compound is removed by sandblasting before placement of concrete against the joint.

Only use Type 2, white-pigmented liquid membrane on the top surfaces of bridge decks or on surfaces not exposed to view in the completed work. Use Type 1-D clear curing compounds on other surfaces and on colored concrete.

Mix membrane curing solutions containing pigments before use. Continue to agitate during application. Use equipment capable of producing a fine spray. Apply the curing compound at a minimum rate of 1 gallon per 150 square feet (0.25 liters per square meter) in one or two uniform applications. If the solution is applied in 2 applications, follow the first application with the second application within 30 minutes, and apply at right angles to the first application.

Immediately apply a new coat over the damaged areas if the membrane is damaged by rain or other means during the curing period.

552.16 Finishing Formed Concrete Surfaces. Remove and replace or repair, as approved, rock pockets or honeycombed concrete. Finish sound, formed concrete surfaces as follows:
(a) **Class 1 – Ordinary surface finish.** Finish the following surfaces with a Class 1, ordinary surface finish:

(1) Under surfaces of slab spans, box girders, filled spandrel arch spans, and the roadway deck slab between superstructure girders;

(2) Inside vertical surface or T-girders of superstructures; and

(3) Surfaces to be buried and culvert surfaces above finished ground that are not visible from the traveled way or a walkway.

Begin finishing as soon as the forms are removed. Remove fins and irregular projections from surfaces that are exposed or will be waterproofed. Remove bulges and offsets with carborundum stones or discs. Remove localized, poorly-bonded rock pockets or honeycombed concrete, and replace with sound concrete or packed mortar in an approved manner.

Clean and point form tie cavities, holes, broken corners and edges, and other defects. Saturate the area with water. Finish the area with mortar that is less than 1-hour old. After the mortar is set, rub it (if required) and continue curing. Match exposed surfaces to surrounding concrete.

Carefully tool and remove free mortar and concrete from construction and expansion joints. Leave joint filler exposed for its full length with clean, true edges.

Rub or grind bearing surfaces on piers and abutments to the specified elevation and slope.

If the final finished surface is not true and uniform, rub it according to Subsection 552.16(b).

(b) **Class 2 – Rubbed finish.** Finish the following surfaces with a Class 2, rubbed finish:

(1) Surfaces of bridge superstructures, except those surfaces designated to receive a Class 1 or other finish;

(2) Surfaces of bridge piers, piles, columns and abutments, and retaining walls above finished ground and to at least 12 inches (300 millimeters) below finished ground;

(3) Surfaces of open spandrel arch rings, spandrel columns and abutment towers;

(4) Surfaces of pedestrian undercrossings, except floors and surfaces to be covered with earth;

(5) Surfaces above finished ground of culvert headwalls and endwalls when visible from the traveled way or walkway;

(6) Inside surfaces of culvert barrels higher than 48 inches (1200 millimeter) that are visible from the traveled way. Finish for a distance inside the barrel at least equal to the height of the culvert; and

(7) Surfaces of railings.

Complete a Class 1 finish according to Subsection 552.16(a). Saturate the concrete surface with water. Rub the surface with a medium coarse carborundum stone using a small quantity of mortar on its face. Use mortar composed of cement and fine sand mixed in the same proportions as the concrete being finished. Continue rubbing until form marks, projections, and irregularities are removed and a uniform surface is obtained. Leave the paste produced by this rubbing in place.
After other work which could affect the surface is complete; rub with a fine carborundum stone, and water until the entire surface has a smooth texture and uniform color. After the surface has dried; rub it with burlap to remove loose powder. Leave the surface without unsound patches, paste, powder, and objectionable marks.

(c) Class 3 – Tooled finish. Do not use mortar blocks or wires to set reinforcing steel near the formed surface of areas to receive a tooled finish. Complete a Class 1 finish according to Subsection 552.16(a). Let the concrete set for at least 14 days or longer if necessary to prevent the aggregate particles from being picked out of the surface. Use air tools (such as a bush hammer, pick, or crandall). Chip away the surface mortar, and break the aggregate particles to expose a grouping of broken aggregate particles in a matrix of mortar. Produce a tooled finish on a small test area for approval before proceeding. Adjust the work procedures to produce a satisfactory finish and use those same procedures to finish the designated area.

(d) Class 4 – Sandblasted finish. Complete a Class 1 finish according to Subsection 552.16(a). Let the concrete cure for at least 14 days. Protect adjacent surfaces that are not to be sandblasted. Sandblast a small test area for approval before proceeding. Use hard, sharp sand to produce an even fine-grained surface in which the mortar is cut away leaving the aggregate exposed. Do not remove mortar beyond one-third the diameter of the coarse aggregate.

(e) Class 5 – Wire brushed or scrubbed finish. Complete a Class 1 finish according to Subsection 552.16(a). Begin as soon as the forms are removed. Scrub the surface with stiff wire or fiber brushes using a solution of muriatic acid. Mix the solution in the proportion of 1 part acid to 4 parts water. Scrub until the cement film or surface is completely removed and the aggregate particles are exposed. Leave an evenly pebbled texture having the appearance of fine granite to coarse conglomerate depending upon the size and grading of aggregate. Wash the entire surface with water containing a small quantity of ammonia.

(f) Class 6 – Color finish. Build a sufficient number of 24- by 48-inch (600- by 1200-millimeter) concrete color sample panels to obtain a color acceptable to the CO. Protect the approved color sample panel. Color designated surfaces to match the color of the approved sample.

Complete a Class 1 finish according to Subsection 552.16(a). Do not apply the color finish until concrete placement for the structure is complete. Remove dust, foreign matter, form oil, grease, and curing compound with a 5 percent solution of trisodium phosphate and then rinse the concrete surface with clean water.

Use paper, cloth, or other means to protect surfaces not to be color finished. Apply the finish to a dry concrete surface when the surface temperature is 40 °F (4 °C) or higher and the air temperature in the shade is anticipated to be 40 °F (4 °C) or higher during the 24 hours following application.

Apply the color finish according to the manufacturer’s recommendations. Spray, brush, or roll on the first coat of penetrating sealer and color base. Spray, brush, or roll on the finish coat after the first coat has thoroughly dried. Apply finish to provide a uniform, permanent color, without runs and sags to the surfaces.

Clean concrete areas not intended to be covered by the finish using an approved method.
552.17 Concrete Anchorage Devices. Use chemical, grouted, or cast-in-place concrete anchorage devices for attaching equipment or fixtures to concrete.

Furnish the following for approval:

(a) Concrete anchorage device sample;

(b) Manufacturer’s installation instructions; and

(c) Material data and certifications.

Fabricate metal parts of the anchorage devices from stainless steel or from steel protected with a corrosion resistant metallic coating that does not react chemically with concrete. Supply anchorage devices complete with hardware.

For chemical or grouted anchors, conduct a system approval test on one anchor on the project, not to be incorporated in the work. Conduct a static load test according to ASTM E488. Demonstrate that the anchorage device can withstand a sustained direct tension test load not less than the values shown in Table 552-7 for at least 48 hours with movement not to exceed $\frac{1}{32}$ inch (1 millimeter). Also demonstrate that when loaded to failure, the anchor device demonstrates a ductile failure of the anchor steel, not a failure of the chemical, grout, or concrete.

<table>
<thead>
<tr>
<th>Anchorage Device Stud Size</th>
<th>Tension Test Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾ inch (M20)</td>
<td>5,000 lb (24 kN)</td>
</tr>
<tr>
<td>½ inch (M16)</td>
<td>4,100 lb (18.3 kN)</td>
</tr>
<tr>
<td>½ inch (M12)</td>
<td>3,200 lb (12.7 kN)</td>
</tr>
<tr>
<td>½ inch (M8)</td>
<td>2,100 lb (7.1 kN)</td>
</tr>
</tbody>
</table>

Install concrete anchorage devices as recommended by the device manufacturer and so that the attached equipment or fixtures bear firmly against the concrete. Torque installed nuts to the values specified in Table 552-8 unless otherwise specified in the manufacturer’s instructions. Set bearing anchor bolts according to the requirements of Section 564.

In the presence of the CO, proof load a random sample of at least 10 percent of the anchors to 90 percent of the yield stress of the steel. If an anchor fails, reset the failed anchor and proof load the reset anchor and 100 percent of remaining anchors. The proof load may be applied by torqueing against a load indicator washer, applying a direct tension load to the anchor, or another method approved by the CO. After proof loading, release the load on the anchor and retighten the nuts to the torque specified in Table 552-8 or according to the manufacturer’s instructions.
### Table 552-8

**Torque for Anchorage Devices**

<table>
<thead>
<tr>
<th>Anchorage Device</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stud Diameter</td>
<td>Torque</td>
</tr>
<tr>
<td>¾ inch (M20)</td>
<td>125 ft•lb (180 N•m)</td>
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<tr>
<td>⅝ inch (M16)</td>
<td>90 ft•lb (130 N•m)</td>
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<tr>
<td>½ inch (M12)</td>
<td>60 ft•lb (80 N•m)</td>
</tr>
<tr>
<td>⅜ inch (M8)</td>
<td>35 ft•lb (30 N•m)</td>
</tr>
</tbody>
</table>

### 552.18 Loads on New Concrete Structures.

Do not allow traffic on concrete bridge decks until deck concrete has attained the design compressive strength and has been in place 14 days or longer. Construction loads less than 4000 pounds (1800 kilograms) may be placed on the deck 7 days after the concrete is placed and the concrete in the entire span has attained a compressive strength of at least 70 percent of the specified design strength.

For precast concrete multi-beam sections, do not allow vehicles on any span until the grout has attained a strength of 3,000 pounds per square inch (21 megapascals) and tie rods have been tightened.

For post-tensioned concrete structures, do not allow vehicles over 4,500 pounds (2000 kilograms) on any span until the prestressing steel for that span is tensioned, grouted, and cured, the grout has obtained a strength of 3,000 pounds per square inch (21 megapascals), and the tie rods are tightened. Vehicles weighing less than 4,500 pounds (2000 kilograms) may be permitted on a span provided the mass of the vehicle was included in the falsework design.

### 552.19 Concrete Repair.

For concrete repairs, remove existing or new defective concrete according to Subsection 203.04(b) and (c). After removal of deteriorated or unsound concrete, shotblast exposed structural steel, reinforcing steel, and concrete surfaces which will be in contact with repair material until free of rust and foreign material. Clean the sound concrete surface by flushing with clean water from a high pressure water jet or compressed air. Remove and replace deteriorated reinforcing steel. Before placing repair concrete, thoroughly flushing with clean water under pressure or compressed air. If compressed air is used, provide a filter in airline to ensure that the air is oil-free. If there is an interval of more than 24 hours between cleaning of the sound concrete surfaces that have been contaminated by substances detrimental to good bonding, clean by abrasive shot blasting and pressurized water flushing or remove the concrete.

For vertical and overhead concrete repairs and those horizontal repairs to areas less than 5 inches (130 millimeters) in depth; use a non-shrink grout patching compound placed according to the manufacturer’s recommendations.

For other repairs patches greater than 5 inches (130 millimeters) in depth, apply a bonding coat of a epoxy resin adhesive to the surfaces of the sound existing concrete immediately before placing new concrete against it. Follow the manufacturer’s recommendations for the epoxy resin adhesive. Repair areas using Class A(AE) concrete.
552.20 Acceptance. See Table 552-9 for sampling, testing, and acceptance requirements and the quality characteristic category.

Material for concrete will be evaluated under Subsections 106.02 and 106.03. Furnish production certifications with each shipment cementitious material.

The 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 ($f'_c$).

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

Falsework and forms will be evaluated under Section 562.

Measurement

552.21 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.

Payment

552.22 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, except the structural concrete contract price will be adjusted according to Subsection 106.05. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Payment for structural concrete will be made at a price determined by multiplying the contract price by the compressive strength pay factor.
### Table 552-9
**Sampling, Testing, and Acceptance Requirements**

<table>
<thead>
<tr>
<th>Material or Product (Subsection)</th>
<th>Type of Acceptance (Subsection)</th>
<th>Characteristic</th>
<th>Category</th>
<th>Test Methods Specifications</th>
<th>Sampling Frequency</th>
<th>Point of Sampling</th>
<th>Split Sample</th>
<th>Reporting Time</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aggregate (703.02)</td>
<td>Measured and tested for conformance (106.04 &amp; 105)</td>
<td>Quality</td>
<td>–</td>
<td>Subsection 703.01 &amp; 703.02</td>
<td>1 per material type</td>
<td>Source of material</td>
<td>Yes</td>
<td>Before producing</td>
<td>–</td>
</tr>
<tr>
<td><strong>Mix Design</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete composition</td>
<td>&quot;</td>
<td>All</td>
<td>–</td>
<td>Subsection 552.03</td>
<td>1 per mix design</td>
<td>&quot;</td>
<td>If requested</td>
<td>&quot;</td>
<td>–</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Produced aggregate (fine &amp; coarse)</td>
<td>Measured and tested for conformance (106.04)</td>
<td>Gradation</td>
<td>–</td>
<td>AASHTO T 27 &amp; T 11</td>
<td>1 per day</td>
<td>Flowing aggregate stream (bin, belt, discharge conveyor belt, or stockpile)</td>
<td>Yes</td>
<td>Before batching</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fineness modulus</td>
<td>–</td>
<td>AASHTO T 27</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moisture test</td>
<td>–</td>
<td>AASHTO T 255</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
<td>–</td>
</tr>
</tbody>
</table>

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### Table 552-9 (continued)
**Sampling, Testing, and Acceptance Requirements**

<table>
<thead>
<tr>
<th>Material or Product (Subsection)</th>
<th>Type of Acceptance (Subsection)</th>
<th>Characteristic</th>
<th>Category</th>
<th>Test Methods Specifications</th>
<th>Sampling Frequency</th>
<th>Point of Sampling</th>
<th>Split Sample</th>
<th>Reporting Time</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (552.09(b))(^{(1)})</td>
<td>Measured and tested for conformance (106.04)</td>
<td>Density</td>
<td>–</td>
<td>AASHTO T 121</td>
<td>1 per load after at least 0.25 yd(^3) (0.2 m(^3)) is discharged(^{(4)})</td>
<td>Point of discharge</td>
<td>No</td>
<td>Upon completing tests</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Air content</td>
<td>–</td>
<td>AASHTO T 152 or AASHTO T 196</td>
<td>&quot;</td>
<td>&quot;</td>
<td>No</td>
<td>&quot;</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Slump</td>
<td>–</td>
<td>AASHTO T 119</td>
<td>&quot;</td>
<td>&quot;</td>
<td>No</td>
<td>&quot;</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temperature</td>
<td>–</td>
<td>ASTM C1064</td>
<td>&quot;</td>
<td>&quot;</td>
<td>No</td>
<td>&quot;</td>
<td>–</td>
</tr>
<tr>
<td>Concrete (552.09(b))(^{(1)})</td>
<td>Statistical (106.05)</td>
<td>Compressive strength(^{(2)(3)}) (28-day)</td>
<td>II</td>
<td>AASHTO T 23 &amp; T 22</td>
<td>1 set per 30 yd(^3) (25 m(^3)), but not less than 1 per day and not less than 5 sets total</td>
<td>Discharge stream at point of placing</td>
<td>Yes</td>
<td>28 days</td>
<td>Deliver verification cylinders to the CO or designated laboratory for scheduled testing</td>
</tr>
</tbody>
</table>

(1) Sample according to AASHTO R 60, except composite samples are not required.
(2) Cast at least four compressive strength test cylinders for 6- by 12-inch (150- by 300-millimeter) specimens or six compressive strength cylinders for 4- by 8-inch (100- by 200-millimeter) and carefully transport the cylinders to the job site curing facility.
(3) A single compressive strength test result is the average result from two 6- by 12-inch (150- by 300-millimeter) or three 4- by 8-inch (100- by 200-millimeter) cylinders cast from the same load.
(4) If three successive samples are tested and compliance to the specifications is indicated, screening tests may be reduced to an approved frequency. Resume initial testing frequency if a test shows a failing temperature, air content, slump, or when directed.
(5) If the point of placement is different from the point of discharge, correlate the discharge tests with the placement tests to document the changes.
Section 554. — REINFORCING STEEL

Description

554.01 This work consists of furnishing and placing reinforcing steel.

Material

554.02 Conform to the following Subsection:

Reinforcing steel

| 709.01 |

Construction Requirements

554.03 Order Lists. On reinforcing steel order lists, use the same respective bar marks for labeling as shown in the plans. Submit order lists and bending diagrams for approval. Approval does not relieve the Contractor of responsibility for the accuracy of the lists and diagrams. Do not order material until the lists and diagrams are accepted.

Do not fabricate vertical reinforcement in columns, walls, piers, and shafts until footing elevations are established in the field.

554.04 Identification. Ship bar reinforcement in standard bundles, tagged and marked according to CRSI, Manual of Standard Practice.

554.05 Bending. Fabricate reinforcing bars according to ACI SP-66, ACI Detailing Manual. Cold bend reinforcing bars that require bending. Limit the overall height or drop bending tolerance of deck truss bars to plus 0 inch (0 millimeter) or minus ¼ inch (6 millimeters). Do not bend bars partially embedded in concrete, except as shown in the plans or otherwise permitted.

Provide standard hooks conforming to ACI SP-66.

554.06 Protection of Material. Store reinforcing steel above the ground on platforms, skids, or other supports. Protect from physical damage, rust, and other surface deterioration.

Use reinforcing steel only when the surface is clean and the minimum dimensions, cross-sectional area, and tensile properties conform to the physical requirements for the size and grade of steel specified.

Do not use reinforcing steel that is cracked, laminated, or is covered with dirt, rust, loose scale, paint, grease, oil, or other deleterious material.

554.07 Epoxy-Coated Reinforcing Steel. Support coated bars on padded contact areas. Pad bundled bands. Lift with a strong back, multiple supports, or a platform bridge. Prevent bar-to-bar abrasion. Do not drop or drag bundles.

Before placement, inspect bars for coating damage. Replace and do not use bars with a total damaged area in any 12-inch (300-millimeter) length that exceeds 5 percent of the surface area of that length of the bar.
Clean other damaged coatings by removing surface contaminants and the damaged coating. Roughen the area around the damage and remove rust by blast cleaning or power tool cleaning. Use a prequalified ASTM A775 patching/repair material to patch defects in the coating that are discernible to the unaided eye. Overlap the patching material onto the original coating for 2 inches (50 millimeters) or as recommended by the manufacturer. Provide a minimum 8 mil (200-micrometer) dry film thickness on the patched areas.

Take necessary steps to minimize damage to the coating of installed bars. Clean and patch damage to coatings noted after installation as described above. Promptly treat the bar according to the resin manufacturer’s recommendations and before detrimental oxidation occurs.

Coat mechanical splices after splice installation according to ASTM A775 for patching damaged epoxy coatings.

554.08 Placing and Fastening. Place, fasten, and support the bars according to the CRSI, Manual of Standard Practice. Coat chairs, tie wires, and other devices used to support, position, or fasten epoxy-coated reinforcement with a dielectric material.

Use precast concrete blocks or metal supports. Attach concrete block supports to the supported bar with wire cast in the center of each block. Use Class 1 (plastic protected) or Class 2, Type B (stainless steel protected) metal supports in contact with exposed concrete surfaces. Use stainless steel conforming to ASTM A493, Type 430.

Space slab bar supports no more than 48 inches (1200 millimeters) apart transversely or longitudinally. Do not use bar supports either directly or indirectly to support runways for concrete buggies or other similar construction loads. Replace damaged supports.

Place bars within 1½ inches (38 millimeters) of the plan location. Do not cumulate spacing variations. Do not allow the average of any two adjacent spaces to exceed the required spacing. Place reinforcing steel in deck slabs within ¼ inch (6 millimeters) of the vertical plan location. Using a template, check the clear cover over deck reinforcing steel before placing deck concrete.

Provide 2 inches (50 millimeters) clear cover for reinforcement. The tolerance on minimum concrete cover is minus ⅜ inch (10 millimeters). For concrete surfaces cast against the ground provide a minimum 3 inches (75 millimeters) of clear cover over reinforcement.

Tie reinforcing at intersections around the perimeter of each mat and at not more than 24-inch (600-millimeter) centers or at every intersection, whichever is greater. Tie bridge deck reinforcing bars at not more than 12 inch (300 millimeter) or every intersection, whichever is greater.

Tie bundle bars together at intervals not exceeding 6 feet (1.8 meters). Do not bundle bars unless the location and splice details are specified.

Do not place concrete in members until the reinforcing steel placement is approved.

554.09 Splices. Splicing, except as shown in the plans, is not permitted without approval. Provide lap lengths shown in the plans. Splice reinforcing bars only where shown in the plans or accepted drawings.

Make lapped splices by placing the reinforcing bars in contact and wiring them together so as to maintain the alignment and position of the bars.
If welding of reinforcing steel is permitted, use welders with current certifications and make the welds conform to AWS, *Structural Welding Code - Reinforcing Steel, D1.4 (D1.4M)*. Do not weld reinforcing steel if the chemical composition of the steel exceeds the percentages in Table 554-1.

<table>
<thead>
<tr>
<th>Chemical Composition</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon (C)</td>
<td>0.30</td>
</tr>
<tr>
<td>Manganese (MA)</td>
<td>1.50</td>
</tr>
<tr>
<td>Carbon Equivalent (C.E.)</td>
<td>0.55</td>
</tr>
</tbody>
</table>

Mechanical couplers may be used instead of welding if approved. Use couplers with a strength that is at least 125 percent of the required yield strength of the reinforcing steel. Do not exceed 0.01 inches (0.25 millimeters) total slip of the reinforcing bar within the splice sleeve when loading in tension to 30.0 kips per square inch (207 megapascals) and relaxing to 3.0 kips per square inch (20 megapascals) for bar sizes up to No. 14 (No. 43) as measured between gage points clear of the splice sleeve.

If welded wire fabric is shipped in rolls, straighten into flat sheets before placing. Splice sheets of mesh or bar mat reinforcement by overlapping not less than 1-mesh width plus 2 inches (50 millimeters). Securely fasten at the ends and edges.

**554.10 Acceptance.** Reinforcing steel and epoxy coating material will be evaluated under Subsections 106.02 and 106.03. Furnish a production certification with each shipment of reinforcing steel.

Placement of reinforcing steel will be evaluated under Subsections 106.02 and 106.04.

**Measurement**

**554.11** Measure the Section 554 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

Measure reinforcing steel excluding laps added for the Contractor's convenience.

**Payment**

**554.12** The accepted quantities will be paid at the contract price per unit of measurement for the Section 554 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.
Section 564. — BEARING DEVICES

Description

564.01 This work consists of furnishing and installing bridge bearings.

Bearing devices are designated as elastomeric, rocker, roller, and sliding plate.

Material

564.02 Conform to the following Section and Subsections:

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Section/Subsection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearings (elastomeric, plain or laminated)</td>
<td>717.10(a)</td>
</tr>
<tr>
<td>Bolts and nuts (threaded anchor bolts)</td>
<td>717.01(d)</td>
</tr>
<tr>
<td>Galvanized coatings</td>
<td>717.07</td>
</tr>
<tr>
<td>Nonshrink grout</td>
<td>725.13(b)</td>
</tr>
<tr>
<td>Polytetrafluoroethylene (PTFE) surfaces for bearings</td>
<td>717.11</td>
</tr>
<tr>
<td>Steel Structures (rocker, roller, and sliding bearings)</td>
<td>555</td>
</tr>
</tbody>
</table>

Construction Requirements

564.03 General.

(a) Drawings. Submit drawings according to Subsection 104.03 and Section 18 of the AASHTO, Load and Resistance Factor Design (LRFD) Bridge Construction Specification. Show details of bearings including material proposed for use. Do not begin fabrication until drawings are approved by the CO.

(b) Fabrication. Fabricate bearings according to Section 18 of AASHTO, LRFD Bridge Construction Specification. Finish bearing components surfaces in contact with each other or with concrete, but not embedded in concrete according to Subsection 555.07(e).

Preassemble bearing assemblies and check for proper completeness and geometry. Galvanize steel bearing components and anchor bolts. Do not galvanize stainless steel bearing components or anchor bolts.

(c) Packaging, handling, and storing material. Clearly identify each bearing component and mark on its top the location and orientation in the structure before shipping. Securely bolt, strap, or otherwise fasten bearings to prevent relative movement.

Package bearings to prevent damage during shipping, handling or storing.

Do not dismantle bearing assemblies on-site unless necessary for inspection or installation. Dismantle under the direct supervision or with the approval of the manufacturer.

Furnish a listing of all individual bearing numbers.

Store bearing devices to prevent damage from weather or other hazards.
Section 564

(d) Construction and installation. Clean bearings of deleterious material. Install and set bearings to the dimensions shown on the drawings or prescribed by the manufacturer. Adjust bearings according to the manufacturer’s instructions to compensate for installation temperature and future movements.

Set bearings level, at the elevation, and position shown on the drawings. Provide full and even bearing on all external bearing contact surfaces. Notify the CO if bearing surfaces are at improper elevations, not level, or if bearings cannot be set properly. Submit a written proposal to modify the installation for approval.

Bed metallic bearing assemblies on concrete with an approved filler or fabric material when not embedded in concrete.

Set elastomeric bearing pads directly on properly prepared concrete surfaces without bedding material.

Machine bearing surfaces seated directly on steel to provide a level and planar bearing surface.

564.04 Elastomeric Bearings. Fabricate, comply with testing and acceptance criteria, and mark elastomeric bearings according to AASHTO M 251. Test and accept bearings specified by hardness and designed according to Method A of AASHTO, Load and Resistance Factor Design (LRFD) Bridge Design Specifications according to Appendix X1 of AASHTO M 251 instead of Section 8 full size bearing test.

Place bearings on a level surface. Correct misalignments in the support to form a level surface. Do not weld steel girders or base plates to the exterior plates of the bearing unless there is more than 1½ inches (38 millimeters) of steel between the weld and elastomer. Do not expose the elastomer or elastomer bond to instantaneous temperatures greater than 400 °F (200 °C).

564.05 Rocker, Roller, and Sliding Plate Bearings. Fabricate and finish rocker, roller, and sliding plate bearings according to Section 555. Remove burrs, rough and sharp edges, and other flaws. Stress relieve rocker, roller, and other bearings that are built up by welding sections of plate together before boring, straightening, or final machining.

Thoroughly coat contact surfaces with oil and graphite before placing roller bearings. Install rocker, roller, and sliding bearings vertically at the specified mean temperature after release of falsework and after shortening due to prestressing forces. Account for variations from mean temperature of the supported span at time of installation and other anticipated changes in length of the supported span.

Ensure the superstructure has full and free movement at movable bearings. Position cylindrical bearings so their axes of rotation align and coincide with the axis of rotation of the superstructure.

564.06 Masonry, Sole, and Shim Plates for Bearings. Provide metal plates conforming to AASHTO M 270, Grade 36 (250).

Fabricate and finish steel according to Section 555. Form holes in bearing plates by drilling, punching, or controlled oxygen cutting. Remove burrs by grinding.

Set bearing plates in a level position and provide a uniform bearing over the bearing contact area. When plates are embedded in concrete, make provisions to keep them in correct position as the concrete is placed.
564.07 Polytetrafluoroethylene (PTFE) Surfaces for Bearings. Furnish PTFE material that is factory-bonded, mechanically connected, or recessed into the backup material.

Bond or mechanically attach the fabric containing PTFE fibers to a rigid substrate. Use a fabric capable of carrying unit loads of 10,000 pounds per square inch (70 megapascals) without cold flow. Use a fabric-substrate bond capable of withstanding, a shear force equal to 10 percent of the perpendicular or normal application loading plus other bearing shear forces without delamination.

Use approved test methods and procedures according to Section 18 of AASHTO, LRFD Bridge Construction Specification. Perform at least one material test on the material used in the sliding surface for each lot of bearings. If required by the contract, test complete bearings for complete bearing friction. If the test facility does not permit testing of completed bearings; manufacture extra bearings and prepare samples of at least 100-kip (450-kilonewton) capacity at normal working stresses by sectioning the bearing.

Measure the coefficient of friction between two mating surfaces. Provide test results showing the static and dynamic coefficients of friction meet the requirements for the design coefficient of friction specified in the contract or by the manufacturer for approved material.

564.08 Anchor Bolts. Furnish threaded anchor bolts.

Adjust bolt locations for superstructure temperature and anticipated lengthening of bottom chord or bottom flange due to dead load after setting as required. Do not restrict free movement of the superstructure at movable bearings.

Preset anchor bolts before concrete placement or install anchor bolts in drilled holes after concrete placement. Drill holes 1 inch (25 millimeters) in diameter greater than the bolt if nonshrink cement grout is used to secure the bolts. Follow adhesive manufacturer’s recommendations for hole-diameter if an approved chemical adhesive is used to secure the bolts.

564.09 Bedding of Masonry Plates. Clean the contact surfaces of the concrete and steel before placing the bedding material and installing bearings or masonry plates. If bedding is specified, place filler or fabric as bedding material under masonry plates and install it to provide full bearing on contact areas. If bedding material is not specified, comply with Subsection 18.10.2 of AASHTO, LRFD Bridge Construction Specifications as directed by the CO.

564.10 Acceptance. Bearing devices will be evaluated under Subsections 106.02 and 106.03. Submit a production certification with each shipment of bearing devices.

Bearing device installation will be evaluated under Subsections 106.02 and 106.04.

Measurement

564.11 Measure the Section 564 pay items listed in the bid schedule according to Subsection 109.02.

Payment

564.12 The accepted quantities will be paid at the contract price per unit of measurement for the Section 564 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.
Section 571. — PREFABRICATED BRIDGES

Description

571.01 This work consists of designing, fabricating, delivering, and installing a prefabricated modular bridge superstructures, or transporting and installing Government-furnished prefabricated, modular superstructures and components. The work also includes constructing caps, bearings, and abutments including excavation and backfill and anchoring bridge superstructures to abutments as required.

Materials

571.02 Requirements. Furnish materials that meet the requirements specified in the following sections:

- Bridge Railing 556
- Structural Metal 717
- Prestressed Concrete 553
- Reinforcing Steel 554
- Steel Structures 555
- Structural Concrete 552
- Timber Structures 557
- Material for Timber Structures 716

Concrete compressive strength, structural steel tensile strength, finish and designation, timber species, grade, and treatment, and other material specifications shall be as required or if not listed in the contract documents, take them from the manufacturer’s drawings, and have them approved by the CO prior to fabrication.

Construction Requirements

571.03 Design Requirements. For required loadings use the most recent AASHTO “Standard Specifications for Highway Bridges”.

When design of the structure is required, submit plans and calculations signed by a professional engineer registered in the state where the bridge will initially be located or in the state where the fabricator’s offices are located.

Use durable materials to allow removal, transportation, and re-installation without using specialized construction equipment. When required, design bridges to allow transportation by air or pack animals and complete construction by manual labor. Use design techniques and fabrication methods to minimize field installation difficulties. Fabricate primary components from steel.
Rig main superstructure components with permanent lifting devices to facilitate efficient installation and removal of these items. Place lifting devices so as not to interfere with traffic.

571.04 Design Drawings. When furnishing a prefabricated bridge superstructure, submit design drawings, calculations, or shop drawings at least 21 days in advance of the start of fabrication to allow time for review and correction of any changes and approval by the CO. Include plan, elevation, and section views of the modular bridge superstructure, dimensions of all components, welding and connection details, and general and specific notes regarding design and construction.

When Government-furnished prefabricated bridge superstructure components are specified, material lists, installation information, and manufacturer’s instructions will be furnished by the Government.

571.05 General. Perform excavation, backfill, and embankment work under Sections 204 and 209.

Dispose of all debris resulting from operations in accordance with Section 203.

571.06 Performance. Notify the CO at least before delivering the bridge.

If the prefabricated superstructure is not installed immediately upon delivery to the project site, provide appropriate equipment and labor to unload and stack, support, and store all material at the delivery point. Support and stack all components to prevent damage. Furnish and install blocking to support all components at least 12 inches above the ground.

Furnish all tools, devices, special equipment, and material needed for installation in well-marked watertight containers suitable for long-term, outdoor storage.

571.07 Abutments and Approaches. Construct required caps, bearing, and abutments according to Division 500. Construct approaches including excavation and backfill according to sections 204 and 209.

571.08 Contractor-Furnished Prefabricated Bridge Superstructure. Furnish the following items for approval prior to delivery of the bridge component:

(a) Supplier or inspection agency certification of wood species and grade of all timber and a conformance certificate for all sawn and glued laminated members.

(b) Certification by an approved inspection and testing agency of wood treatment, listing method of treatment, type of preservative, retention, and penetration. Supplier certification is permitted if each piece is stamped or branded with a legible American Wood Preservers Bureau quality mark.

(c) Certification of structural steel, fasteners, and hardware.

(d) Certification of galvanizing process used.

(e) Steel fabricator certification that steel fabrication and quality control meet the requirements of the AISC Code of Standard Practice; and that all welding meets the requirements of ANSI/AASHTO/AWS D 1.5 Bridge Welding Code.

(f) A complete list of all bridge components, hardware, and fasteners.
(g) Complete instructions and drawings. Provide drawings that are black line, of reproducible quality, on ANSI sheet size D (24 inches by 36 inches). Furnish the same information in an approved electronic format.

Mark each major component of the bridge superstructure with the same permanent serial number in a location that is clearly visible, both when stacked in storage and erected at the site.

Assemble bridge superstructure prior to delivery to assure proper fit-up of all components. Notify the CO of the assembly 2 weeks before assembly.

571.09 Government-Furnished Prefabricated Bridge Superstructure. For Government-furnished prefabricated bridge units, transport all material from the storage site(s) to the bridge site, and install the superstructure complete and in place, including connection of all girders, diaphragms, railings, panels, transoms, and other elements.

Upon taking possession of the Government-furnished units at the storage site, assume liability for damage resulting from handling, transporting, or erecting the units in place, until final acceptance of the project.

571.10 Non-pressure Epoxy Grout Anchors. Furnish non-pressure epoxy grout to cement anchor dowels and bolts. At least 15 days prior to use submit for approval manufacture’s test information on the non-pressure epoxy grout proposed for use.

Immediately prior to placing dowels or bolts, clean drill hole of dust and other material. Fill hole halfway with grout. Insert dowels by rotating it though one complete turn while tapping it down. Insert bolts according to manufacture’s instructions. If necessary add more grout to fill the hole.

571.11 Acceptance. Furnish a production certification for timber, including glued-laminated lumber, structural steel, and fabricated steel. Furnish a certification for all wood treatment, fasteners, hardware, galvanizing processes, and non-pressure epoxy grout.

Measurement

571.12 Measure the Section 571 items listed in the bid schedule according to Subsection 109.02.

Payment

571.13 The accepted quantities, measured as provided in Subsection 109.02 and above, will be paid at the contract price per unit of measurement for the Section 571 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.
DIVISION 600
INCIDENTAL CONSTRUCTION
Section 635. — TEMPORARY TRAFFIC CONTROL

Description

635.01 This work consists of furnishing, installing, maintaining, relocating, and removing temporary traffic control devices and services as ordered for the control and protection of public traffic through the project.

Advance warning arrow board, barricade, and warning light types are designated in the MUTCD.

Material

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

| Concrete barrier (temporary) | 618 |
| Delineator and object marker retroreflectors | 718.08(b) |
| Guardrail (temporary) | 617 |
| Retroreflective sheeting | 718.01 |
| Sign panels | 633.05 |
| Sign posts | 633.04 |
| Temporary plastic fence | 710.11 |
| Temporary pavement markings | 718.16 |

Construction Requirements

635.03 Qualifications. Provide flaggers certified by ATSSA, the National Safety Council, a state department of transportation, or other acceptable organization. Use pilot car operators conforming to the qualifications of a flagger.

635.04 General. Furnish, install, and maintain temporary traffic control devices adjacent to and within the project as required by the MUTCD, traffic control plan, and Section 156. Install and maintain traffic control devices as follows:

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

(b) Install only those traffic control devices needed for each stage or phase;

(c) Relocate temporary traffic control devices as necessary;

(d) Remove devices that no longer apply to the existing conditions;

(e) Immediately replace devices that are lost, stolen, destroyed, or inoperative;

(f) Keep temporary traffic control devices clean;

(g) Furnish and maintain traffic control devices that meet the "acceptable" standard described in ATSSA, Quality Standards for Work Zone Traffic Control Devices. Amend the ATSSA standards as follows:
Section 635

(1) Repair or remove and replace "marginal" devices within 48 hours; and
(2) Repair or remove and replace "unacceptable" devices immediately;
(h) Remove temporary traffic control devices upon contract completion or when approved; and
(i) Furnish crashworthy temporary traffic control devices.

635.05 Barricades. Use barricades of the type and size specified or according to the MUTCD. Use Type III, IV, IX, or XI retroreflective sheeting.

635.06 Cones and Tubular Markers. Use cones or tubular markers of the height specified or according to the MUTCD. Use Type III or Type VI retroreflective sheeting.

635.07 Construction Signs. Use Type III, IV, VIII, IX, or XI prismatic retroreflective sheeting. Use fluorescent sheeting for orange signs. For roll-up signs, use fluorescent Type VI retroreflective sheeting.

Install posts according to Section 633. Portable sign supports may be used instead of sign posts when approved by the CO.

Remove or completely cover unnecessary signs. Use metal, plywood, or other acceptable material to cover signs. Do not use adhesives, glues, tapes, or mechanical fasteners that mar the face of the panel of the sign to be covered.

635.08 Drums. Use plastic drums that are at least 36 inches (900 millimeters) high and at least 18 inches (450 millimeters) in diameter. Use Type III or Type VI retroreflective sheeting.

635.09 Flaggers. Use flaggers certified according to Subsection 635.03. Use Type III, IV, VIII, IX, or XI retroreflective sheeting on flagger paddles. Do not use flags.

635.10 Pilot Cars. Use pilot car operators certified according to Subsection 635.03. Mount a "PILOT CAR FOLLOW ME" sign on the rear and a high-intensity, rotating, flashing, oscillating, or strobe light on the roof of the pilot car.

635.11 Temporary Barriers. Use temporary barriers that are crashworthy and are new or used provided they are not badly damaged. Lifting holes no larger than 4 inches (100 millimeters) or lifting loops are permitted.

Mount white or yellow retroreflectors as applicable, to the top or side of the barrier on 25-foot (8-meter) centers. Mount the retroreflectors at a uniform height at least 24 inches (600 millimeters) above the road surface. Flexible barrier delineators or barrier delineation tape may be used instead of retroreflectors when approved by the CO.

635.12 Temporary Guardrail. Construct temporary guardrail according to Section 617.

Mount white or yellow retroreflectors as applicable, to the top or side of the guardrail on 25-foot (8-meter) centers. Mount the retroreflectors at a uniform height at least 24 inches (600 millimeters) above the road surface.

635.13 Temporary Pavement Markings and Delineation. Before opening a pavement surface to traffic, remove conflicting pavement markings by sandblasting or other methods that do not damage the surface or
texture of the pavement. Make the removal pattern uneven to not perpetuate the outline of the removed pavement markings. Lightly coat sandblasted or removal areas on asphalt surfaces with emulsified asphalt.

Place and maintain temporary pavement markings that are neat, crack free, true, straight, and unbroken.

If temporary signs and pavement markers are substituted for temporary pavement markings, install temporary signs and pavement markers according to the MUTCD and plans.

For temporary pavement markings, use preformed retroreflective tape, traffic paint, or pavement markers as follows:

(a) **Preformed retroreflective tape.** Apply according to the manufacturer’s instructions. Remove loose preformed retroreflective tape before placing additional pavement layers.

(b) **Pavement markers.** Do not use pavement markers during seasonal suspensions. When chip seals, slurry seals, or tack coats are used after marker placement, protect the markers with an approved protective cover, and remove it after the asphalt material is sprayed.

(c) **Traffic paint.** Do not apply traffic paint to the final surface. Apply traffic paint as the temporary pavement marking if no work will be performed on the project for at least 30 consecutive days. Apply traffic paint at a 15 mil (0.38-millimeter) minimum wet film thickness or at a rate of 107 square feet per gallon (2.6 square meters per liter). Immediately apply Type 1 glass beads on the paint at a minimum rate of 6 pounds per gallon (0.7 kilograms per liter) of paint.

Remove temporary pavement markers before placing additional pavement layers or permanent pavement markings. Remove temporary markings after 14 days and apply permanent pavement markings unless approved by the CO.

635.14 **Vertical Panels.** Use vertical panels that are at least 24 inches (600 millimeters) in height and 8 to 12 inches (200 to 300 millimeters) wide. Use Type III, IV, VIII, IX, or XI retroreflective sheeting.

635.15 **Warning Lights.** Use warning lights of the types shown in the plans or according to the MUTCD. Install warning lights with a minimum mounting height of 30 inches (750 millimeter) to the bottom of the lens. Secure lights to the top of the traffic control device they are supplementing. Use batteries recommended by the light manufacturer. Mount large batteries below windshield height and preferably on the ground. Replace batteries when they no longer provide satisfactory performance.

Use Type C steady-burn warning lights for delineation on barricades or drums. Use Type A low-intensity flashing warning lights on the first 2 barricades or drums in the merging or shifting taper series. Use Type B high-intensity flashing warning lights on the first two advance warning signs. Type A and Type C warning lights are intended to warn road users during nighttime hours, while Type B warning lights are intended to warn road users during both daylight and nighttime hours.

635.16 **Shadow Vehicle.** Use a 19,800 pound (9000-kilogram) ± 990 pound (±450 kilogram) shadow vehicle equipped with a truck-mounted attenuator (crash cushion) attached to the rear of the vehicle, exterior flashing yellow dome light, and an arrow board.

Use the shadow vehicle to provide physical protection to workers from traffic approaching from the rear during moving operations.
Use the following procedures to close a lane of traffic:

(a) Move the shadow vehicle to a point approximately 200 feet (60 meters) from the first advance warning sign for the lane closure and stop on the shoulder;

(b) Activate the flashing lights and flashing arrow board. Begin the arrow board in the caution mode and after approximately 2 minutes display the correct flashing pass arrow;

(c) Move the shadow vehicle (now acting as a protection vehicle) along the shoulder to the first sign location, stopping approximately 100 feet (30 meters) before the sign location in a blocking position;

(d) Place the first sign then proceed to the next advance sign location. Repeat step (c) for the second sign and install that sign. Repeat this procedure until advance warning signs are installed;

(e) After installing the advanced warning signs for the lane closure, move the shadow vehicle into the lane that is to be closed to a position 100 feet (30 meters) before the closing taper location. Install the channelizing devices for the taper in the shielded lane; then

(f) Move the shadow vehicle off the roadway and past the taper on the shoulder and remain in position until the flashing arrow board for the closure (if one is to be provided) is placed and operating. Move the shadow vehicle with the workers as they proceed to set up the remaining devices as additional protection.

Alternate lane closure procedures may be used if approved by the CO.

635.17 Pavement Patch. Use an asphalt mix according to Section 403 or commercial available cold asphalt mix to repair potholes and rough spots in the traveled way before reopening travel lanes to traffic. If cold asphalt mix is used, remove and replace with hot asphalt mix before placing succeeding hot asphalt lifts.

635.18 Temporary Crash Cushions. Use a crashworthy temporary crash cushion according to manufacturer’s recommendations.

635.19 Temporary Signal System. Use a temporary signal system according to MUTCD Parts 4 and 6.

Provide the names and telephone numbers of at least two emergency contacts who can be reached 24 hours a day, and who are available to arrive on site within 4 hours of notification to repair or replace malfunctioning temporary signal equipment. In addition, provide for emergency flaggers who can be reached 24 hours a day, and who are available to perform traffic control operations within the timeframes specified below until the temporary signal system is operable.

If the traffic signal malfunctions during construction operations, immediately begin traffic control operations using flaggers until the system is returned to normal signal operation. Complete traffic signal repairs within 6 hours of the malfunction.

If the traffic signal malfunctions during a period when no construction activity is taking place, begin traffic control operations using flaggers as soon as possible, but no later than 2 hours after the initial notification. Continue temporary flagging operations until the system is returned to normal signal operation. Complete traffic signal repairs within 12 hours of notification.
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No payment will be made for the use of flaggers in place of a malfunctioning or inoperable temporary signal system.

635.20 Temporary Fence. Use temporary fence according to Section 619.

635.21 Temporary Rumble Strip. Use transverse or longitudinal rumble strips according to the MUTCD Part 6 to alert drivers of an approaching flagger station or work area.

635.22 Steel Plates. Use 1-inch (25-millimeter) or thicker steel plates capable of safely carrying traffic. Secure the plates to the pavement to prevent movement.

635.23 Acceptance. Material for temporary traffic control devices will be evaluated under Subsections 106.02 and 106.03.

Vehicles for pilot cars and shadow vehicles will be evaluated under Subsections 106.02 and 106.04.

Placement of temporary traffic control devices will be evaluated under Subsections 106.02 and 106.04.

Temporary traffic control services will be evaluated under Subsections 106.02 and 106.04.

Measurement

635.24 Measure the Section 635 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable when ordered by the CO and installed.

When measuring temporary traffic control pay items, measure only one time even if relocated or replaced, except for pay items paid by the hour.

Measure barricades by the linear foot (meter) of width.

When measuring construction signs by the square foot (square meter), measure front face sign panel. Do not measure posts and temporary supports.

When there is a pay item for moving temporary barriers, do not measure movement of temporary barriers for work access or the convenience of the Contractor.

When measuring temporary pavement markings, measure only one application of pavement markings per lift. When temporary pavement markings are measured by the linear foot or mile (meter or kilometer), measure the number of linear feet or miles (meters or kilometers) of lines applied along the centerline of each 4-inch (100-millimeter) wide line applied regardless of color. Measure solid lines from end to end of each continuous line. Measure broken lines from end to end including gaps. For line widths greater than 4 inches 100 millimeters), adjust the measured length of line in the ratio of the required width to 4 inches (100 millimeters). When temporary pavement markings are measured by the square foot (square meter), measure the number of square feet (square meters) of symbols or letter markings based on the marking area shown in the plans or, if not shown, the area of each marking measured in place to the nearest square foot (square meter).

When measuring temporary pavement markers, measure only one application of pavement markings per lift, even if replaced. Measure temporary pavement markers used at the option of the Contractor instead of temporary pavement markings as equivalent temporary pavement markings and not as temporary pavement markers.
When measuring pavement marking removal, measure the actual line removed. Do not measure gaps.

When measuring temporary crash cushions, measure each entire crash cushion configuration.

When there is a pay item for moving temporary crash cushion, do not measure movement of temporary crash cushion for work access or the convenience of the Contractor.

Measure replacement barrels or cartridges for crash cushions for the barrels or cartridges damaged by public traffic.

**Payment**

635.25 The accepted quantities will be paid at the contract price per unit of measurement for the Section 635 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Progress payments for temporary traffic control devices will be paid as follows:

(a) 50 percent of the pay item amount will be paid upon installation.

(b) An additional 25 percent of the pay item amount will be paid following completion of 50 percent of the contract amount.

(c) Payment of the remaining portion of the pay item amount will be paid when the temporary traffic control devices are removed from the project.

Progress payments for pay items paid for by the hour will be paid at 100 percent of the pay item amount when ordered by the CO and furnished.
1. **Fire Period and Closed Season**

Specific fire prevention measures are listed below and shall be effective for the period April 1 to October 31 of each year. The Forest Service may change the dates of said period by advance written notice if justified by unusual weather or other conditions. Required tools and equipment shall be kept currently in serviceable condition and immediately available for initial attack on fires.

2. **Fire Plan**

Before starting any operations on the project, the Contractor shall prepare a fire plan in cooperation with the National Forest Foundation (NFF) and the Forest Service providing for the prevention and control of fires in the project area.

The Contractor shall certify with the NFF compliance with fire protection and suppression requirements before beginning operations during the fire period and closed season, and shall update such certification when operations change.

3. **Substitute Measures**

The Forest Service via the NFF may by written notice authorize substitute measures or equipment or may waive specific requirements during periods of low fire danger.

4. **Emergency Measures**

The Forest Service may require emergency measures, including the necessary shutting down of equipment or portions of operations in the project area during periods of fire emergency created by hazardous climatic conditions.

5. **Fire Control**

The Contractor shall, independently and in cooperation with the Forest Service, take all reasonable action to prevent and suppress fires in the project area. Independent initial action shall be prompt and shall include the use of all personnel and equipment available in the project area.

6. **Compliance with State Forest Laws**

Listing of specific fire precautionary measures herein is not intended to relieve the Contractor in any way from compliance with the State Fire Laws covering fire prevention and suppression equipment, applicable to operations under this contract.

7. **Fire Precautions**

Specific fire precautionary measures are as follows:
Appendix C – Fire Protection and Suppression

a. *Smoking and Open Fires*

Smoking and fires shall be permitted only at the option of the Contractor. The Contractor shall not allow open fires on the project area without advance permission in writing from Forest Service.

Unless restricted by State Law or Federal Regulation, smoking shall be permitted only in such portions of the project area that are free of flammable material. Smokers shall sit down to smoke in such a position that any burning material will fall within a cleared area, and shall extinguish and press out in mineral soil all burning material before leaving the cleared area.

b. *Fire Extinguishers and Equipment on Trucks, Tractors, etc.*

All power-driven equipment operated by the Contractor on National Forest land, except portable fire pumps, shall be equipped with one fire extinguisher having a UL rating of at least 5 BC, and one "D" handled or long handled round point shovel, size "0" or larger. In addition, each motor patrol, truck, and passenger-carrying vehicle shall be equipped with a double-bit axe or Pulaski, 3-1/2 pounds or larger.

Equipment shall be kept in a serviceable condition and shall be readily available.

c. *Power Saws*

Each gasoline power saw operator shall be equipped with a pressurized chemical fire extinguisher of not less than 8-ounce capacity by weight, and one long-handled round point shovel, size "0" or larger. The extinguisher shall be kept in possession of the saw operator at all times. The shovel shall be accessible to the operator within 1 minute.

d. *Extinguishers*

One refill for each type or one extra extinguisher sufficient to replace each size extinguisher required on equipment shall be safely stored in the fire tool box or other agreed upon place on the project area that is protected and readily available.

e. *Spark Arresters and Mufflers*

Each internal combustion engine shall be equipped with a spark arrester meeting either (1) USDA Forest Service Standard 5100-1a, or (2) appropriate Society of Automotive Engineers (SAE) recommended practice J335(b) and J350(a) as now or hereafter amended unless it is:

(1) Equipped with a turbine-driven exhaust supercharger such as the turbocharger. There shall be no exhaust bypass.

(2) A passenger-carrying vehicle or light truck, or medium truck up to 40,000 GVW, used on roads and equipped with a factory-designed muffler complete with baffles and an exhaust system in good working condition.
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(3) A heavy-duty truck, such as a dump or log truck, or other vehicle used for commercial hauling, used only on roads, and equipped with a factory designed muffler and with a vertical stack exhaust system extending above the cab.

Exhaust equipment described in this subsection, including spark arresters and mufflers, shall be properly installed and constantly maintained in serviceable condition.

f. Emergency Fire Precautions

The Contractor shall restrict operations in accordance with the Industrial Fire Precaution Levels listed below. The Forest Service may change the Industrial Fire Precaution Levels to other values upon revision of the National Fire Danger Rating System and may change the specific Industrial Fire Precaution Levels when such changes are necessary for the protection of the National Forest. When sent to the Contractor, the revised Industrial Fire Precaution Levels will supersede the attached levels.

INDUSTRIAL FIRE PRECAUTIONS SCHEDULE

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>INDUSTRIAL FIRE PRECAUTION (IFPL)</th>
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<tbody>
<tr>
<td>I.</td>
<td>Closed season – Fire precaution requirements are in effect. A fire watch/security is required at this and all higher levels unless otherwise waived.</td>
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<tr>
<td>II.</td>
<td>Partial hootowl - The following may operate only between the hours of 8 p.m. and 1 p.m., local time:</td>
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<td></td>
<td>a. power saws, except at loading sites;</td>
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<td></td>
<td>b. cable yarding;</td>
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<tr>
<td></td>
<td>c. blasting;</td>
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<td></td>
<td>d. welding or cutting of metal.</td>
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<tr>
<td>III.</td>
<td>Partial shutdown - The following shall be prohibited except as indicated:</td>
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<td></td>
<td>Cable yarding – except that gravity operated logging systems employing non-motorized carriages may be operated between the hours of 8 p.m. and 1 p.m., local time, when all block and moving lines, except the line between the carriage and the chokers, are suspended 10 feet above the ground;</td>
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<tr>
<td></td>
<td>Power saws – except power saws may be used at loading sites and on tractor/skidder operations between the hours of 8 p.m. and 1 p.m., local time.</td>
</tr>
<tr>
<td></td>
<td>In addition, the following are permitted between the hours of 8 p.m. and 1 p.m., local time:</td>
</tr>
<tr>
<td></td>
<td>a. tractor/skidder operations;</td>
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<td></td>
<td>b. mechanized loading and hauling of any product or material;</td>
</tr>
<tr>
<td></td>
<td>c. blasting;</td>
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<tr>
<td></td>
<td>d. welding or cutting of metal;</td>
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<tr>
<td></td>
<td>e. any other spark-emitting operation not specifically mentioned.</td>
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<tr>
<td>IV.</td>
<td>General shutdown - All operations are prohibited.</td>
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</table>
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The following definitions shall apply to these Industrial Fire Precaution Levels:

_Cable yarding systems:_ A yarding system employing cables and winches in a fixed position.

_Closed season (Fire Precautionary Period):_ That season of the year when a fire hazard exists as declared by the responsible agency official.

_Loadning sites/woods site/project area:_ A place where any product or material (including but not limited to logs, firewood, slash, soil, rock, poles, posts, etc.) is placed in or upon a truck or other vehicle.

_Low hazard area:_ Means any area where the responsible agency representative (WDNR, ORF, BIA, BLM) determines the combination of elements reduces the probability of fire starting and/or spreading.

_Tractor/skidder operations:_ Include a harvesting operation, or portion of a harvesting operation, where tractors, skidders, or other harvesting equipment capable of constructing fire line, are actively yarding forest products and can quickly reach and effectively attack a fire start.

Waivers, written in advance, may be used for any and all activities. Activities for which waivers may be issued include, but are not limited to:

- a. mechanized loading and hauling;
- b. road maintenance such as sprinkling, graveling, grading, and paving;
- c. cable yarding using gravity systems or suspended lines and blocks, or other yarding systems where extra prevention measures will significantly reduce the risk of fire;
- d. powersaws at loading sites or in felling and bucking where extra prevention measures will significantly reduce the risk of fire;
- e. maintenance of equipment (other than metal cutting and welding) or improvements such as structures, fences, and powerlines.

Such waiver, or substitute precautions will prescribe measures to be taken by the Contractor to reduce the risk of ignition, and/or the spread of fire. The Forest Service shall consider site specific weather factors, fuel conditions, and specific operations that result in less risk of fire ignition and/or spread than contemplated when precaution level was predicted. Consideration shall also be given to measures that reduce the precaution levels above. The Contractor shall assure that all conditions of such waivers or substitute precautions are met.

The Contractor shall obtain the predicted Industrial Fire Precaution Level daily, prior to the start of work, from the appropriate Ranger District headquarters. If predictions made after 6:00 p.m., local time, are significantly different than the original prediction, the Forest Service will inform the Contractor when changes in restrictions or industrial precautions are made.

Where hauling involves transit through more than one shutdown/regulated use area, the precaution level at the woods loading site shall govern the level of haul restriction, unless otherwise prohibited by other than industrial precaution level system.
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8. **Fire Tools**
The Contractor shall furnish serviceable firefighting tools in a readily accessible fire toolbox or compartment of sound construction with a hinged lid and hasp so arranged that the box can be secured or sealed. The box shall be red and marked “Fire Tools” in letters one inch high. It shall contain a minimum of:

   a. 2 axes or Pulaskis with a 32-inch handle;
   b. 3 adze eye hoes. One Pulaski may be substituted for 1 adze eye hoe;
   c. 3 long-handled, round point shovels, size “0” or larger.

9. **Fire Security**

When the Industrial Fire Precautions Level is “I” or higher, unless a waiver is granted, the Contractor shall designate a person who shall perform fire security services listed below on the project area and vicinity. The designated person shall be capable of operating the Contractor's communications and firefighting equipment specified in the contract, excluding helicopters, and of directing the activities of the Contractor's personnel on forest fires. In lieu of having the designated person perform the required supervisory duties, the Contractor may provide another person meeting the qualifications stated above to direct the activities of Contractor's personnel and equipment during all firefighting activities.

Services described shall be for at least 1 hour from the time the Contractor's operations are shut down. For the purposes of this provision, personnel servicing equipment, and their vehicles, who are not engaged in cutting or welding metal are excluded.

Fire security services shall consist of moving throughout the operation area or areas constantly looking, reporting, and taking suppression action on any fires detected. Where possible, the designated person shall observe inaccessible portions of helicopter operating areas from vantage points within or adjacent to project area.

**Additional Fire Precautionary Measure 1 - Tank Truck**

The Contractor shall provide a tank truck or trailer, containing not less than 300 gallons of water, during yarding, loading, land clearing, right-of-way clearing and mechanical treatment of slash. A tank truck or trailer will not be required if powersaw falling and bucking is the only operation. Such tank truck or trailer shall be maintained in a serviceable condition and located within 10 minutes, round trip, from each project area during fire period and closed season.

The tank truck or trailer shall be equipped with a pump capable of discharging 20 gallons of water per minute, using a 1/4-inch nozzle tip, through a 50-foot length of rubber lined hose. In addition, 500 feet of serviceable fabric jacket rubber lined hose of not less than 1 inch outside diameter, fitted with a nozzle capable of discharging a straight stream of 1/4 inch diameter and a spray pattern shall be immediately available for use. The tank, pump and at least 250 feet of hose and nozzle shall be connected and ready for use at all times.

If a trailer is used, it shall be equipped with a hitch to facilitate prompt movement. A serviceable tow vehicle shall be immediately available for attachment to the trailer and must meet the time requirement stated above. Such truck or trailer shall be equipped to operate for a minimum of 8
Appendix C – Fire Protection and Suppression

hours. Tank truck or trailer shall be available from the start of work to the end of the Fire Watch/Fire Security service.

Additional Fire Precautionary Measure 2- Communications

The Contractor shall provide adequate two-way communication facilities to report a fire to Forest Service within 15 minutes of detection. FCC Regulations prohibit commercial use of Citizen Bank (CB) radio. (CBs are not considered adequate two-way communications.)

Such communications shall be operable during periods of operation of power-driven equipment, including the time fire security is required.