

# **STANDARD SPECIFICATIONS FOR CONSTRUCTION OF ROADS AND BRIDGES ON FEDERAL HIGHWAY PROJECTS**

## **FP-14**



U.S. Department  
of Transportation

**Federal Highway  
Administration**

**Federal Lands Highway**

**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.

When designated in a contract, the FP-14 becomes part of the contract and binding upon all parties to the contract. Construction contracts of the Federal Highway Administration are also governed by the following regulations:

- Federal Acquisition Regulation (FAR), Title 48, Code of Federal Regulations, Chapter 1; and
- Transportation Acquisition Regulation (TAR), Title 48, Code of Federal Regulations, Chapter 12.

The FAR and TAR regulations are not included in the FP-14. A complete copy of the FAR is available from the Superintendent of Documents, Congressional Sales Office, U.S. Government Printing Office, Washington, DC 20402.

U.S. Customary units of measure are used in the FP-14 as provided in the November 25, 2008 Memorandum from Jeffrey F. Paniati entitled *Update on Metric Use Requirements for FHWA Documents*. Metric units are noted in parentheses following the U.S. Customary Units. The references to Metric or Metric units apply only when the project or portion of the project expressly calls for Metric units of measure.

<b>METRIC TO U.S. CUSTOMARY CONVERSION FACTORS (approximate)</b>				
<b>Symbol</b>	<b>When You Know</b>	<b>Multiply By</b>	<b>To Find</b>	<b>Symbol</b>
<b>LENGTH</b>				
μm	micrometers	$3.9 \times 10^{-5}$	inches	in
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
<b>AREA</b>				
mm <sup>2</sup>	square millimeters	0.0016	square inches	in <sup>2</sup>
m <sup>2</sup>	square meters	10.764	square feet	ft <sup>2</sup>
m <sup>2</sup>	square meters	1.195	square yards	yd <sup>2</sup>
ha	hectares	2.47	acres	ac
km <sup>2</sup>	square kilometers	0.386	square miles	mi <sup>2</sup>
<b>VOLUME</b>				
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m <sup>3</sup>	cubic meters	35.31	cubic feet	ft <sup>3</sup>
m <sup>3</sup>	cubic meters	1.308	cubic yards	yd <sup>3</sup>
<b>MASS</b>				
g	grams	0.035	ounces	oz
kg	kilograms	2.2046	pounds	lb
Mg	megagrams	1.1023	short tons	T
(or "t")	(or "metric ton")		(2000 lb)	
<b>TEMPERATURE (exact)</b>				
°C	Celsius temperature	1.8C +32	Fahrenheit temperature	°F
<b>ILLUMINATION</b>				
lx	lux	0.0929	foot-candles	fc
cd/m <sup>2</sup>	candela/m <sup>2</sup>	0.2919	foot-Lamberts	fl
<b>MISCELLANEOUS</b>				
J	joule	0.7376	foot-poundforce	ft·lbf
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	Poundforce per square inch	lbf/in <sup>2</sup>

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**DIVISION 100**  
**GENERAL REQUIREMENTS**

## **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.

**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

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

<b>°F</b>	—	degree Fahrenheit	temperature
<b>ft</b>	—	feet	length
<b>ft<sup>2</sup></b>	—	square feet	area
<b>ft<sup>3</sup></b>	—	cubic feet	volume
<b>in</b>	—	inches	length
<b>in<sup>2</sup></b>	—	square inches	area
<b>in<sup>3</sup></b>	—	cubic inches	volume
<b>lb</b>	—	pound	mass
<b>mi</b>	—	mile	length
<b>oz</b>	—	ounces	mass
<b>psi</b>	—	pounds per square inch	pressure
<b>T</b>	—	ton (2000 lb)	mass
<b>yd</b>	—	yards	length
<b>yd<sup>2</sup></b>	—	square yards	area
<b>yd<sup>3</sup></b>	—	cubic yards	volume
<b>s</b>	—	second	time
<b>°</b>	—	degree	plane angle
<b>'</b>	—	minute	plane angle
<b>"</b>	—	second	plane angle

**(c) Metric unit abbreviations and symbols.**

<b>A</b>	—	ampere	electric current
<b>cd</b>	—	candela	luminous intensity
<b>°C</b>	—	degree Celsius	temperature

<b>d</b>	—	day	time
<b>g</b>	—	gram	mass
<b>H</b>	—	Henry	inductance
<b>ha</b>	—	hectare	area
<b>Hz</b>	—	hertz ( $s^{-1}$ )	frequency
<b>J</b>	—	joule ( $N\cdot m$ )	energy
<b>K</b>	—	kelvin	temperature
<b>kg</b>	—	kilogram	mass
<b>L</b>	—	liter	volume
<b>lx</b>	—	lux	illuminance
<b>m</b>	—	meter	length
<b>mm</b>	—	millimeter	length
<b>m<sup>2</sup></b>	—	square meter	area
<b>m<sup>3</sup></b>	—	cubic meter	volume
<b>min</b>	—	minute	time
<b>N</b>	—	newton ( $kg\cdot m/s^2$ )	force
<b>Pa</b>	—	pascal ( $N/m^2$ )	pressure
<b>t</b>	—	metric ton	mass
<b>V</b>	—	volt ( $W/A$ )	electric potential
<b>W</b>	—	watt ( $J/s$ )	power
<b><math>\Omega</math></b>	—	ohm $V/A$	electric resistance

**(d) Metric prefix symbols.**

<b>E</b>	—	exa	$10^{18}$
<b>P</b>	—	peta	$10^{15}$
<b>T</b>	—	tera	$10^{12}$
<b>G</b>	—	giga	$10^9$
<b>M</b>	—	mega	$10^6$
<b>k</b>	—	kilo	$10^3$
<b>c</b>	—	centi	$10^{-2}$
<b>m</b>	—	milli	$10^{-3}$
<b><math>\mu</math></b>	—	micro	$10^{-6}$
<b>n</b>	—	nano	$10^{-9}$
<b>p</b>	—	pico	$10^{-12}$
<b>f</b>	—	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.

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

**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 prepared schedule included with the bid forms, containing the estimated quantities of pay items for which unit bid prices are invited.

**Bridge** — A structure more than 20 feet (6 meters) long, including supports, spanning and providing passage over a depression, waterway, railroad, highway, or other obstruction.

**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.

**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** — A structure, not classified as a bridge, that provides an opening under the roadway.

**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** — 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.

**Federal Land Management Agencies** — Federal agencies including the National Park Service, U.S. Forest Service, U.S. Fish & Wildlife Service, U.S. Army Corps of Engineers, Bureau of Land Management, and Bureau of Reclamation.

**Government** — The Government of the United States of America.

**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.

**Notice to Proceed** — 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.

**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.

**Right-of-Way** — Real property necessary for the project, including roadway, buffer areas, access, and drainage areas.



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

**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.

**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** — 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.

**Standard Specifications** — The Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects approved for general application and repetitive use.

**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.

**Work** — The furnishing of labor, material, equipment, and other incidentals necessary to complete the project according to the contract.

## Section 102. — BID, AWARD, AND EXECUTION OF CONTRACT

**102.01 Acquisition Regulations.** Bid, award, and execution of the contract is governed by the FAR and TAR.

**102.02 Preparation of Bids.** Follow the requirements of FAR Clause 52.214-18 Preparation of Bids - Construction.

Execute and submit required standard forms, bid schedules, and solicitation provisions contained in the solicitation as part of the bid.

Complete SF 1442, *Solicitation, Offer, and Award*, and sign as follows:

**(a) Individuals.** Sign your individual signature. For individuals doing business as a firm, follow the individual signature with the individual's typed, stamped, or printed name and the words, "*an individual doing business as* (name of firm)".

**(b) Limited liability partnerships and partnerships.** Submit a list of partners having authority to bind the partnership. One of the listed partners must sign on behalf of the partnership.

**(c) Corporations.** Sign in the corporate name, followed by the word "*by*" and the signature and title of the person authorized to sign. Submit evidence from the corporation that the person signing has authority to bind the corporation.

**(d) Joint ventures.** Submit a copy of the Joint Venture agreement. Sign the SF 1442 according to the Joint Venture agreement.

**(e) Limited liability company.** Sign in the company name, followed by the word "*by*" and the signature of the person authorized to sign. Submit evidence that the individual executing the document has authority to bind the company.

**(f) Agents.** When an agent signs, other than as stated in Subsection 102.02(a) through (e), furnish satisfactory evidence that the agent has authority to bind the bidder.

Insert a numeric unit bid price for each pay item for which a quantity appears in the bid schedule. Multiply the unit bid price by the quantity for each pay item and show the amount bid. When mathematical checks made by the Government show a mistake in the amount bid, the corrected unit price extension governs.

When the words "*lump sum*" appear as a unit bid price, insert an amount bid for each lump sum pay item.

When the words "*contingent sum*" or "*fixed rate*" appears as a unit bid price, include the Government inserted amount bid for the pay item in the total bid amount.

Total the amounts bid for each pay item and show the total bid amount.

The quantities listed in the bid schedule are approximate, unless designated as a contract quantity, and are used for the comparison of bids. Payment will be made for the actual quantities of work performed and accepted or material furnished according to the contract. The scheduled quantities may be increased, decreased, or deleted. Bid schedule quantities are considered the original contract quantities.

**102.03 Bid Guarantee.** Follow the requirements of FAR Clause 52.228-1 Bid Guarantee.

**(a) General.** Submit the bid guarantee on SF 24, *Bid Bond*. If the bid guarantee is other than a corporate or individual surety, sign the SF 24 as the principal and make a statement on the form pledging the security. Make checks or money orders payable to the agency issuing the solicitation.

**(b) Power of attorney.** A corporate surety shall submit a current power of attorney for the signing agent or attorney-in-fact with each SF 24.

**(c) Evidence of guarantee assistance.** A surety that has a guarantee of assistance from the Small Business Administration (SBA) shall submit a copy of SBA Form 990, *Surety Bond Guarantee Agreement* with each SF 24. In addition, submit a power of attorney for the surety representative identified in the agreement.

**102.04 Individual Surety.** Follow the requirements of FAR Clause 52.228-11 Pledges of Assets.

Complete and date the SF 28, *Affidavit of Individual Surety* after the solicitation date. The individual surety shall personally sign the SF 28. Bidders cannot serve as their own surety. See FAR 28.203 Acceptability of Individual Sureties.

After reviewing the SF 28, the surety may be requested to submit further documentation with respect to its assets, debts, or encumbrances. The information may be required to be furnished under oath. Failure of the surety to respond with the requested documentation within 7 days of receipt of the request is cause for rejection of the surety.

Any material misstatement by the surety, overstatement of assets (either as to ownership or value), or understatement of liabilities is cause for rejection of the surety. Substitution of individual sureties to support a bid bond after the bid opening will not be permitted.

Furnish documentary evidence as to the ownership and value of the assets pledged in support of the bond and details of the security interest in the assets by the individual sureties for the apparent low bidder within 14 days after the opening of bids. Failure to submit evidence within the time required will be grounds for declaring the surety unacceptable.

In addition the CO may, after reviewing the SF 28 and documentary information on the security interest and the assets pledged; request the surety to submit further information and documents with respect to the documents submitted. The CO may require such information to be furnished under oath. Failure of the surety to accept such mail or failure of the surety to respond with the requested information or documents within 7 days of receipt of the request; will be cause for rejection of the surety.

These requirements are in addition to the requirements in FAR Subpart 28.203, except where in conflict with the requirements in the FAR, in which case the FAR controls.

**102.05 Public Opening of Bids.** Bids will be publicly opened at the time specified in the SF 1442, *Solicitation, Offer, and Award*. Their contents will be made public information. The Government reserves the right to reject bids as set forth in the FAR, Part 14.

**102.06 Performance and Payment Bonds.** Follow the requirements of FAR Clause 52.228-15 Performance and Payment Bonds – Construction.

Use SF 25, *Performance Bond* and SF 25A, *Payment Bond* for submitting the bonds.

The requirements contained in Subsections 102.03 and 102.04 relating to power of attorney, evidence of guarantee assistance, and individual sureties also apply to performance and payment bonds.

Submit the documentary evidence for individual sureties at the same time as the Affidavit of Individual Surety and security interest in assets pledged. A Contractor submitting an unacceptable individual surety in satisfaction of a performance or payment bond before the issuance of the Notice to Proceed will be permitted one opportunity to substitute an acceptable surety or sureties within 7 days of receipt of notification that the surety is unacceptable.

The Government's right to direct the substitution of sureties to ensure the continuing acceptability of the bonds during the performance of the Contract according to FAR Clause 52.228-2 Additional Bond Security is not restricted.

These requirements are in addition to the requirements in FAR Subpart 28.203, except where in conflict with the requirements in the FAR, in which case the FAR controls.

## **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.

**103.02 Disputes.** Follow the requirements of FAR Clause 52.233-1 Disputes (Alternate I).

When requesting a CO's decision on an interpretation of contract terms for the recovery of increased costs; quantify the amount and certify the amount if required by FAR Clause 52.233-1 Disputes (Alternate I). Include an explanation of the interpretation of contract terms, the contract clause under which the claim is made, supporting documentation, and adequate cost data to support the amount claimed.

**103.03 Value Engineering.** Follow the requirements of FAR Clause 52.248-3 Value Engineering - Construction.

Before undertaking significant expenditures, submit a written description of the value engineering change proposal (VECP) concept. Within 14 days the CO will inform the Contractor as to whether the concept appears to be viable or if the concept is unacceptable. If the CO indicates that the concept appears to be viable, prepare and submit the formal VECP proposal.

**103.04 Contractor Records.** Upon request, provide records related to the contract to the Government for up to 3 years after final payment or for longer periods as provided by law.

Include a provision in subcontracts at all tiers giving the Government the same rights as provided above with respect to the subcontractor's records.

**103.05 Partnering.** To facilitate this contract, the CO offers to participate in a formal partnership with the Contractor. This partnership draws on the strengths of each organization to identify and achieve reciprocal goals. Partnering strives to resolve problems in a timely, professional, and non-adversarial manner. If problems result in disputes, partnering encourages, but does not require, alternative dispute resolution instead of the formal claim process. The objective is effective and efficient contract performance to achieve a quality project within budget and on schedule.

Acceptance of this partnering offer by the Contractor is optional, and the partnership is bilateral.

If the partnering offer is accepted, mutually agree with the CO on the level of organizational involvement and the need for a professional to facilitate the partnering process. Engage the facilitator and other resources for key Contractor representatives and the CO to attend a partnership development and team-building workshop usually between the time of award and the Notice to Proceed. Hold additional progress meetings upon mutual agreement.

The direct cost of partnering facilities, professional facilitation, copying fees, and other miscellaneous costs directly related to partnering meetings will be shared by the Contractor and Government. Secure and pay for facilities, professional fees, and miscellaneous requirements. Submit invoices to the CO. The Government will reimburse the Contractor for 50 percent of the agreed costs incurred for the partnering process. The Government's share will not exceed \$5,000.

Each party is responsible for making and paying for its own travel, lodging, and meal arrangements. No time extension for the completion of the project will be made for the use of partnering.

## **Section 104. — CONTROL OF WORK**

**104.01 Authority of the Contracting Officer (CO).** The CO may delegate authority to representatives to decide on acceptability of work, progress of work, suspension of work, interpretation of the contract, and acceptable fulfillment of the contract. The term "CO" includes authorized representatives of the CO, including inspectors, acting within the limits of their authority as delegated by the CO.

**104.02 Authority of Inspectors.** Inspectors are authorized to inspect work including the preparation, fabrication, or manufacture of material for the project. The inspector is not authorized to alter or waive contract requirements, issue instruction contrary to the contract, act as foreman for the Contractor, or direct the Contractor's operations. The inspector has authority to identify non-conforming work until the issue can be referred to and decided by the CO. The inspector may take necessary action to prevent imminent and substantial risk of death or injury including stopping 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.

**(c) 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.

**104.04 Coordination of Contract Documents.** The FAR, TAR, special contract requirements, plans, and standard specifications are contract documents. A requirement in one document is binding as though occurring in all the contract documents. The contract documents are intended to be complementary and to describe and provide for a complete contract. In case of discrepancy, calculated and shown dimensions govern over scaled dimensions. The contract documents govern in the following order:

- (a) Federal Acquisition Regulations;
- (b) Transportation Acquisition Regulations;
- (c) Special contract requirements;
- (d) Plans; and
- (e) Standard specifications.

**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.

## **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. If the Contractor produces or processes material from Government lands in excess of the quantities required for the contract, the Government may:

- (a) Take possession of the excess material and direct its use, paying the Contractor only for the cost of production or
- (b) Require removal of the material and restoration of the land to a satisfactory condition at no cost to the 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 documents and test methods of AASHTO, ASTM, GSA, and other recognized standard authorities refer to the documents and methods in effect on the date of the Invitation for Bids (IFB) or Request for Proposal (RFP).

Use the FLH, *Field Materials Manual (FMM)*, *Appendix B: FLH Test Methods* in effect on the date of the IFB or RFP. Electronic copies of the FLH Test Methods and FHWA forms can be downloaded from:

<http://flh.fhwa.dot.gov/resources/manuals/fmm/>

Specification limits, tolerances, test results, and related calculations are according to ASTM E29, Absolute Method.

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

Incorporate manufactured material into the work according to the manufacturer's recommendations or to these specifications, whichever is stricter.

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

Plan dimensions and contract specification values are the values to be strived for and complied with as the design values from which 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.

The Government may inspect, sample, or test work before final acceptance of the project. If 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 Government testing is performed on work, the result will be used for acceptance purposes under Subsection 106.04.

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 through 106.05. The primary method of acceptance is specified in each Section of work, but work may be rejected if it is found not to comply with the contract.

For work that is evaluated and accepted under Subsection 106.05, 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. Contractor data will be verified using the F- and t-test statistics in comparison to Government test results at a significance level of 0.01. If the Contractor's data is not verified and the CO determines it to be appropriate, the Government will perform tests associated for that discrete portion of work. In this situation, the Government test results will control in determining the acceptability and pay factor of the work.

Remove and replace work that does not conform to the contract, or to prevailing industry standards where no specific contract requirements are noted, at no cost to the Government.

As an alternative to removal and replacement, the Contractor may submit a written request to:

- (a) Have the work accepted at a reduced price; or
- (b) Perform corrective measures to bring the work into conformity.

Include supporting rationale and documentation in the request. 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 contract and prevailing industry standards.

**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:
  - (a) Test results on material from the same lot and documentation of the inspection and testing system;
  - (b) A statement from the manufacturer that the material complies with the contract; and
  - (c) 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:

**(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.

**(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 106-1**  
**Estimated Percent of Work Within Specification Limits**

Estimated Percent within Specification Limits (P <sub>U</sub> or P <sub>L</sub> )	Upper Quality Index Q <sub>U</sub> or Lower Quality Index Q <sub>L</sub>								
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10 to n=11	n=12 to n=14
100	1.16	1.49	1.72	1.88	1.99	2.07	2.13	2.20	2.28
99	-	1.46	1.64	1.75	1.82	1.88	1.91	1.96	2.01
98	-	1.43	1.58	1.66	1.72	1.75	1.78	1.81	1.84
97	1.15	1.40	1.52	1.59	1.63	1.66	1.68	1.71	1.73
96	-	1.37	1.47	1.52	1.56	1.58	1.60	1.62	1.64
95	1.14	1.34	1.42	1.47	1.49	1.51	1.52	1.54	1.55
94	-	1.31	1.38	1.41	1.43	1.45	1.46	1.47	1.48
93	1.13	1.28	1.33	1.36	1.38	1.39	1.40	1.41	1.41
92	1.12	1.25	1.29	1.31	1.33	1.33	1.34	1.35	1.35
91	1.11	1.22	1.25	1.27	1.28	1.28	1.29	1.29	1.30
90	1.10	1.19	1.21	1.23	1.23	1.24	1.24	1.24	1.25
89	1.09	1.16	1.18	1.18	1.19	1.19	1.19	1.19	1.20
88	1.07	1.13	1.14	1.14	1.15	1.15	1.15	1.15	1.15
87	1.06	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.11
86	1.04	1.07	1.07	1.07	1.07	1.06	1.06	1.06	1.06
85	1.03	1.04	1.03	1.03	1.03	1.03	1.02	1.02	1.02
84	1.01	1.01	1.00	0.99	0.99	0.99	0.99	0.98	0.98
83	0.99	0.98	0.97	0.96	0.95	0.95	0.95	0.95	0.94
82	0.97	0.95	0.93	0.92	0.92	0.92	0.91	0.91	0.91
81	0.95	0.92	0.90	0.89	0.88	0.88	0.88	0.87	0.87
80	0.93	0.89	0.87	0.86	0.85	0.85	0.84	0.84	0.84
79	0.91	0.86	0.84	0.82	0.82	0.81	0.81	0.81	0.80
78	0.88	0.83	0.81	0.79	0.79	0.78	0.78	0.77	0.77
77	0.86	0.80	0.77	0.76	0.75	0.75	0.74	0.74	0.74
76	0.83	0.77	0.74	0.73	0.72	0.72	0.71	0.71	0.70
75	0.81	0.74	0.71	0.70	0.69	0.69	0.68	0.68	0.67
74	0.78	0.71	0.68	0.67	0.67	0.65	0.65	0.65	0.64
73	0.75	0.68	0.65	0.64	0.63	0.62	0.62	0.62	0.61
72	0.73	0.65	0.62	0.61	0.60	0.59	0.59	0.59	0.58
71	0.70	0.62	0.59	0.58	0.57	0.57	0.56	0.56	0.55
70	0.67	0.59	0.56	0.55	0.54	0.54	0.53	0.53	0.52
69	0.64	0.56	0.53	0.52	0.51	0.51	0.50	0.50	0.50
68	0.61	0.53	0.50	0.49	0.48	0.48	0.48	0.47	0.47
67	0.58	0.50	0.47	0.46	0.45	0.45	0.45	0.44	0.44
66	0.55	0.47	0.45	0.43	0.43	0.42	0.42	0.42	0.41
65	0.51	0.44	0.42	0.40	0.40	0.39	0.39	0.39	0.38
64	0.48	0.41	0.39	0.38	0.37	0.37	0.36	0.36	0.36
63	0.45	0.38	0.36	0.35	0.34	0.34	0.34	0.33	0.33
62	0.41	0.35	0.33	0.32	0.32	0.31	0.31	0.31	0.30
61	0.38	0.30	0.30	0.30	0.29	0.28	0.28	0.28	0.28
60	0.34	0.28	0.28	0.25	0.25	0.25	0.25	0.25	0.25
59	0.31	0.27	0.25	0.23	0.23	0.23	0.23	0.23	0.23
58	0.30	0.25	0.23	0.20	0.20	0.20	0.20	0.20	0.20
57	0.25	0.20	0.18	0.18	0.18	0.18	0.18	0.18	0.18
56	0.20	0.18	0.16	0.15	0.15	0.15	0.15	0.15	0.15
55	0.18	0.15	0.13	0.13	0.13	0.13	0.13	0.13	0.13
54	0.15	0.13	0.10	0.10	0.10	0.10	0.10	0.10	0.10
53	0.10	0.10	0.08	0.08	0.08	0.08	0.08	0.08	0.08
52	0.08	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
51	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

If the value of Q<sub>U</sub> or Q<sub>L</sub> does not correspond to a value in the table, use the next lower Q value. If Q<sub>U</sub> or Q<sub>L</sub> are negative values, P<sub>U</sub> or P<sub>L</sub> is equal to 100 minus the table value for P<sub>U</sub> or P<sub>L</sub>.

**Table 106-1 (continued)**  
**Estimated Percent of Work Within Specification Limits**

Estimated Percent within Specification Limits ( $P_U$ or $P_L$ )	Upper Quality Index $Q_U$ or Lower Quality Index $Q_L$					
	n=15 to n=17	n=18 to n=22	n=23 to n=29	n=30 to n=42	n=43 to n=66	n=67 to $\infty$
100	2.34	2.39	2.44	2.48	2.51	2.56
99	2.04	2.07	2.09	2.12	2.14	2.16
98	1.87	1.89	1.91	1.93	1.94	1.95
97	1.75	1.76	1.78	1.79	1.80	1.81
96	1.65	1.66	1.67	1.68	1.69	1.70
95	1.56	1.57	1.58	1.59	1.59	1.60
94	1.49	1.50	1.50	1.51	1.51	1.52
93	1.42	1.43	1.43	1.44	1.44	1.44
92	1.36	1.36	1.37	1.37	1.37	1.38
91	1.30	1.30	1.31	1.31	1.31	1.31
90	1.25	1.25	1.25	1.25	1.26	1.26
89	1.20	1.20	1.20	1.20	1.20	1.20
88	1.15	1.15	1.15	1.15	1.15	1.15
87	1.11	1.11	1.11	1.11	1.11	1.11
86	1.06	1.06	1.06	1.06	1.06	1.06
85	1.02	1.02	1.02	1.02	1.02	1.02
84	0.98	0.98	0.98	0.98	0.98	0.98
83	0.94	0.94	0.94	0.94	0.94	0.94
82	0.91	0.90	0.90	0.90	0.90	0.90
81	0.87	0.87	0.87	0.87	0.87	0.87
80	0.83	0.83	0.83	0.83	0.83	0.83
79	0.80	0.80	0.80	0.80	0.80	0.79
78	0.77	0.76	0.76	0.76	0.76	0.76
77	0.73	0.73	0.73	0.73	0.73	0.73
76	0.70	0.70	0.70	0.70	0.70	0.70
75	0.67	0.67	0.67	0.67	0.67	0.66
74	0.64	0.64	0.64	0.64	0.64	0.63
73	0.61	0.61	0.61	0.61	0.61	0.60
72	0.58	0.58	0.58	0.58	0.58	0.57
71	0.55	0.55	0.55	0.55	0.55	0.54
70	0.52	0.52	0.52	0.52	0.52	0.52
69	0.49	0.49	0.49	0.49	0.49	0.49
68	0.47	0.46	0.46	0.46	0.46	0.46
67	0.44	0.44	0.43	0.43	0.43	0.43
66	0.41	0.41	0.41	0.41	0.41	0.40
65	0.38	0.38	0.38	0.38	0.38	0.38
64	0.36	0.35	0.35	0.35	0.35	0.35
63	0.33	0.33	0.33	0.33	0.33	0.32
62	0.30	0.30	0.30	0.30	0.30	0.30
61	0.28	0.28	0.28	0.28	0.28	0.28
60	0.25	0.25	0.25	0.25	0.25	0.25
59	0.23	0.23	0.23	0.23	0.23	0.23
58	0.20	0.20	0.20	0.20	0.20	0.20
57	0.18	0.18	0.18	0.18	0.18	0.18
56	0.15	0.15	0.15	0.15	0.15	0.15
55	0.13	0.13	0.13	0.13	0.13	0.13
54	0.10	0.10	0.10	0.10	0.10	0.10
53	0.08	0.08	0.08	0.08	0.08	0.08
52	0.05	0.05	0.05	0.05	0.05	0.05
51	0.03	0.03	0.03	0.03	0.03	0.03
50	0.00	0.00	0.00	0.00	0.00	0.00

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

PAY FACTOR	Minimum Required Percent of Work Within Specification Limits for a Given Pay Factor ( $P_U + P_L$ ) – 100																
	Category		n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10 to n=11	n=12 to n=14	n=15 to n=17	n=18 to n=22	n=23 to n=29	n=30 to n=42	n=43 to n=66	n=67 to $\infty$
I	II																
1.05								100	100	100	100	100	100	100	100	100	100
1.04							100	99	97	95	96	96	96	97	97	97	97
1.03						100	98	96	94	92	93	93	94	95	95	96	96
1.02						99	97	94	91	89	90	91	92	93	93	94	94
1.01		100	100	100	98	95	92	89	87	88	89	90	91	91	92	92	93
1.00		69	75	78	80	82	83	84	85	86	87	88	89	90	91	92	92
0.99		66	72	76	78	80	81	82	83	84	85	86	87	87	89	90	91
0.98		64	70	74	76	78	79	80	81	82	84	85	86	86	87	88	90
0.97		63	68	72	74	76	77	78	79	81	82	82	83	84	86	87	88
0.96		61	67	70	72	74	75	76	78	79	81	82	83	84	86	87	87
0.95	1.00	59	65	68	71	72	74	75	76	78	79	80	82	83	84	86	86
0.94	0.99	58	63	67	69	71	72	73	75	76	78	79	80	82	83	85	85
0.93	0.98	57	62	65	67	69	71	72	73	75	76	78	79	80	82	84	84
0.92	0.97	55	60	63	66	68	69	70	72	73	75	76	78	79	81	82	82
0.91	0.96	54	59	62	64	66	68	69	70	72	74	75	76	78	79	81	81
0.90	0.95	53	57	61	63	65	66	67	69	71	72	74	75	77	78	80	80
0.89	0.94	51	56	59	62	63	65	66	68	69	71	72	74	75	77	79	79
0.88	0.93	50	55	58	60	62	64	65	66	68	70	71	73	74	76	78	78
0.87	0.92	49	53	57	59	61	62	63	65	67	68	70	71	73	75	77	77
0.86	0.91	48	52	55	58	59	61	62	64	66	67	69	70	72	74	76	76

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)

PAY FACTOR		Minimum Required Percent of Work Within Specification Limits for a Given Pay Factor (P <sub>U</sub> + P <sub>L</sub> ) – 100														
Category																
I	II	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10 to n=11	n=12 to n=14	n=15 to n=17	n=18 to n=22	n=23 to n=29	n=30 to n=42	n=43 to n=66	n=67 to ∞
0.85	0.90	46	51	54	56	58	60	61	62	64	66	67	69	71	72	75
0.84	0.89	45	49	53	55	57	58	60	61	63	65	66	68	70	71	73
0.83	0.88	44	48	51	54	56	57	58	60	62	64	65	67	69	70	72
0.82	0.87	43	47	50	53	54	56	57	59	61	62	64	66	67	69	71
0.81	0.86	41	46	49	51	53	55	56	58	59	61	63	64	66	68	70
0.80	0.85	40	44	48	50	52	54	55	56	58	60	62	63	65	67	69
0.79	0.84	39	43	46	49	51	52	54	55	57	59	61	62	64	66	68
0.78	0.83	38	42	45	48	50	51	52	54	56	58	59	61	63	65	67
0.77	0.82	36	41	44	46	48	50	51	53	55	57	58	60	62	64	66
0.76	0.81	35	39	43	45	47	49	50	52	54	56	57	59	61	63	65
0.75	0.80	33	38	42	44	46	48	49	51	53	54	56	58	60	62	64
REJECT	0.79	32	37	40	43	45	47	48	49	52	53	55	57	59	60	63
	0.78	30	36	39	42	44	45	47	48	50	52	54	56	57	59	62
	0.77	28	34	38	41	43	44	46	47	49	51	53	55	56	58	61
	0.76	27	33	37	39	42	43	45	46	48	50	52	53	55	57	60
	0.75	25	32	36	38	40	42	43	45	47	49	51	52	54	56	59
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.

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 (NLRB), *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.

**107.05 Responsibility for Damage Claims.** Indemnify and hold harmless the Government, its employees, and its consultants from suits; actions; or claims brought for injuries or damage received or sustained by a person, persons, or property resulting from the construction operations or arising out of the negligent performance of the contract.

Procure and maintain until final acceptance of the contract, liability insurance of the types and limits specified below. Obtain insurance from companies authorized to do business in the appropriate state. Ensure the insurance covers operations under the contract whether performed by the Contractor or by subcontractors.

Before work begins, submit "*certificates of insurance*" certifying that the policies will not be changed or canceled until written notice has been given to the Government. Insurance coverage in the minimum amounts set forth below does not relieve the Contractor of liability in excess of the coverage.

Carry insurance conforming to the following minimums:

- (a) Worker's compensation insurance. Minimum required by law.
- (b) Comprehensive or commercial general liability insurance.
  - (1) Personal injury and property damage coverage;
  - (2) Contractual liability coverage;
  - (3) Completed operations liability coverage;
  - (4) \$1,000,000 combined single limit for each occurrence; and
  - (5) \$2,000,000 general aggregate limit.
- (c) Automobile liability insurance. \$1,000,000 combined single limit for each occurrence.

**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 tornadoes, earthquakes, major floods, and other officially declared natural disasters). The Government will not be responsible for delay costs, impact costs, or extended overhead costs.

**107.07 Furnishing Right-of-Way.** The Government will obtain right-of-way.

**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) Description, schedule, and map of area.**

**(2) Documentation of compliance with applicable laws and regulations.**

**(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) 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 108. — PROSECUTION AND PROGRESS

**108.01 Commencement, Prosecution, and Completion of Work.** Follow the requirements of FAR Clause 52.211-10 Commencement, Prosecution, and Completion of Work.

A preconstruction conference will be held after the contract is awarded and before beginning work. Seven days before the preconstruction conference, submit copies of the preliminary construction schedule according to Section 155.

**108.02 Subcontracting.** Follow the requirements of FAR Clause 52.219-14 Limitations on Subcontracting, FAR Clause 52.222-11 Subcontracts (Labor Standards), and FAR Clause 52.236-1 Performance of Work by the Contractor.

Subcontracting does not relieve the Contractor of liability and responsibility under the contract and does not create any contractual relation between subcontractors and the Government. The Contractor is liable and responsible for actions or lack of action of subcontractors.

Within 14 days of subcontract award, submit an SF 1413, *Statement and Acknowledgment* with Part I completed. Complete other forms that may be provided by the Government to show the work subcontracted and the total dollar amount of the subcontract. For subcontracts involving on-site labor, require the subcontractor to complete Part II of the SF 1413 and complete other forms that may be provided by the Government. Submit a separate statement documenting the cumulative amount of on-site subcontracts to date as a percentage of the original contract amount. Submit this information on subcontracts at lower tiers.

In FAR Clause 52.219-8, Utilization of Small Business Concerns and FAR Clause 52.232-27 Prompt Payment for Construction Contracts, the term "*subcontracts*" includes on-site and off-site work and supply contracts.

For contracts in which FAR Clause 52.219-14 Limitations on Subcontracting applies, the percentage of work performed by the Contractor will be computed as the cost of the contract work performed by the Contractor's employees, not including the cost of material, divided by the cost of all contract work, not including the cost of material. For contracts on which FAR Clause 52.236-1 Performance of Work applies, the percentage of work performed by the Contractor will be computed as the cost of the contract work performed on-site by the Contractor's employees divided by the total cost of the contract.

**108.03 Determination and Extension of Contract Time.** Follow the requirements of FAR Clause 52.211-10 Commencement, Prosecution, and Completion of Work.

**(a) Definitions.**

**(1) Time Impact Analysis.** The procedure by which the Contractor demonstrates the effect of specific time impacts on the overall construction schedule. Time impacts may result in an increase or decrease in contract time.

**(2) Float.** The amount of time between when an activity "*can start*" (the early start) and when an activity "*must start*" (the late start).

**(b) Time Impact Analysis.** Comply with the applicable contract clauses when requesting a time extension. Notify the CO in writing within 7 days after identifying a time impact.

Submit a time impact analysis and revised construction schedule within 14 days after the end of the time impact event for which notice has been given. Include the following:

(1) A title page or header block with:

- (a) Contract number;
- (b) Project number and name;
- (c) Contractor name;
- (d) Current fixed completion date;
- (e) Date of submittal; and
- (f) Consecutive number for each analysis.

(2) State the impact that requires a Time Impact Analysis:

- (a) CO proposed or directed Contract Modification;
- (b) Contractor proposed Contract Modification;
- (c) Weather delay; or
- (d) Other Government caused delay.

(3) A copy of the most current approved schedule existing before the impact.

(4) A detailed narrative describing each impact event. Describe impacts to each affected activity in the construction schedule. Include the following:

- (a) Contract clauses under which the request is being made;
- (b) Cause of the impact;
- (c) Start date of the impact;
- (d) Duration of the impact; and
- (e) Methods to be employed to re-sequence or reschedule the work to mitigate the impact. Discuss the feasibility of re-sequencing future work to mitigate delay. Re-sequencing or rescheduling of work will be at no cost to the Government. Include corresponding rationale and assumptions of measures which increase the cost of mitigating the impact.

(5) A revised construction schedule to show the impact of the activities identified, including re-sequencing which would mitigate the delay.

**(c) Time extensions.** Only delays or modifications that affect critical activities or cause noncritical activities to become critical will be considered for time extensions.

When a Critical Path Method schedule is used, no time extension will be made for delays or modifications that use available float as shown in the most current approved schedule existing before the impact.

No time extension will be made for a claim that states insufficient time was provided in the contract.

**(d) Execution of the Time Impact Analysis.** Incorporate accepted logic changes or time extensions into the baseline schedule by the next monthly submittal.

**108.04 Failure to Complete Work on Time.** Follow the requirements of FAR Clause 52.211-12 Liquidated Damages — Construction.

Liquidated damages in the amount specified in Table 108-1 will be assessed for each day beyond the time allowed to complete the contract until substantial completion of the work.

If a winter shutdown occurs during this period, liquidated damages in an amount equal to 10 percent of the amount specified in Table 108-1 will be assessed for each day until work resumes at which time full liquidated damages will be assessed.

Liquidated damages in an amount equal to 20 percent of the amount specified in Table 108-1 will be assessed for each day beyond the time allowed to complete the contract beginning with the day after substantial completion and ending with the date of final completion and acceptance.

Liquidated damages will not be assessed for the following:

- (a) Day of the final inspection;
- (b) Days required to perform work added to the contract after substantial completion including items identified during the final inspection that were not required before that time;
- (c) Delays by the Government after all work is complete and before a formal acceptance is executed; or
- (d) Periods of time when all work is complete, but acceptance is delayed pending the plant establishment period or similar warranty period.

**Table 108-1**  
**Charge for Liquidated Damages for Each Day**  
**Work Is Not Substantially Completed**

<b>Original Contract Price</b>		<b>Daily Charge</b>
<b>From More Than —</b>	<b>To and Including —</b>	
\$0	\$1,000,000	\$1,000
\$1,000,000	\$2,000,000	\$1,800
\$2,000,000	\$5,000,000	\$3,500
\$5,000,000	\$10,000,000	\$4,400
\$10,000,000	and more	\$5,200

**108.05 Stop Order.** The CO may order the performance of the work to be stopped, either in whole or in part, for such periods deemed necessary due to the following:

- (a) Weather or soil conditions considered unsuitable for prosecution of the work; or
- (b) Failure of the Contractor to:
  - (1) Correct conditions unsafe for the workers or the general public;
  - (2) Carry out written orders given by the CO; or
  - (3) Perform provisions of the contract.

No adjustment in contract time or amount will be made for stop orders issued under Subsection 108.05(a) or (b), except an adjustment in contract time, as provided by FAR Clause 52.249-10 Default (Fixed-Price Construction), may be made when the Contractor is able to demonstrate that the weather was unusually severe based on the most recent 10 years of historical data.

## 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. Measurement of quantities for payment for the individual pay items will be based on the contract price for each pay item according to Table 109-1.

**Table 109-1**  
**Decimal Accuracy of Quantities for Payment**

<b>Contract Price</b>	<b>Decimal Accuracy of Quantities for Payment</b>
< \$1.00	0 decimal
≥ \$1.00 to < \$100.00	1 decimal
≥ \$100.00 to < \$1000.00	2 decimals
≥ \$1000.00	3 decimals

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.

(c) **Cubic yard (Cubic meter).**

(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.

**(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.

**109.06 Pricing of Adjustments.** Determine costs according to FAR Part 31 Contract Cost Principles and Procedures. Follow the requirements of FAR clauses providing for an equitable price adjustment.

If agreement on price and time cannot be reached, the CO may make a unilateral determination.

If the work will delay contract completion, request a contract time extension according to Subsection 108.03.

**(a) Proposal.**

**(1) General.** Submit a written proposal for each line item of the work or a lump sum for the total work. Identify the major elements of the work, the quantity of the element, and its contribution to the proposed price. Submit further breakdowns if requested by the CO.

**(2) Data.** Submit information as requested by the CO to the extent necessary to permit the CO to determine the reasonableness of the proposed price.

**(3) Cost or pricing data.** When the contract modification exceeds the amount indicated in FAR Clause 52.214-27 Price Reduction for Defective Cost or Pricing Data - Modifications - Sealed Bidding, FAR Clause 52.215-10 Price Reduction for Defective Certified Cost or Pricing Data, or FAR Clause 52.215-11 Price Reduction for Defective Cost or Pricing Data - Modifications, and the CO has determined that an exception does not apply, submit cost or pricing data.

Submit cost or pricing data, as defined in FAR Subpart 2.1—Definitions, for the Contractor and each major subcontractor.

Submit with the cost or pricing data a written proposal for pricing the work according to Subsection 109.06(a)(1). See FAR Subpart 15.4—Contract Pricing and FAR Table 15-2—*Instructions for Submitting Cost/Price Proposals when Certified Cost or Pricing Data are Required* for guidance.

Certify cost or pricing data according to FAR Subpart 15.4, upon completion of negotiations.

**(b) Post-work pricing.** When a contract modification is not forward priced, it requires a change order and a supplemental agreement reflecting the resulting equitable adjustment. When negotiating the price of a contract modification after all or most of the work has been performed, submit the following:

**(1) Direct costs.**

*(a) Material.* Include invoices showing the cost of material delivered to the work.

*(b) Labor.* Show basic hourly wage rates, fringe benefits, applicable payroll costs (that is FICA, FUTA, worker's compensation, insurance, and tax levies), paid subsistence, and travel costs for each labor classification and foreman employed in the adjusted work.

(c) *Equipment.* Include a complete descriptive listing of equipment including make, model, and year of manufacture. Support rented or leased equipment costs with invoices. Determine allowable ownership and operating costs for Contractor- and subcontractor-owned equipment as follows:

(1) Use actual equipment cost data when such data can be determined from the Contractor's or subcontractor's ownership and operating cost records.

(2) When actual costs cannot be determined, use the rates shown in the U.S. Army Corps of Engineers *Construction Equipment Ownership and Operating Expense Schedule (CEOOES)* for the region where costs are incurred. Adjust the rates for used equipment and for other variable parameters used in the schedules.

(3) Compute standby costs from acceptable ownership records or when actual costs cannot be determined according to *CEOOES*. Do not exceed 8 hours in a 24-hour period or 40 hours in a week. Do not include standby for periods when the equipment would have otherwise been in an idle status or for equipment that was not in operational condition.

(d) *Other direct costs.* Include documentation or invoices to support other direct costs incurred that are not included above (such as bonds, mobilization, demobilization, permits, and royalties).

(e) *Production rates.* Include actual hours of performance on a daily basis for each labor classification and for each piece of equipment. Include production rate information reflecting the actual work occurring on an approved Contractor daily record document.

(f) *Subcontract costs.* Include supporting data as required above.

**(2) Overhead.** Identify overhead rates and include supporting data, which justifies the rates. List the types of costs which are included in overhead. Identify the cost pools to which overhead is applied. Apply the overhead costs to the appropriate pool.

Limit Contractor overhead applied to subcontractor payments to 5 percent unless a higher percentage is justified.

**(3) Profit.** Include a reasonable profit, except when precluded by the FAR.

For work priced after all or most of the work is performed, profit is limited to 10 percent of the total cost. Due to the limited risk in post-work pricing, a lower profit percentage may be determined by a profit analysis according to FAR Subpart 15.404-4 Profit.

**109.07 Eliminated Work.** Follow the requirements of FAR Clause 52.243-4 Changes.

Work may be eliminated from the contract without invalidating the contract. The Contractor is entitled to compensation for direct costs incurred before the date of elimination of work plus profit and overhead on the direct incurred costs. Anticipated profit and overhead expense on the eliminated work will not be compensated.

**109.08 Progress Payments.** Follow the requirements of FAR Clause 52.232-5 Payments under Fixed-Price Construction Contracts and FAR Clause 52.232-27 Prompt Payment for Construction Contracts.

**(a) General.** Only invoice payments will be made under this contract. Invoice payments include progress payments made monthly as work is accomplished and the final payment made upon final acceptance. Only one progress payment will be made each month. No progress payment will be made in a month in which the work accomplished results in a net payment of less than \$1,000. Full or partial progress payment will be withheld until a construction schedule or schedule update is approved by the CO.

**(b) Closing date and invoice submittal date.** The closing date for progress payments will be designated by the CO. Include work performed after the closing date in the following month's invoice. Submit invoices to the designated billing office.

**(c) Invoice requirements.** Submit the invoice to the Government's designated billing office with the following items in the invoice:

**(1)** The information required in FAR Clause 52.232-27(a)(2).

**(2)** A tabulation of total quantities and contract prices of work accomplished or completed on each pay item. Do not include quantities unless field note documentation for those quantities were submitted by the closing date. Do not include quantities of work involving material for which test reports required under Section 153, Section 154, or certifications required by Subsection 106.03 are, or will be, past due as of the closing date.

**(3)** The certification required by FAR Clause 52.232-5(c) and if applicable, the notice required by FAR Clause 52.232-5(d). Provide an original signature on the certification. Facsimiles are unacceptable.

**(4)** If applicable, a copy of the notices that are required by FAR Clause 52.232-27(e)(5) and (g).

**(5)** The amount included for work performed by each subcontractor under the contract.

**(6)** The total amount of each subcontract under the contract.

**(7)** The amounts previously paid to each subcontractor under the contract.

**(8)** Adjustments to the proposed total payment that relate to the quantity and quality of pay items. Adjustments for the following may be made by the Government after validation of the invoice:

*(a)* Retent resulting from a failure to maintain acceptable progress;

*(b)* Retent resulting from violations of the labor provisions;

*(c)* Retent pending completion of incomplete work, other "*no pay*" work, and verification of final quantities;

*(d)* Obligations to the Government (such as excess testing cost or the cost of corrective work) pursuant to FAR Clause 52.246-12(g); or

*(e)* Liquidated damages for failure to complete work on time.

**(d) Government's receiving report.** The Government's receiving report will be developed using the measurement notes received by the CO and determined acceptable. Within 7 days after the closing date, the CO will be available by appointment at the Government's designated billing office to advise the Contractor of quantities and contract prices appearing on the Government's receiving report.

**(e) Processing progress payment requests.** No payment will be made for work unless field note documentation for the work was submitted.

**(1) Proper invoices.** If the invoice meets the requirements of Subsection 109.08(c) and the quantities and contract prices shown on the Contractor's invoice agree with the corresponding quantities and contract prices shown on the Government's receiving report; the invoice will be paid.

**(2) Defective invoices.** If the invoice does not meet the requirements of Subsection 109.08(c) or if quantities or contract prices shown on the Contractor's invoice exceed the corresponding quantities and contract prices shown on the Government's receiving report; the invoice is defective and the Contractor will be notified according to FAR Clause 52.232-27(a)(2). Defective invoices will be returned to the Contractor within 7 days after receipt by the Government's designated billing office. Correct and resubmit returned invoices. If the defects are minor, the Contractor may elect, in writing, to accept the quantities and contract prices shown on the Government's receiving report for payment.

**(f) Partial payments.** Progress payments may include partial payment for material to be incorporated in the work according to FAR Clause 52.232-5(b)(2), provided the material meets the requirements of the contract and is delivered on, or in the vicinity of, the project site or stored in acceptable storage places.

Partial payment for material does not constitute acceptance of the material for use in completing items of work. Partial payments will not be made for living or perishable material until incorporated into the project.

Individual and cumulative partial payments for preparatory work and material will not exceed the lesser of:

- (1)** 80 percent of the contract price for the pay item; or
- (2)** 100 percent of amount supported by copies of invoices submitted.

The quantity paid will not exceed the corresponding quantity estimated in the contract. The CO may adjust partial payments as necessary to protect the Government.

**(g) Retainage.** Follow the requirements of FAR Clause 52.232-5 Payments under Fixed Price Construction Contracts.

**(1)** Satisfactory progress includes performance of all work under the contract including submittals, schedules, certifications, reports, and drawings. When satisfactory progress has not been made, the CO may retain a maximum of 10 percent of the amount the progress payment until satisfactory progress has been made.

**(2)** After substantial completion of the contract, the CO may retain an amount adequate for protection of the Government.

**109.09 Final Payment.** Follow the requirements of FAR Clause 52.232-5 Payment under Fixed-Price Construction Contracts and FAR Clause 52.232-27 Prompt Payment for Construction.

Upon final acceptance and verification of final pay records, the Government will send a SF 1034, *Public Voucher for Purchases and Services other than Personal* (final voucher) and a release of claims document. Execute both the voucher and the release of claims, and return the documents to the Government for payment. The date of approval by the Government of the final voucher for payment constitutes the date of final settlement of the contract.

If unresolved claims exist or claims are proposed, reserve the right to the claims by listing a description of each claim and the amount being claimed on the release of claims document.

Failure to execute and return the voucher and release of claims document within 90 days after receipt will constitute execution of the documents and the release of claims against the Government arising by virtue of the contract. In this event, the day after 90 days from receipt constitutes the date of final settlement of the contract.





**DIVISION 150  
PROJECT  
REQUIREMENTS**

## **Section 151. — MOBILIZATION**

### **Description**

**151.01** This work consists of moving personnel, equipment, material, and incidentals to the project and performing work necessary before beginning work at the project site. This work also includes obtaining permits, insurance, and bonds.

### **Measurement**

**151.02** Measure the Section 151 items listed in the bid schedule according to Subsection 109.02.

### **Payment**

**151.03** The accepted quantities will be paid at the contract price per unit of measurement for the Section 151 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 mobilization by the lump sum will be paid as follows:

- (a)** Bond premiums will be reimbursed according to FAR Clause 52.232-5 Payments Under Fixed-Price Construction Contracts, after receipt of the evidence of payment.
- (b)** When 5 percent of the original contract amount is earned from pay items (not including mobilization), 50 percent of the mobilization pay item, or 5 percent of the original contract amount, whichever is less, will be paid.
- (c)** When 10 percent of the original contract amount is earned from pay items (not including mobilization), 100 percent of the mobilization pay item, or 10 percent of the original contract amount, whichever is less, will be paid.
- (d)** Any portion of the mobilization pay item in excess of 10 percent of the original contract amount will be paid after final acceptance.

## Section 152. — CONSTRUCTION SURVEY AND STAKING

### Description

**152.01** This work consists of performing surveying, staking, calculating, and recording data for the control of work. See FAR Clause 52.236-17 Layout of Work.

### Construction Requirements

**152.02 Qualifications.** Provide technically qualified survey crews experienced in highway construction survey and staking. Provide personnel capable of performing in a timely and accurate manner.

**152.03 Submittals.** Submit the following at the preconstruction conference:

Include the following when Automated Machine Guidance (AMG) methods are used:

**(a) Technology statement.** A written statement that includes:

- (1)** The manufacturer, model, and software version of the AMG equipment; and
- (2)** Certification that the final 3D data is compatible with the AMG equipment.

**(b) Personnel qualifications.**

- (1)** The name, authority, relevant experience, and qualifications of the person with overall responsibility for the AMG system.
- (2)** The names, authority, and relevant experience of personnel directly responsible for operating the AMG equipment.

**(c) Contractor quality control plan.** Comply with Section 153 and describe procedures for checking, mechanical calibration, and maintenance of both survey and construction equipment. Include the frequency and types of checks performed.

Include a price breakdown by individual tasks when construction survey and staking is paid by the lump sum for use in making progress payments and price adjustments.

**152.04 General.** Conform to the following:

- (a) Personnel.** Provide a crew supervisor on the project whenever surveying and staking is in progress.
- (b) Equipment.** Furnish survey instruments and supporting equipment capable of achieving the specified tolerances.

Construction equipment controlled with a Global Positioning System (GPS) and Robotic Total Station (RTS) machine guidance system may be used in the construction of subgrade, subbase, and base aggregate courses, or other construction operations when approved.

**(c) Material.** Furnish acceptable tools and supplies of the type and quality suitable for highway survey work. Furnish stakes and hubs of sufficient length to provide a solid set in the ground with sufficient surface area above ground for necessary legible and durable markings.

Include staking activities in the construction schedule required under Section 155. Include the dates and sequence of each staking activity.

The Government will set horizontal control points, vertical control points, and will provide data for use in establishing control for completion of each element of the work.

Data relating to horizontal and vertical alignment, theoretical slope stake catch points, and other design data will be furnished. Reformatting and additional calculations may be required for the convenient use of the Government-furnished data. Provide immediate notification of apparent errors in the initial staking or in the Government-furnished data.

Record survey and measurement field data in an approved format. Submit as-staked data and corrections made to the Government-furnished survey data. Submit survey and measurement data at least weekly. Field data and supporting documentation become the property of the Government upon completion of the work.

Discuss and coordinate the following with the CO before surveying or staking:

- (1) Surveying and staking methods;
- (2) Stake marking;
- (3) Grade control for courses of material;
- (4) Referencing;
- (5) Structure control;
- (6) Field staking data;
- (7) Localization of the GPS systems to the Government-established control points; and
- (8) Other procedures and controls necessary for the work.

Do not start work until staking or three-dimensional (3D) verification data for the affected work has been approved.

Preserve initial reference and control points. Notify the CO of missing control points or stakes at least 10 days before beginning construction. The Government will reestablish control points missing before the beginning of construction.

Acceptance of the construction staking does not relieve the Contractor of responsibility for correcting errors discovered during the work and for bearing additional costs associated with the error.

Maintain legibility of stake markings for the duration of the project or until notified in writing the stakes are no longer needed. Replace stakes if necessary to ensure markings are maintained.

Remove and dispose of flagging, paint, lath, stakes, and other staking material after the project is complete.

**152.05 Survey and Staking Requirements.** Perform survey, staking, recording of data, and calculations as necessary to construct the project from the initial layout to final completion. Survey and set stakes to the tolerances in Table 152-1. Reset stakes, refine 3D data, or both as many times as necessary to construct the work.

**(a) Control points.** Relocate initial horizontal and vertical control points in conflict with construction to areas that will not be disturbed by construction operations. Furnish the coordinates, elevations, and supporting documentation for the relocated points before the initial points are disturbed. Set durable monuments for survey control that uniquely identify the points.

Furnish the GPS localization results at least 7 days before beginning construction layout survey work. The CO may order the GPS localization calibration and associated 3D model to be broken into two or more zones to maintain the localized relationship between control points and original ground.

**(b) Centerline establishment.** Establish or reestablish centerline at roadway design cross-section locations and as necessary to construct the work. Reestablish the centerline when construction survey and staking work does not meet the tolerances.

**(c) Original ground topographic verification.** Use an approved method to regenerate cross-section data in areas where theoretical and actual ground elevations do not meet a tolerance of plus or minus 0.5 feet (150 millimeters). Retake cross-section to verify existing ground topography to mapping. Submit cross-section or 3D data in electronic and printed format for approval. Reduce cross-sections to horizontal and vertical distances from centerline.

Retake cross-section 10 feet (3 meters) beyond catch points to verify existing ground topography.

**(d) Slope and references stakes.** Perform the following:

**(1) AMG method.** After clearing operations are completed, set centerline reference stakes and hubs on both sides of centerline at 100-foot (30-meter) intervals at the clearing limit locations. Where clearing limits are greater than 10 feet (3 meters) vertically, 25 feet (8 meters) horizontally, or both from subgrade hinge point; provide an additional reference stake and hub as approved by the CO. Label each centerline reference stake with station, hub elevation, and offset from centerline.

Construct a 1000-foot (300-meter) long test section using AMG on the project at an approved location before beginning grading operations. Select a test location with superelevation and curve widening transitions if applicable. Notify the CO 10 days before beginning the test section. Demonstrate capability, knowledge, equipment, and experience to achieve work within tolerances. Allow 14 days to evaluate the test section. Do not start full grading operations until the test section is approved.

Provide as-built cross-sections at random locations specified by the CO not to exceed 500-foot (150-meter) intervals. If as-built cross-sections do not meet the tolerances in Subsection 204.13(d); rework the section until the specified tolerances are achieved and provide additional cross-sections as directed by the CO at no cost to the Government.

**(2) Conventional survey methods.** Verify and set slope stakes on both sides of centerline at the theoretical catch point. If the theoretical catch point is not within a tolerance of 0.5 feet (150 millimeters), perform original ground topographic verification according to Subsection 152.05(c). Set the slope stake at the actual intersection of the design roadway slope with the natural ground-line. Set reference stakes outside the clearing limits. Include reference points and slope-stake information on the reference stakes.

Establish slope stakes in the field as the actual point of intersection of the design roadway slope with the natural ground-line when theoretical catch point information is not available.

**(e) Clearing and grubbing limits.** Set clearing and grubbing limits on both sides of centerline based on the actual slope-stake locations.

**(f) Grade-finishing stakes.**

**(1) AMG method.** Construct a 1000-foot (300-meter) long test section using AMG on the project at an approved location before beginning grading operations. Select a test location with superelevation and curve widening transitions if applicable. Notify the CO 10 days before beginning the test section. Demonstrate the capability, knowledge, equipment, and experience to achieve work within tolerances. Allow 14 days to evaluate the test section. Do not start full grading operations until the test section is approved.

Verify the grade elevation and horizontal alignment of roadway grade-finishing operations. Use conventional survey methods at random locations specified by the CO, not to exceed 500-foot (150-meter) intervals. Submit 3D coordinates of grade-finishing quality control checks.

**(2) Conventional survey methods.** Set grade-finishing stakes for grade elevations and horizontal alignment, on centerline and on each shoulder at design roadway cross-section locations. Set stakes at the top of subgrade and the top of each aggregate course. Reset grade finishing stakes as many times as necessary to construct the subgrade and each aggregate course.

During turnout or pullout construction, set stakes on the centerline, on each normal shoulder, and on the shoulder of the turnout. In parking areas, set stakes at the center and along the edges of the parking area. Set stakes in ditches to be paved.

When the centerline curve radius is less than or equal to 250 feet (75 meters), use a maximum longitudinal spacing between stakes of 25 feet (8 meters). When the centerline curve radius is greater than 250 feet (75 meters), use a maximum longitudinal spacing between stakes of 50 feet (15 meters). Use a maximum transverse spacing between stakes of 20 feet (6 meters). Use brushes or guard stakes at each stake.

**(g) Culverts.** Verify and set culvert locations at the inlet, outlet, and inlet basin points according to the plans. Perform the following if culvert design does not fit field conditions:

**(1)** Survey and record the ground profile along the culvert centerline;

**(2)** Determine the slope catch points at the inlet and outlet;

**(3)** Set reference points and record information necessary to determine culvert length and end treatments;

**(4)** Plot to scale the profile along the culvert centerline. Show the natural ground, the flow line, the roadway section, and the culvert including end treatments and other appurtenances. Show elevations, grade, culvert length, and degree of elbow.

*(a)* For single skewed culverts, submit a plotted field-design cross-section normal to roadway centerline and at each end section. Plot the offset and elevation of natural ground at the end section and at proposed template break points between centerline and the end section. Ensure the template design embankment slope is not exceeded;

*(b)* For multiple skewed culverts, submit a plotted field design cross-section normal to roadway centerline and at the end sections (left and right) nearest to the shoulder. Plot the offset and elevation of natural ground at the end section and at proposed template break points between centerline and the end section. Ensure the template design embankment slope is not exceeded;

*(c)* Submit the plotted field-design cross-section for approval of final culvert length and alignment. Plot at a clear and readable scale;

*(d)* Set inlet, outlet, and reference stakes when the field design has been approved. Stake inlet and outlet ditches to make sure the culvert and end treatments (such as drop inlets) are functional; and

*(e)* Adjust slope, reference, and clearing stakes as necessary to provide for culvert inlet treatments in cut slopes. Readjust slope, reference, and clearing stakes as necessary when culvert inlets are moved from their plan locations. Review slope adjustments with the CO and obtain approval.

**(h) Bridges.** Set adequate horizontal and vertical control and reference points for bridge substructure and superstructure components. Establish and reference the bridge chord, bridge tangent, or control lines as specified on the bridge plans. Also establish and reference the centerline of each pier, bent, and abutment.

**(i) Retaining walls and reinforced soil slopes.** Survey and record profile measurements along the face of the proposed wall or reinforced soil slope at 5 feet (1.5 meters) and 10 feet (3 meters) in front of the wall or slope face. Take cross-sections every 25 feet (8 meters) along the length of the wall or reinforced soil slope and at major breaks in terrain within the limits designated by the CO. Measure and record points every 25 feet (8 meters) and at major breaks in terrain for each cross-section. Set additional references and control points to perform the work.

**(j) Borrow and waste sites.** Perform field work necessary for initial layout and measurement of the borrow or waste site. Establish site limits and clearing limits. Measure both original and final ground conditions and submit cross-sections as directed by the CO.

**(k) Permanent monuments and markers.** Perform survey and staking work necessary to establish permanent monuments and markers as described in Section 621 or reestablish monuments as described in Subsection 107.02.

**(l) Miscellaneous survey and staking.** Survey and stake other work (such as guardrail, curb and gutter, turf establishment, utilities, and excavation limits for structures) to the proper location and required tolerances. Propose staking increments for approval by the CO when not specified.

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

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

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

(2) N is the number of instrument setups.

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

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

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

(6) Includes paved ditches.

**152.06 Acceptance.** Construction survey and staking will be evaluated under Subsections 106.02 and 106.04.

Survey notes will be evaluated under Subsection 106.02.



### **Measurement**

**152.07** Measure the Section 152 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

When measuring grade finishing, measure one time for the subgrade and one time for each aggregate course.

When measuring miscellaneous survey and staking paid by the hour; do not measure time spent in making preparations, traveling to and from the project site, performing calculations, plotting cross-sections and other data, processing computer data, and other efforts necessary to successfully accomplish construction survey and staking.

Do not measure re-establishing missing control points or stakes after construction operations have begun.

### **Payment**

**152.08** The accepted quantities will be paid at the contract price per unit of measurement for the Section 152 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Payment for lump sum pay items will be prorated based on the progress of the work under this Section.

## 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).** Provide a QCM according to (1) or (2) below. If neither is specified, conform to (1).

**(1) Full-time, on-site QCM.** Provide a QCM with no responsibilities for performing testing and inspection, managing the project, or performing operations other than managing quality control and the following:

(a) One year experience managing quality control on construction projects of similar type and scope, and

(b) One of the following:

(1) Two years' experience as a construction project manager or superintendent on construction projects of similar type and scope;

(2) Three years' experience as a project engineer, resident engineer, foreman, construction inspector, or equivalent on construction projects of similar type and scope; or

(3) National Institute for Certification in Engineering Technologies (NICET) Level III certification or equivalent in highway construction or highway material.

**(2) Part-time, on-site QCM.** Furnish a QCM who has at least 2 years' experience in highway construction, inspection, quality control, and material testing.

**(b) Inspectors.** Provide inspectors with at least 2 years' experience inspecting projects of similar complexity and with training related to the work to be inspected.

**(c) 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.

**153.07 Records and Control Charts.** Maintain records and control charts by pay item.

**(a) Quality control and construction operations reports.** Submit written quality control and construction operations reports daily according to the QCP. Document meetings, work locations, labor and equipment used including actual hours worked, testing and measurement activities, inspection results, deficiencies observed, corrective actions taken, and process changes. Use FHWA Form 1413, *Inspector's Daily Record of Construction Operations* or approved alternate forms. Include the following certification signed by the QCM on all reports:

*"I certify that the information contained in this record is accurate and that work documented herein complies with the contract. Exceptions to this certification are documented as a part of this record."*

**(b) Control charts.** Maintain linear control charts that identify the test number, test parameter, upper and lower specification limit applicable to each test parameter, and test results for applicable material. Use the control charts to document variability of the process, to identify production and equipment problems, and to identify actions to improve processes or quality.

Update and post control charts daily in a location accessible to the CO. Cease production and correct the process when problems are evident.

**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 154. — CONTRACTOR SAMPLING AND TESTING**

### **Description**

**154.01** This work consists of obtaining samples for testing.

When there is a pay item for Contractor testing included in the bid schedule, this work also includes sampling, testing and reporting the required test results. It excludes Contractor quality control testing required under Section 153.

### **Construction Requirements**

**154.02 General.** Include the work required under this Section in the Section 153 quality control plan.

Sample and test material according to the Sampling, Testing, and Acceptance Requirements tables included at the end of each Section. Perform additional sampling and testing as directed when material does not meet requirements.

Provide the CO the opportunity to witness sampling, splitting, and testing of material.

Where process control sampling and testing frequencies are identical to the sampling and testing frequencies for acceptance, the process control samples may be used for acceptance for the applicable work.

**154.03 Sampling.** Sample and split samples according to AASHTO or other acceptable procedures. The location of statistical acceptance sampling will be provided using a random number system. Perform splits when required and deliver the Government's portion of the sample or split sample in an acceptable container suitable for shipment. Label samples with the following:

- (a) Project number and name;
- (b) Pay item number and description;
- (c) Source of material;
- (d) Sample number;
- (e) Date sampled;
- (f) Time sampled;
- (g) Location sample taken;
- (h) Name of person sampling;
- (i) Name of person witnessing sampling; and
- (j) Type of test required on sample.

**154.04 Testing.** Perform tests when there is a pay item for Contractor testing included in the bid schedule. Demonstration of testing competence may be required.

**154.05 Records.** When tests are on material being incorporated in the work, report test results within 24 hours unless specified otherwise in the Sampling, Testing, and Acceptance Requirements tables. Report test results on forms containing sample information required by Subsection 154.03. Label interim measurements used to determine the results. Attach work sheets used to determine test values to the test result forms. Payment for work may be delayed or the work stopped until test results are submitted.

**154.06 Acceptance.** Contractor sampling and testing will be evaluated under Subsections 106.02 and 106.04 based on Government verification testing.

### **Measurement**

**154.07** Measure the Section 154 pay items listed in the bid schedule according to Subsection 109.02.

### **Payment**

**154.08** The accepted quantities will be paid at the contract price per unit of measurement for the Section 154 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 Contractor testing lump sum will be paid as follows:

- (a) 25 percent of the pay item amount, not to exceed 0.5 percent of the original contract amount, will be paid after the testing facilities are in place, qualified sampling and testing personnel are identified, and the work being tested has started.
- (b) Payment for the remaining portion of the pay item amount will be prorated based on the total work completed in Section 154.

Payment may be retained if Government verification testing does not validate the Contractor testing or if it is determined that documentation of sampling and testing does not meet requirements.

## Section 155. — SCHEDULES FOR CONSTRUCTION CONTRACTS

### Description

**155.01** This work consists of scheduling and monitoring the progress of construction activities.

#### **155.02 Definitions.**

**(a) Construction schedule.** A progress time-scaled logic diagram, tabular schedule, written narrative, and submittal list.

**(b) Preliminary construction schedule.** A written narrative and a schedule diagram of contract activities for the first 60 days after the effective date issued in the Notice to Proceed. A schedule diagram consists of either a Bar Chart Method (BCM) or a Critical Path Method (CPM).

**(c) Initial construction schedule.** The first approved BCM or CPM construction schedule submitted after the preliminary construction schedule. Once approved the initial construction schedule becomes the first baseline construction schedule.

**(d) Baseline construction schedule.** The current approved initial construction schedule in which subsequent construction schedule updates are based on.

**(e) Baseline construction schedule update.** The normal monthly updating of the currently approved baseline schedule with no changes in the schedule logic or activities and no changes to the critical path.

**(f) Baseline construction schedule revision.** A significant change to the schedule logic, schedule activities or activity durations, or some other modification to the schedule of planned work. Activities performed out of sequence from the baseline schedule affecting the critical path require a revision. A baseline schedule revision may show construction being completed at a date other than the contract completion date.

### Construction Requirements

**155.03 General.** Follow the requirements of FAR Clause 52.236-15 Schedules for Construction Contracts.

Designate an individual in the Contractor's organization who will be the authorized representative responsible for the construction schedule. Identify the representative before or at the preconstruction conference.

When preparing schedules, show completion of work within the contract time.

**155.04 Preliminary Construction Schedule.** Do not begin work, except mobilization, traffic control, and Section 637 work, without an approved preliminary construction schedule. No progress payments will be made until a preliminary construction schedule has been approved.



Submit a written narrative that includes:

- (a) A title page stating the contract number, project number, project name, Contractor name, current contract completion date, date of submittal, submittal number and schedule name designated as preliminary construction schedule;
- (b) A description of the work to be done within each activity including the type and quantity of equipment, labor, and material to be used;
- (c) A description of the planned production rates by pay item units;
- (d) A description of the work days per week, number of shifts per day, and number of hours per shift. Include calendars used in the schedule module;
- (e) Estimated periods during which an activity is idle or partially idle. Show the beginning and end dates for reduced production or idle time;
- (f) Identification of the vendor, supplier, or subcontractor to perform the activity. State assumptions made in scheduling their work;
- (g) A description of site mobilization (such as dates of expected material shipments, planned dates for equipment arrivals, office setup, material laboratory arrival and setup, and anticipated portable crusher or batch plant setup);
- (h) A list of drawing and sample submittals; and
- (i) The fabrication and delivery of key and long-lead procurement activities.

Submit 2 copies of a preliminary construction schedule at least 7 days before the preconstruction conference. Within 7 days after the preconstruction conference, the preliminary construction schedule will be approved or rejected. If rejected, submit a revised schedule within 3 days.

The preconstruction conference will be rescheduled if the CO does not receive the schedule 7 days before the scheduled preconstruction conference date. Contract time will not be extended for failure to submit a preliminary construction schedule by the date required.

**155.05 Initial and Baseline Construction Schedule.** Prepare and submit a Critical Path Method (CPM) initial construction schedule unless otherwise required by the contract.

- (a) **Bar Chart Method (BCM).** Include the contract number, project number, project name, Contractor name, current contract completion date, date of submittal, and submittal number.

**(1) Progress bar chart.**

- (a) Use a time scale to graphically show the percentage of work scheduled for completion during the contract time;
- (b) Define and relate activities to the contract pay items;
- (c) Show activities in the order the work will be performed, including submittals, submittal reviews, fabrication, and delivery;

- (d) Show critical (major) activities that are controlling factors in the completion of the work;
- (e) Show the time needed to perform each activity and its relationship in time to other activities;
- (f) Show the total expected time to complete work; and
- (g) Provide enough space for each activity to permit two additional plots parallel to the original time span plot. Use one space for revision of the planned time span, and one for showing actual time span achieved.

**(2) Written narrative.** Submit a written narrative of the activities displayed in the progress bar chart. The following applies to the written narrative:

- (a) Estimate starting and completion dates of each activity;
- (b) Describe work to be done within each activity including the type and quantity of equipment, labor, and material to be used;
- (c) Describe the location on the project where each activity occurs;
- (d) Describe planned production rates by pay item quantities (such as quantity of excavation per day or week);
- (e) Describe work days per week, holidays, number of shifts per day, and number of hours per shift;
- (f) Estimate periods during which an activity is idle or partially idle. Show the beginning and end dates for reduced production or idle time;
- (g) Describe expected and critical delivery dates for equipment or material that can affect completion of the project;
- (h) Describe critical completion dates for maintaining the construction schedule; and
- (i) Identify the vendor, supplier, or subcontractor to perform the activity. State assumptions made in the scheduling their work.

**(3) Bar Chart Method updates.** Review the construction schedule to verify or adjust: start and finish dates of activities underway, remaining duration of uncompleted activities, and finish dates of completed activities. Inform the CO of changes.

Submit 2 copies of an updated construction schedule with each progress estimate or every 30 days, whichever is less or within 2 days of:

- (a) A delay occurs in the completion of a critical (major) activity;
- (b) A delay occurs which causes a change in a critical activity;
- (c) The actual prosecution of the work is different from that represented on the current construction schedule;
- (d) There is an addition, deletion, or revision of activities caused by a contract modification; or
- (e) There is a change in the schedule logic.

**(b) Critical Path Method (CPM).** Prepare an initial construction schedule using a CPM that is computer-generated. Submit an initial construction schedule that includes all activities, contractual requirements (such as construction or traffic staging), contract restrictions, and subcontract work.

**(1) Format.** Prepare a construction schedule diagram and supporting documents as follows:

- (a) A title page or header block for each component (time-scaled logic diagram, tabular schedule, written narrative, and submittal list) with the contract number, project number, project name, Contractor name, current fixed completion date, date of submittal, and submittal number.
- (b) A schedule diagram using the activity-on-arrow diagram method (ADM) or the precedence diagram method (PDM). Depict the order and interdependence of all activities and the sequence of the work that will be accomplished by the Contractor in coordination with its subcontractors. Show how the completion of predecessor activities restricts the start of successor activities.

**(2) Time-scaled logic diagram.**

- (a) Show all activities including those in the preliminary construction schedule. Add items for correcting punch-list items, and general cleanup. Relate an activity or groups of activities to the contract pay items;
- (b) Show all activity nodes or boxes, activity IDs, activity descriptions, and durations;
- (c) Group the activities independently by area (that is separate distinct bridges or roadways) and by type of work (such as submittals, utilities, roadway, and bridge);
- (d) Include a description of the work represented by each activity at or near the event node or box for each activity;
- (e) Code each subcontractor's activities so that its activities can be shown separately as well as cumulatively;
- (f) Show durations for construction activities as whole working days, with a maximum duration of 30 working days each. Divide activities with longer durations into subgroups of activities not exceeding 30 working days in duration. Indicate logical start and end points (such as stationing and staging) for each subgroup;
- (g) Show the durations of non-construction activities. Non-construction activities include mobilization, drawing and sample submittals by pay item number, and the fabrication and delivery of key material. Non-construction activities may have durations exceeding 30 working days consistent with the contract. Indicate intended submittal dates and delivery dates for fabrication and delivery activities. Allow for review, approval, and distribution of each submittal or resubmittal. Where no times are specified, allow 14 days for the review, approval, and distribution of each submittal or resubmittal after receipt by the CO;
- (h) Indicate the total number of anticipated working days to complete each activity of work;
- (i) Identify the critical path on the diagram; and

(j) Begin the construction schedule diagram with the date of the Notice to Proceed and include the contract completion date. Float time within the construction schedule is not for use or benefit of either party, but is a jointly owned project resource available to both parties as needed to meet the completion date established in the contract.

**(3) Tabular schedule.** Submit a tabular schedule sorted by early start and total float. Include the following information in the tabular schedule:

- (a) Activity ID;
- (b) Activity description;
- (c) Subcontractors codes;
- (d) Activity percent complete;
- (e) Original and remaining duration;
- (f) Early and late schedule dates;
- (g) Total float;
- (h) A predecessor/successor report; and
- (i) Other tabular schedule report formats if requested by the CO for analyzing CPM revisions or time impacts.

**(4) Written narrative.** Submit a written narrative describing the rationale and assumptions utilized in the development of the construction schedule. Use the time-scaled logic diagram as the basis of schedule-related comments, referencing specific activities by number and description. Include the following:

- (a) Describe the planned critical path and the general sequence of work;
- (b) Information and references to adequately define the scope of work by pay item included in each major activity type (such as roadway excavation and aggregate base course). Include such information as station numbers, location, etc.;
- (c) Describe the resource loading planned for use in the performance of the work for each major activity. The description should include manpower allocation by types of labor and crew size, types and number of equipment and special equipment, material, and subcontractors involved;
- (d) Describe the basis (including the resource loading above) for the calculation of the duration for all major activities, to be stated as quantity production rates (such as quantity of excavation per day);
- (e) Describe work days per week, number of shifts per day, and number of hours per shift;
- (f) A description of the assumptions used in converting working days to calendar dates. Include anticipated holidays, non-work days, winter shutdowns, and other constraints within the contract;
- (g) Identify the subcontractor or supplier performing an activity and identify their activity codes used on the schedule diagram. State assumptions made in the scheduling of the subcontractor's or supplier's work;

- (h) Describe expected and critical delivery dates for equipment or material that can affect completion of the project;
- (i) A description of organizational limitations (such as resource constraints or subcontractor commitments) which limit scheduling flexibility;
- (j) Ensure that there is no conflict between the diagram and the narrative;
- (k) An explanation of the schedule's Work Breakdown Structure (WBS), and Activity ID protocol to be use throughout the life of the work; and
- (l) A list and description of constraints used in the CPM scheduling software.

**(5) Submittal list.**

- (a) Submit a list of drawings and other submittals by pay item number required for the entire contract period.
- (b) Include the following information for each submittal:
  - (1) Pay item number and description;
  - (2) Related activity ID number and description from the CPM;
  - (3) Planned date of initial submittal;
  - (4) Planned date of CO's initial response; and
  - (5) Other comments.

**(f) Submission and approval** Submit 2 paper copies and one electronic copy of the initial construction schedule within 45 days after the effective date of the Notice to Proceed has been issued. Submit an electronic copy via media approved by the CO. In case of discrepancy between the paper version and the electronic version, the paper version will govern over the electronic version of the schedule.

Allow 14 days for the approval or rejection of the schedule. If rejected, submit corrected schedule within 7 days after the date of the rejection of the schedule. If rejected, schedule a meeting within 3 days to discuss corrections.

The approved copy of the initial construction schedule with supporting documents becomes baseline construction schedule. Implement and execute the work under the contract according to the baseline construction schedule. Update the baseline construction schedule according to Subsection 155.06.

Failure to include elements of work in the construction schedule diagram that are required for performance of the contract, even when approved by the Government, will not excuse the Contractor from completing the work required by the contract completion date.

**155.06 Baseline Schedule Update.** Submit a baseline construction schedule update no less than 7 days before the closing date for the progress estimate or every 30 days, whichever is less. Show completion of work within the contract time. No progress payment will be made for any work until an updated construction schedule is approved by the CO.

Unless previously approval by the CO, changes to the construction schedule for work that is still to be completed, can only be changed with a Time Impact Analysis according to Subsection 108.03, and a Baseline Construction Schedule revision according to Subsection 155.08. Receipt of a baseline construction schedule update with negative float does not constitute agreement by the Government of the revised completion date.

**(a) Written narrative.** Submit an update of the initial or previous written narrative identifying adjustments made to each operation since the last update. Adjustments include, but are not limited to the following:

- (1) Equipment added or removed from the project;
- (2) Changes to labor (such as added crews or subcontractors);
- (3) Work shift adjustments (such as extended hour or added shifts);
- (4) Periods of anticipated suspension or holiday;
- (5) Changes in material delivery;
- (6) Early completion of individual work items; and
- (7) Efficiency of operations

**(b) Submittal list.**

- (1) Actual dates of initial (and expected dates for all subsequent) submittals;
- (2) Actual dates of CO's initial (and expected dates for subsequent) responses;
- (3) Status of CO's responses (that is approved, rejected, or approved as noted); and
- (4) Comments.

**(c) Bar Chart Method updates.** Submit 2 paper copies of an updated baseline construction schedule. Verify or adjust: start and finish dates of activities underway, remaining duration of uncompleted activities, and finish dates of completed activities. Include the initial time span plot adjacent to the updated span plot for each work activity.

**(d) Critical Path Method updates.** Submit 2 paper copies and one electronic copy of the construction schedule update. Provide an electronic copy via media approved by the CO. In case of discrepancy between the paper version and the electronic version, the paper version will govern over the electronic version of the schedule.

**(1) Tabular schedule:**

- (a) Actual finish dates for completed activities;
- (b) Remaining duration required to complete each activity started, or scheduled to start, but not completed;
- (c) Float remaining for each activity;
- (d) Percentages for completed and partially completed activities; and
- (e) Additional tabular schedules using different sort parameters when requested by the CO.

**(2) Updated time-scaled logic diagram.**

**(e) Review and approval of a construction schedule update.** The CO will review and approve the baseline construction schedule update within 7 days or return it for corrections. The approved baseline construction schedule revision will become the new baseline construction schedule.

**155.07 Baseline Schedule Revision.** Submit a time impact analysis when requesting approval of a baseline schedule revision. Submitting a proposed baseline schedule revision is not considered a notification of delay or of other basis for change. Continue to submit monthly schedule updates according to Subsection 155.08 until a baseline construction schedule revision is approved.

**(a) Time impact analysis.** Perform a time impact analysis according to Subsection 108.03 within 20 days of impacts caused by:

- (1)** Changes in the resource loading, durations, specifications, subcontractors;
- (2)** Addition or deletion of work;
- (3)** Increased or decreased quantities;
- (4)** Defective work;
- (5)** Acceleration of the work; or
- (6)** Other changes.

**(b) Bar Chart Method revisions.** Submit a bar chart according to Subsection 155.05(a) which includes revised construction activities affected by impacts addressed with a time impact analysis. Include a revised completion date for the total work.

**(c) Critical Path Method revisions.** Submit a tabular schedule and time-scaled logic diagram according to Subsection 155.05(b) which includes revised construction activities affected by impacts addressed with a time impact analysis. Include a revised critical path and completion date for the total work.

**(d) Written narrative.** Submit a written narrative according to Subsection 155.05 describing the changes to the critical path and logic revisions. Identify delays and disruptions which are ongoing as of the date of the proposed revision. When delays or disruptions have occurred which are the responsibility of the Contractor; propose efforts to return the project to a schedule consistent with the terms of the contract including the commitment of additional resources or other appropriate action. Notify the CO which completion dates or other terms of the contract will not be met.

**155.08 Acceptance.** Construction schedules and supporting documents will be evaluated under Subsection 106.02 and Subsection 109.08(a).

### **Measurement**

**155.09** Measure the Section 155 pay items listed in the bid schedule according to Subsection 109.02.

### **Payment**

**155.10** The accepted quantities will be paid at the contract price per unit of measurement for the Section 155 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 construction schedule lump sum will be paid as follows:

**(a)** 25 percent of the pay item amount, not to exceed 0.5 percent of the original contract amount, will be paid after the initial baseline construction schedule is approved.

**(b)** Payment of the remaining portion of the lump sum pay item will be prorated based on the total work completed.



## Section 156. — PUBLIC TRAFFIC

### Description

**156.01** This work consists of controlling and protecting public traffic adjacent to and within the project. See FAR Clause 52.236-13 Accident Prevention.

### Material

**156.02** Conform to the following Section:

Temporary traffic control

635

### Construction Requirements

**156.03 Qualifications.** Provide a traffic control supervisor certified by a state department of transportation, ATSSA, or other acceptable certification programs.

**156.04 Accommodating Traffic During Work.** Accommodate traffic according to the MUTCD, contract traffic control plan, Section 635, and this Section. An alternate traffic control plan may be submitted for approval according to Subsection 104.03. Submit alternate traffic control plans at least 30 days before intended use.

Perform work in a manner that ensures the safety and convenience of the public and protects the residents and property adjacent to the project. Accommodate public traffic on roads adjacent to and within the project until the project is accepted according to Subsection 106.07(b).

**156.05 Maintaining Roadways During Work.** Maintain roadways as follows:

- (a) Construct and remove diversion roads and bridges as required by the traffic control plan;
- (b) Maintain intersections with trails, roads, streets, businesses, parking lots, residences, garages, farms, and other features;
- (c) Snow removal to facilitate the work is the Contractor's responsibility. Snow removal to provide public access is the responsibility of the maintaining agency and will be performed at the maintaining agency's discretion. Allow the maintaining agency access to perform snow removal;
- (d) Maintain a dust-free traveled way such that visibility and air quality are not affected and a hazardous condition is not created;
- (e) Remove accumulations of soil and other material from traveled way;
- (f) Do not allow water to pond on the traveled way; and
- (g) Maintain the roadway, detours, and diversions in a safe and acceptable condition.

If corrective action is requested and the corrective action is not taken immediately, the condition may be corrected and the cost of the corrective action deducted from monies due the Contractor.

**156.06 Maintaining Roadways During Non-Work Periods.** Maintain roadways and traffic control for public traffic during periods when work is not in progress. Snow removal to provide public access is the responsibility of the maintaining agency.

**156.07 Limitations on Construction Operations.** When the roadway is open to public traffic, restrict operations as follows:

- (a) Operate equipment in the direction of traffic, where practical;
- (b) For shoulder drop-offs of 3 inches (75 millimeters) or less, provide "*Low Shoulder*" warning signs. For shoulder drop-offs in excess of 3 inches (75 millimeters), provide a 1V:3H fillet with "*Shoulder Drop-Off*" warning signs. Complete the construction of shoulders adjacent to traffic lanes to the same elevation within 14 days;
- (c) Provide minimum lane widths of 10 feet (3 meters). Use barricades, drums, or other acceptable devices to delineate traffic lanes through areas where the edge of pavement or intended path has been obliterated by construction operations;
- (d) Locate staging areas at least 30 feet (9 meters) from the traveled way or behind acceptable traffic barriers. Obtain approval of the location and access to staging areas. Store unused traffic control devices at staging areas;
- (e) Park equipment at least 30 feet (9 meters) from the traveled way or behind acceptable traffic barriers;
- (f) Provide parking areas for employee's personal vehicles in approved areas;
- (g) Provide uninterrupted two-way communications between flaggers and also between flaggers and pilot cars unless flaggers are able to see each other and communicate. Use communications devices approved by the CO. Citizen band radios are unacceptable. Make communication devices available to the CO as necessary;
- (h) Where switching traffic to a completed lane, provide adequate personnel and equipment to set or relocate traffic control devices;
- (i) Limit construction-caused delays to public traffic to a maximum of 30 minutes per passage through the project; and
- (j) Maintain existing guardrails, barriers, and bridge railings until removal is necessary for construction. Use a temporary barrier or appropriate channelizing devices while the guardrails and bridge rails are absent. Install permanent barriers, guardrails, and bridge rails as soon as possible to minimize risk to the public.

**156.08 Nighttime Operations.** Perform construction operations during the hours of daylight (one-half hour after sunrise to one-half hour before sunset).

Where night operations are permitted, submit a night lighting system for approval. Include the light types, locations, and the manner in which the lights will be moved. Submit the proposed system at least 14 days before use. Use an independent source other than vehicle headlights. Do not use incandescent lights. Furnish and install the approved system to illuminate the entire work area. Position the lights so they do not shine directly at motorists traveling from any direction. If the operation is moving, move the lighting with the operation. Provide lighting at each flagger location. Equip vehicles with an exterior flashing yellow dome light.

**156.09 Traffic Control Supervisor.** Provide a traffic control supervisor according to Subsection 156.03. Do not designate the superintendent as the traffic control supervisor. Furnish the traffic control supervisor's name, address, and 24-hour telephone numbers at the preconstruction conference. During the contract, including periods of suspensions and work stoppages, perform the following:

- (a) Implement the traffic control plan.
- (b) Coordinate traffic control operations, including those of subcontractors and suppliers.
- (c) Ensure the condition, position, and applicability of traffic control devices in use.
- (d) Immediately correct traffic control deficiencies.
- (e) Coordinate traffic control maintenance operations with the CO.
- (f) Coordinate and ensure that traffic control devices are furnished, installed, maintained, removed, stored, replaced, relocated and cleaned according to Subsection 635.04. Ensure unused traffic control devices are properly handled and stored.
- (g) Conduct weekly traffic safety meetings for construction workers, and invite the CO to these weekly meetings.
- (h) Submit a weekly certification that inspections and reviews were conducted and that the traffic control devices meet contract requirements. Include the number and types of devices in use. Report with the weekly certification, changes or corrective actions taken to ensure the safe passage of public traffic through the project.
- (i) Inspect traffic control devices, including those in staging, storage, material sources, and disposal areas, as follows:
  - (1) Daily during daylight hours when daylight work is being performed;
  - (2) Daily during hours of darkness when nighttime work is being performed;
  - (3) Weekly during:
    - (a) Daylight hours and hours of darkness when work is suspended for periods of more than one week, except when the project has been shut down for the winter; and
    - (b) Periods of winter suspension, inspect only as requested by the CO.
  - (4) Additional inspections, day or night, as directed by the CO; and
  - (5) Submit reports of inspections in an acceptable format within 2 days.

(j) Before winter suspension, conduct an inspection of the project with the CO to ensure proper provisions are made for winter travel during the period of suspension.

(k) Provide temporary flagging assistance.

**156.10 Acceptance.** Public traffic work will be evaluated under Subsection 106.02.

Traffic control devices and services will be evaluated under Section 635.

### **Measurement and Payment**

**156.11** Do not measure controlling and protecting public traffic for payment. See Subsection 109.05.

Measure temporary traffic control under Section 635.

Measure dust abatement under Section 158 or 312.

## 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	704.03
Concrete masonry unit	725.07(c)
Fertilizer	713.03
Fiber rolls and socks	713.12
Floating turbidity curtains	713.21
Gravel bags	713.13
Mulch	713.05
Plastic lining	725.12
Prefabricated filter insert	713.20
Riprap	705.02
Rock mulch	705.07
Sandbags	713.14
Sediment filter bags	713.19
Seed	713.04
Separation and stabilization geotextile and geotextile filter	714.01(a)
Silt fence	713.16
Tackifiers	713.11(a)
Temporary culvert pipe	713.15
Temporary plastic fence	710.11
Temporary rolled erosion control products	713.17
Turf reinforcement mats	713.18
Water	725.01(b)

### 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.** Provide soil erosion and sediment control measures according to the contract erosion and sediment control plan, contract permits, Section 107, and this Section. Contract permits amend the requirements of this Section. Do not modify the type, size, or location of controls or practices without approval.

The erosion and sediment control plan reflects special concerns and measures to protect resources. An alternate erosion and sediment control or stormwater pollution prevention plan, with necessary permits, may be submitted for approval according to Subsection 104.03. Submit alternate erosion and sediment control proposals at least 30 days before their intended use.

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

If wood chips are used, do not import without approval from the CO.

**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.

**157.09 Water Crossings.** Construct temporary culvert pipe at temporary crossings where construction vehicles cross a live waterway.

**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**

<b>Material</b>	<b>Application Rate pounds/acre (kilograms/hectares)</b>
Seed	45 (50)
Wood fiber or grass straw cellulose fiber mulch	1500 (1700) <sup>(1)</sup>

(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.

## Section 158. — WATERING FOR DUST CONTROL

### Description

**158.01** This work consists of furnishing and applying water for the control of dust caused by the work and public travel.

### Material

**158.02** Conform to the following Subsection:

Water

725.01(c)

### Construction Requirements

**158.03 General.** Provide an adequate water supply and apply water uniformly across the traveled way as necessary to control dust. Uniformly apply water using pressure-type distributors, pipelines equipped with spray systems, or hoses with nozzles.

**(a) Project dust control for public benefit.** Control dust within the construction limits as necessary including nights, weekends, and periods of non-work when the project is open to public traffic. When the project is not open to public traffic, control dust in areas of the project that have adjacent residences or businesses. Control dust on approved, active detours established for the project. Apply water at the locations, rates, and frequencies as ordered.

**(b) Other dust control.** Control dust on active haul roads, in pits and staging areas, and on the project during periods not covered in Subsection 158.03(a).

**158.04 Acceptance.** Water will be evaluated under Subsection 106.02.

Furnishing and applying water will be evaluated under Subsection 106.02.

### Measurement

**158.05** Measure the Section 158 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

When measuring water for dust control by volume or mass; measure in the hauling vehicle, or by metering.

Do not measure water for dust control applied according to Subsection 158.03(b).

### Payment

**158.06** The accepted quantities will be paid at the contract price per unit of measurement for the Section 158 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.



**DIVISION 200  
EARTHWORK**

## Section 201. — CLEARING AND GRUBBING

### Description

**201.01** This work consists of clearing and grubbing within the clearing limits designated in the plans.

### Material

**201.02** Conform to the following Subsections:

Backfill material	704.03
Tree wound dressing	713.08(g)

### Construction Requirements

**201.03 General.** Construct erosion control measures according to Section 157. Perform work within designated limits.

Do not damage vegetation designated to remain. If damage occurs, repair or replace the vegetation in an acceptable manner. Where possible, preserve vegetation adjacent to bodies of water. Treat cuts or scarred surfaces of trees and shrubs with tree wound dressing.

**201.04 Clearing.** Within the clearing limits clear trees, brush, downed timber, and other vegetation as follows:

- (a) Cut trees so they fall within the clearing limits;
- (b) In areas of cut slope rounding, cut stumps flush with or below the final ground-line;
- (c) In areas outside the excavation, embankment, and slope rounding limits, cut stumps to within 6 inches (150 millimeters) of the ground; and
- (d) Trim tree branches that extend over the road surface and shoulders to attain a clear height of 20 feet (6 meters). If required, remove other branches to present a balanced appearance. Trim according to accepted tree surgery practices. Treat wounds with tree wound dressing.

**201.05 Grubbing.** Grub deep enough to remove stumps, roots, buried logs, moss, turf, or other vegetative debris as follows:

- (a) Grub areas to be excavated, except for cut slope rounding areas;
- (b) Grub embankment areas. Undisturbed stumps less than 24 inches (600 millimeters) in diameter may be left in place if they protrude less than 6 inches (150 millimeters) above the original ground and will be covered with more than 48 inches (1200 millimeters) of embankment. Remove all other stumps;
- (c) Grub pits, channel changes, and ditches only to the depth necessary for the excavation; and
- (d) Backfill stump holes and other grubbing holes with backfill material to the level of the surrounding ground according to Subsection 209.09. Compact backfill according to Subsection 209.10.

**201.06 Disposal.** Merchantable timber is the Contractor's property. Dispose of clearing and grubbing debris according to Subsection 203.05.

**201.07 Acceptance.** Clearing and grubbing will be evaluated under Subsection 106.02.

Material for tree wound dressing will be evaluated under Subsection 106.03.

Backfilling and compacting of stumps and grubbing holes will be evaluated under Section 209.

### **Measurement**

**201.08** Measure the Section 201 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

Do not make deductions from the area computation unless excluded areas are shown in the plans.

Do not measure clearing and grubbing of borrow or material sources.

### **Payment**

**201.09** The accepted quantities will be paid at the contract price per unit of measurement for the Section 201 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

## **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:

Backfill material	704.03
Minor concrete	601

### 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  $\frac{3}{4}$  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  $\frac{3}{4}$ -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, select 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:

Select borrow	704.07
Topping	704.05
Unclassified borrow	704.06
Water	725.01(c)

## Construction Requirements

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

Road pioneering may proceed concurrently with excavation and embankment. Maintain drainage during pioneering operations.

**204.05 Conserved Topsoil.** 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 topsoil from other excavated material.

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.

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. Place backfill 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 backfill.

**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. Construct embankments as follows:

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

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

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

- (b) **Embankment within the roadway prism.** Place embankment material in horizontal layers not exceeding 12 inches (300 millimeters) in compacted thickness. Incorporate oversize boulders or rock fragments into the 12-inch (300-millimeter) layers by reducing them in size or placing them individually as required by Subsection 204.10(c). Compact each layer according to Subsection 204.11 before placing the next layer.

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

- (1) Reduce rock to less than 48 inches (1200 millimeters) in the largest dimension;
- (2) Distribute rock within the embankment to prevent nesting;



(3) Place layers of embankment material around each rock to a depth not greater than that permitted by Subsection 204.10(b). 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.** For compaction, use AASHTO T 27 to determine the quantity of material retained on a No. 4 (4.75-millimeter) sieve. Compact as follows:

**(a) 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:

(1) 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;

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

(3) 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), 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)(2) and (3), by eight passes.

**(b) 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).

**(c) 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 180, Method D. For other material classifications, determine the optimum moisture content and 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.

**204.12 Ditches.** Slope, grade, and shape ditches. Remove projecting roots, stumps, rock, or similar matter. Maintain ditches 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 slopes, ditches, culverts, riprap, and other underground minor structures before placing aggregate courses. Slope, shape, and finish 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.

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

**(b) Stepped slopes.** Where required, construct steps on slopes of  $1\frac{1}{3}V:1H$  to  $1V:2H$ . Construct the steps approximately 18 inches (450 millimeters) high. Blend the steps into natural ground at the end of the cut. If the slope contains non-rippable rock outcrops, blend steps into the rock. Remove loose material found in transitional area. Except for removing large rocks that may fall, scaling stepped slopes is not required.

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

**(d) Finishing.** 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. Finish roadbeds that are compacted according to Subsection 204.11(b) and (c) to within  $\pm 0.05$  foot ( $\pm 15$  millimeters) of the staked line and grade. Finish roadbeds that are compacted according to Subsection 204.11(a) to within  $\pm 0.10$  foot ( $\pm 30$  millimeters) of the staked line and grade. Finish ditch cross-sections to within  $\pm 0.10$  feet ( $\pm 30$  millimeters) of the staked line and grade. Maintain proper ditch drainage.

**204.14 Disposal of Unsuitable or Excess Material.** Dispose of unsuitable or excess material 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 Section 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, select borrow, and topping.** When measuring by the cubic yard (cubic meter) measure in its original position. If borrow excavation is measured by the cubic yard (cubic meter) in-place, take initial cross-sections of the ground surface after stripping overburden. Upon completion of excavation and after the borrow source waste material is returned to the source, retake cross-sections before replacing the overburden.

Do not measure borrow excavation until suitable roadway excavation is depleted.

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

**(1)** Include the following volumes in embankment construction:

- (a) Roadway embankments;
- (b) Material used to backfill subexcavated areas, holes, pits, and other depressions;
- (c) Material used to restore obliterated roadbeds to original contours; and
- (d) Material used for dikes, ramps, mounds, and berms.

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

- (a) Preparing foundations for embankment construction;
- (b) Adjustments for subsidence or settlement of the embankment or of the foundation on which the embankment is placed; and
- (c) Material used to round fill slopes.

**(d) Rounding cut slopes.** Measure rounding cut slopes horizontally along the centerline of the roadway.

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

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

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

### **Payment**

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

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

<b>Material or Product (Subsection)</b>	<b>Type of Acceptance (Subsection)</b>	<b>Characteristic</b>	<b>Category</b>	<b>Test Methods Specifications</b>	<b>Sampling Frequency</b>	<b>Point of Sampling</b>	<b>Split Sample</b>	<b>Reporting Time</b>
<b>Source</b>								
Topping (704.05)	Measured and tested for conformance (106.04 & 105)	Classification <sup>(1)</sup>	—	AASHTO M 145	1 per soil type and source of material	Source of material	Yes	Before using in work
Unclassified borrow (704.06)	"	"	—	"	"	"	"	"
Select borrow (704.07)	"	"	—	"	"	"	"	"
		Gradation	—	AASHTO T 27 & T 11	"	"	"	"
		Liquid limit	—	AASHTO R 58 & T 89, Method A	"	"	"	"

**Table 204-1 (continued)  
Sampling, Testing, and Acceptance Requirements**

<b>Material or Product (Subsection)</b>	<b>Type of Acceptance (Subsection)</b>	<b>Characteristic</b>	<b>Category</b>	<b>Test Methods Specifications</b>	<b>Sampling Frequency</b>	<b>Point of Sampling</b>	<b>Split Sample</b>	<b>Reporting Time</b>
<b>Production</b>								
Topping (704.05)	Measured and tested for conformance (106.04)	Moisture-density	–	AASHTO T 180, Method D <sup>(2)</sup> or T 99, Method C <sup>(2)</sup>	1 per soil type, but not less than 1 per each 13,000 yd <sup>3</sup> (10,000 m <sup>3</sup> )	Processed material	Yes	Before using in work
		Density	–	AASHTO T 310 or other approved procedures	1 per 3500 yd <sup>2</sup> (3000 m <sup>2</sup> ), but not less than 1 per layer	In-place	No	Before placement of next layer
Unclassified borrow (704.06)	"	Moisture-density	–	AASHTO T 180, Method D <sup>(2)</sup> or T 99, Method C <sup>(2)</sup>	1 per soil type, but not less than 1 per each 13,000 yd <sup>3</sup> (10,000 m <sup>3</sup> )	Processed material	Yes	Before using in work
		Density	–	AASHTO T 310 or other approved procedures	1 per 3500 yd <sup>2</sup> (3000 m <sup>2</sup> ), but not less than 1 per layer	In-place	No	Before placement of next layer

**Table 204-1 (continued)**  
**Sampling, Testing, and Acceptance Requirements**

<b>Material or Product (Subsection)</b>	<b>Type of Acceptance (Subsection)</b>	<b>Characteristic</b>	<b>Category</b>	<b>Test Methods Specifications</b>	<b>Sampling Frequency</b>	<b>Point of Sampling</b>	<b>Split Sample</b>	<b>Reporting Time</b>
<b>Production (continued)</b>								
Select borrow (704.07)	Measured and tested for conformance (106.04)	Classification	–	AASHTO M 145	1 per soil type, but not less than 1 for each day of production	Processed material	Yes	Before using in work
		Gradation	–	AASHTO T 27 & T 11	"	"	"	"
		Liquid limit	–	AASHTO R 58 & T 89, Method A	"	"	"	"
		Moisture-density	–	AASHTO T 180, Method D <sup>(2)</sup> or T 99, Method C <sup>(2)</sup>	1 per soil type, but not less than 1 per each 13,000 yd <sup>3</sup> (10,000 m <sup>3</sup> )	"	"	"
		Density	–	AASHTO T 310 or other approved procedures	1 per 3500 yd <sup>2</sup> (3000 m <sup>2</sup> ), but not less than 1 per layer	In-place	No	Before placement of next layer



**Table 204-1 (continued)  
Sampling, Testing, and Acceptance Requirements**

<b>Material or Product (Subsection)</b>	<b>Type of Acceptance (Subsection)</b>	<b>Characteristic</b>	<b>Category</b>	<b>Test Methods Specifications</b>	<b>Sampling Frequency</b>	<b>Point of Sampling</b>	<b>Split Sample</b>	<b>Reporting Time</b>
<b>Production (continued)</b>								
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 <sup>(2)</sup> or T 99, Method C <sup>(2)</sup>	1 per soil type, but not less than 1 per each 13,000 yd <sup>3</sup> (10,000 m <sup>3</sup> )	"	"	"
		Density	–	AASHTO T 310 or other approved procedures	1 per 3500 yd <sup>2</sup> (3000 m <sup>2</sup> ), but not less than 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 yd <sup>2</sup> (2000 m <sup>2</sup> ), but not less than 1 per layer	In-place	No	Before placement of next layer
<b>Finished Product</b>								
Roadbed (204.13)	Measured and tested for conformance (106.04)	Final line & grade	–	Field measured	Determined by the CO	Determined by the CO	No	Before placement of next layer

(1) Not required when using Government-provided source.

(2) Minimum 5 points per proctor.

## Section 205. — ROCK BLASTING

### Description

**205.01** This work consists of rock fragmentation blasting using production and controlled blasting techniques to construct engineered rock cuts.

### 205.02 Definitions.

**(a) Production blasting.** Blasting using widely spaced blast holes that typically contain larger explosive charges to expedite movement and fragmentation for rock removal.

**(b) Controlled blasting.** Blasting that includes presplit blasting and cushion blasting hole techniques. Controlled blasting uses closely-spaced and carefully aligned blast holes that typically contain lighter charges than production holes to produce stable, aesthetically pleasing rock faces with minimal blast damage. Controlled blast holes are the first row of blast holes, normally located within 24 inches (600 millimeters) of the top of the staked slope.

**(1) Presplit blasting.** Presplit blasting detonates closely spaced backslope holes before drilling for production blasting or before detonating the production blasting holes to produce a highly controlled, smooth cut face.

**(2) Cushion blasting.** Cushion blasting is similar to presplitting, except that the detonation of the cushion holes along the backslope is detonated immediately after the detonation of the production and buffer holes, generally resulting in a more natural cut face appearance.

### Construction Requirements

**205.03 Regulations.** Comply with Federal, state, and local regulations for the purchase, transportation, storage, and use of explosive material. Federal regulations include the following:

**(a) Safety and health.** OSHA, 29 CFR Part 1926, Subpart U.

**(b) Storage, security, and accountability.** Bureau of Alcohol, Tobacco, and Firearms (BATF), 27 CFR Part 555, *Commerce in Explosives*.

**(c) Shipment.** DOT, 49 CFR Parts 171-179, 390-397.

**(d) National Park Service.** For projects in National Park Service lands, comply with National Park Service Director's Order No. 65, *Explosives Use and Blasting Safety*.

**205.04 Qualifications.** Submit the following for approval at least 14 days before drilling and blasting operations begin:

**(a) Blaster-in-charge.** Furnish an individual who can directly supervise the drilling and blasting crew during drilling, loading, and detonation of charges. Include the following:

**(1)** Name of blaster-in-charge;

- (2) A résumé showing at least 5 years' experience as a blaster-in-charge on projects with similar work;
- (3) Copy of a valid blaster license accepted by the state where the project is located for the type of blasting required; and
- (4) Five references with knowledge of qualifications and reliability. Include name, relationship, and current telephone number for each reference.

**(b) Blasting crew personnel.** Names of personnel and evidence they have completed at least 24 hours of blasting safety training in the last 5 years' or have at least 2 years' of blasting experience.

**(c) Drillers.** Names and evidence they are proficient in drilling methods required to perform the work.

**(d) Vibration specialist.** Name and résumé showing at least 5 years' experience as a vibration specialist on projects with similar work.

**205.05 Blasting Plans.** Submit proof of applicable permits, licenses, and a general blasting plan signed by the blaster-in-charge at least 14 days before drilling and blasting operations. Blasting plans are not required for boulder reduction blasts (mudcapping or blockholing).

**(a) General blasting plan.** Submit a general blasting plan for review and approval by the CO. Include the following:

- (1) Procedures and safety precautions for transporting, handling, storing, loading, and detonating explosives, conducting pre- and post-blast surveys, monitoring blasts, managing misfires, and removing and disposing of excess explosives.
- (2) Explosives transportation and storage plan, including:
  - (a) Name, address, and telephone number of explosives suppliers;
  - (b) Description and license number of explosives transport vehicles, routes to be traveled, proposed hours of travel, and driver qualifications;
  - (c) Magazine and day-box locations;
  - (d) Explosives and accessories inventory system; and
  - (e) Contact information for the person responsible for security of project blasting material and supplies.
- (3) Area security plan including explosives and general site security, methods of site communication, pre- and post-blast signage and audible signaling systems, road closure requirements, and pre-blast notification for affected agencies or entities.
- (4) Manufacturer's MSDS and product data sheets for proposed explosives, primers, initiators, and related blasting devices and accessories.
- (5) Excavation plans and equipment lists for pre-blast scaling and pioneered access roads, and benches for drilling and blasting operations.

(6) Typical plan and section views for both production and controlled blasting, including stationing intended for each typical plan, maximum blast length, free face, burden, hole spacing, hole inclination, hole depth, hole diameter, stemming depth, subdrill depth, powder factor, charge per delay, initiation method and sequence, and delay times.

(7) Methods for limiting dust and noise.

(8) Fire watch plan including number of post-blast observers and duration of the fire watch.

(9) Contingency plan for blast flyrock containment, including the names and qualifications of those responsible for preparing containment system designs.

Do not deliver explosives to the project until the general blasting plan is accepted. Submit revisions and updates within 48 hours of changes in the above information.

**(b) Site-specific blasting plans and general plan revisions and updates.** Submit site-specific blasting plans after approval of the general blasting plan or at times there is a change in drilling and blasting methods provided in the general blasting plan. Allow 3 days for approval. Do not begin drilling until the plan is approved. Include the following:

(1) Proposed excavation sequence;

(2) Station limits and plan view of the proposed blast, showing how the proposed blast fits into the lift excavation sequence;

(3) Elevations of the tops and bottoms of each lift;

(4) Scaled drawings for each blast showing access, containment, plan and section views of drill patterns, clearing limits, free face, burden, blast hole locations, blast hole spacing, subdrill depths, lift height, blast hole diameters, and blast hole angles;

(5) Loading diagram for each blast showing powder factor, charge per delay, type and quantity of explosives, primers, initiators, locations of decking, and range of stemming depths for substantial variations within the drill pattern;

(6) Initiation method and sequence of blast holes for each blast. Include delay times, delay system, and down hole firing times;

(7) Flyrock control measures;

(8) Estimated volume of in-place rock to be blasted. Include the total length of production and controlled blast hole;

(9) Location and orientation of significant joints, fractures, faulting, bedding planes or other rock mass structural features to be accounted for in the site-specific blasting plan; and

(10) Post-blast rockfall containment designs and procedures.

**205.06 Pre-Blast Condition Survey and Vibration Monitoring and Control.** The Contractor is responsible for damage resulting from blast related ground vibrations and air-blast over-pressures. Determine the need for vibration monitoring depending on soil and rock conditions, blasting parameters as outlined in the blasting plan, and proximity of buildings, structures, utilities, and sensitive natural features that may be subject to damage from ground vibrations or air-blasts. If vibration monitoring is required conform to the following requirements:

(a) If not specified in the contract, establish referenceable blasting criteria for buildings, structures, utilities and natural features that conform to federal, state, or local regulations. Present blasting criteria in terms of distance of the facility or feature from blasting, maximum allowable peak particle velocity limits versus structure type, maximum allowable peak particle velocity versus peak frequency, and air over-pressure structure damage limits.

(b) Conduct a pre-blast condition survey of nearby buildings, structures, utilities, and natural features potentially damaged by blasting-related ground vibrations or air-blast. Document the natural frequency of each affected structure or feature. Use a survey method acceptable to the Contractor's insurance company. Submit a copy of pre-blast condition survey records with the site-specific blasting plans for CO review.

(c) Control ground vibrations and air-blast over-pressures with properly designed delay sequences and maximum allowable charge weights per delay. Verify allowable charge weights per delay by conducting representative trial blasts and measuring ground vibrations and air-blast over-pressure levels. Conduct test blasts with blast plan modifications that limit ground vibrations and air-blast over-pressures to levels that will not cause damage to nearby buildings, structures, utilities and natural features as determined by the vibration specialist.

(d) When ground vibration or air-blast damage is possible, monitor each blast with digital recording seismographs and air-blast monitoring equipment calibrated within the last year and approved by the CO. Locate monitoring equipment as directed by the vibration specialist. Place at least three recording stations between the blast area and closest susceptible structures, utilities, or natural features. Place at least one station on the structure. For ground vibration monitoring, use seismographs capable of recording particle velocity, displacement and acceleration for three mutually perpendicular components of vibration. Use a seismograph with a lower linear response limit over the response frequency range of not more than 2 hertz and upper limit not less than 50 hertz. Use sensors having lower thresholds not higher than 0.005 inches (0.13 millimeters), 0.05 inches (1.3 millimeters) per second, and 0.02g. Use seismographs capable of producing a permanent digital time history file for each ground motion episode.

Ensure blasting operations incorporate collected data and findings from vibration monitoring by having the vibration specialist interpret seismograph and air-blast records.

**205.07 Test Blasting.** Before beginning full-scale drilling and blasting, demonstrate adequacy of the site-specific blasting plan by drilling, blasting, and excavating a test blast of up to 100 cubic yards (75 cubic meters) with proposed containment measures in-place. Conduct the test at an approved location within the planned excavation area.

A test blast is unacceptable when it results in oversized fragmentation, excessive or uncontrolled flyrock, potentially damaging ground vibrations or air-blasts, unplanned overbreak, excessive damage to the final rock face, or unwanted overhangs. When a test blast is unacceptable, revise the site-specific blasting plan and conduct an additional test blasts until the combination of blast hole pattern spacing, controlled blast hole alignment, and charges produce acceptable results.

**205.08 Blasting.** Use explosives and initiating devices less than 1-year old. Locate explosives magazines at sites approved by the CO.

Inspect the pre-blast area and submit the proposed extent of pre-blast clearing and scaling for approval.

Use angle- or fan-drilled holes as needed during initial pioneering operations to obtain the desired face. Controlled blasting requirements are applicable to pioneering work.

Record and maintain a log of each blast hole drilled identifying the depth, color, and character of the cuttings, penetration rate, hole collar location and hole orientation, and other pertinent information. Before initiating the blast, prepare a blast plan map and submit it showing designated hole numbers along with individual hole logs completed, dated and signed by the driller.

Ensure blast holes are free of obstructions for the entire depth before placing charges. Take necessary precautions when placing charges so, caving of material from the walls of the holes and the hole collar will not occur.

Mitigate uncontrolled gas pressure loss during blasting and excessive blast noise by stemming the upper portion of blast holes with appropriate dry granular material passing the ½-inch (12.5-millimeter) sieve. Do not stem holes with drill cuttings.

Blast according to the approved site-specific blasting plan. Use blasting mats, rockfall containment systems, and other protective devices to prevent damage to surrounding features.

Stop drilling and blasting operations, and submit a revised site-specific blasting plan according to Subsection 205.05(b), when the following occur:

- Slopes are unstable;
- Slopes exceed overbreak tolerances;
- Unwanted overhangs, ridges, or ledges are created;
- Excessive blast damage occurs;
- Poor fragmentation results in oversize material requiring secondary blasting and rehandling;
- Safety of the public is jeopardized;
- Property or natural features are endangered;
- Excessive or uncontrolled flyrock is generated;
- Excessive ground vibration or air-blast over-pressures occurs where damage to buildings, structures, utilities or natural features is possible; or
- Desired slope or rock face conditions are not produced.

Remove or stabilize cut face rock that is loose, hanging, or potentially dangerous after each blast. Scale by methods approved by the CO. Leave minor irregularities or surface variations in place if they do not create a hazard. Excavate and remove material outside of the planned neat line slopes which is unstable and constitutes a potential hazard. Do not drill the next lift until slope stabilization and blast cleanup work is complete.

**(a) Production blasting.** When conducting cushion blasting or presplitting, drill a lighter-loaded buffer row of production holes on a parallel plane adjacent to the controlled blast line to minimize blast damage to the final slope.

Drill production blast holes a maximum of 4 inches (100 millimeters) in diameter to a sufficient depth such that unbroken rock does not extend above the finish surface. Drill production blast holes to the design depth. If more than 5 percent of the production blast holes in a lift do not conform to the design depth requirements, redrill the shallow holes to the proper. Except when subdrilling, do not drill production blast holes, below the base plane of the controlled blast holes.

Drill production blast holes within two drill hole diameters of the planned collar location. If more than 5 percent of the drill hole collars in a lift are out of tolerance, fill each hole outside of the location tolerance with crushed stone and redrill at the proper.

Detonate production holes in a controlled delay sequence.

**(b) Controlled blasting.** Use angled or fan drilled holes for pioneering the tops of rock cuts and preparing working platforms. Use equipment or methods approved by the CO for areas not accessible to track drill equipment.

Before drilling, completely remove overburden, soil, and loose or decomposed rock along the top of the excavation for a distance of at least 30 feet (9 meters) beyond the end of the production hole drilling limits, or to the end of the cut.

Use controlled blasting to form the final cut face on rock cuts where the staked slope ratio is  $1\frac{1}{3}V:1H$  or steeper and the slope height is more than 10 feet (3 meters) above the ditch grade.

Use drilling equipment that accurately controls the angle the drill as it enters the rock. Select a lift height and conduct drilling operations so the blast hole spacing and down-hole alignment does not vary more than 8 inches (200 millimeters) from the proposed spacing and alignment. If more than 5 percent of the holes exceed the variance, reduce the lift height and modify drilling operations until the holes are within tolerance.

Drill holes a maximum of 3 inches (75 millimeters) in diameter and within 3 inches (75 millimeters) of the staked collar location. Fill and redrill blast holes outside of the location tolerance when more than 5 percent of the hole collars in a lift are outside of the location tolerance. Use crushed stone to fill the blast holes before redrilling. Drill the controlled blast hole line at least 30 feet (9 meters) beyond loaded production holes or to the end of the cut.

Do not exceed 30 feet (9 meters) for bench height or drill hole length. Limit subdrilling of holes to one-half of the hole spacing or 24 inches (600 millimeters) whichever is deeper.

Offset lifts up to 24 inches (600 millimeters) horizontally to allow for drill equipment clearance. Remove benches resulting from the drilling offset.

Compensate for drift that may occur in the upper lifts. Adjust the drill inclination angle or the initial drill collar location to obtain the required typical section. Limit drilling to one-half of the hole spacing or 24 inches (600 millimeters) whichever is deeper.

Do not use bulk ammonium nitrate and fuel oil for controlled blasting. Only standard explosives manufactured specifically for controlled blasting will be used in controlled blast holes, unless approved by the CO.

Maximum diameter of explosives used in controlled blast holes will be no greater than one-half the diameter of the presplit hole.

**(1) Presplitting.** Do not presplit final slopes and rock faces. When presplitting is allowed in the plans, either presplit along the slope face before drilling for production blasting or presplit the slope face in conjunction with production blasting.

**(2) Cushion blasting.** Perform cushion blasting to produce rough, natural looking rock slopes. Use the existing geologic structure to create rock surfaces, terraces, and ridges that blend with adjacent undisturbed rock faces. Preserve existing rock outcrops to the extent practical to vary the cut face slope, composition, color, and texture.

**(3) Horizontal blasting.** With CO approval only, use horizontal drill holes instead of or in conjunction with vertical cushion blasting drill holes to produce natural looking rock slopes, mitigate drill hole traces, assist pioneering access for drill bench excavation, or to excavate sliver rock cuts where vertical drilling is not feasible.

When required, preserve or create soil pockets and ledges for revegetation. Locate, size, and shape these features to replicate the vegetated areas on the undisturbed rock faces. Incorporate these features into the site-specific blasting plans. Do not create features by overshooting or selectively removing damaged rock.

#### **205.09 Reporting.**

**(a) Post-blast.** Prepare an post-blast report for blasts. Submit the report within 3 days following a blast and before drilling for the next blast. Include the following:

**(1)** Results of the blast (overbreak, blast damage, noise levels, flyrock, drill trace retention, fragmentation, material containment, material rehandling requirements, and misfires);

Submit proposed changes for future site-specific blasting plans that will produce acceptable results if blasting objectives were not met. Submit proposed repairs or stabilization plans for unstable or blast damaged backslopes;

**(2)** A detailed blasting plan amended to show significant changes in pattern, loading, or timing;

**(3)** Drilling logs for each hole completed (dated and signed by the driller) that identify the depth, color, and character of the cuttings. Also include the penetration rate, hole collar location, hole orientation, and conditions that adversely affected drilling or explosives loading operations;

**(4)** Depth measurements of production and controlled blast holes;

**(5)** A drawing or sketch showing the direction of blast, the face, or faces, hole numbers, and the physical blast layout;

**(6)** Measurement of overbreak quantities following lift mucking;

**(7)** Date and time of loading and detonating the blast; and

**(8)** Name and signature of the blaster-in-charge.

**(b) Vibration and air-blast reporting.** Submit a vibration and air-blast report within 3 days of a blast for review by the CO. Do not drill until directed by the CO. Include the following:

**(1)** Type of vibration or air-blast recording station used and instrument identification numbers;



- (2) Name of vibration specialist observing the blast and interpreting vibration and air-blast data;
- (3) Blast identification number and location of blast;
- (4) Distance and direction of ground vibration and air-blast over-pressure recording stations from the blast area;
- (5) Type of material ground vibration recording stations were sitting on at the time of the blast;
- (6) Maximum applicable charge weight per delay;
- (7) Peak displacement, particle velocity and frequency recorded at each ground vibration sensor location;
- (8) Peak over-pressure recorded at each air-blast sensor location;
- (9) Dated and signed copy of all instrument records;
- (10) Post-blast condition survey noting changes from the pre-blast survey; and
- (11) Comments on success of the blast in terms of adherence to established ground vibration or air-blast criteria and management practices.

When failing to meet ground vibration and air-blast criteria and management objectives, submit proposed changes to future site-specific blasting plans that will produce acceptable results.

**(c) Close-out.** Submit a written statement signed by the blaster-in-charge certifying:

- (1) Blastholes loaded with explosive material have been either detonated or unloaded and disposed of properly; and
- (2) Blasting is complete and explosive material has been removed from the project site.

**205.10 Acceptance.** Material for rock blasting will be evaluated under Subsections 106.02 and 106.03.

Rock blasting will be evaluated under Subsections 106.02 and 106.04.

### **Measurement**

**205.11** Measure the Section 205 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

When measuring controlled blasting by the square foot (square meter), measure the face blast as shown in the blasting plan.

When measuring controlled blast holes by the linear foot (meter), measure the actual length of drilling recorded in the post blast reports. Controlled blast hole includes the row of holes lying closest to the trim line.

Do not measure presplit blast holes whose misalignment is more than 8 inches (200 millimeters.)

Do not measure production blast holes.

**Payment**

**205.12** The accepted quantities will be paid at the contract price per unit of measurement for the Section 205 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

**Section 206. — RESERVED**

## Section 207. — EARTHWORK GEOSYNTHETICS

### Description

**207.01** This work consists of furnishing and installing geotextile in separation, stabilization, and filter applications, geogrid in stabilization applications, and geomembrane in moisture barrier applications.

Geosynthetics are designated according to the tables in Section 714.

### Material

**207.02** Conform to the following Subsections:

Geomembrane	714.05
Geotextile	714.01
Stabilization geogrid	714.03

### Construction Requirements

**207.03 General.** Identify, store, and handle geosynthetics according to ASTM D4873 and the manufacturer's recommendations. Elevate and protect geosynthetic rolls with a waterproof cover if stored outdoors. Limit geosynthetics exposure to less than 10 days of ultraviolet radiation.

For seams sewn on-site, conform to the manufacturer's recommendations. Obtain approval of the seam before installation. Use thread consisting of high strength polypropylene or polyester. Do not use nylon thread. Use thread that is resistant to ultraviolet radiation and a contrasting color to the geotextile.

Submit a seam assembly description and a sample of the sewn material at least 14 days before installation when geosynthetic joints are sewn as follows:

**(a) Assembly description.** Include the seam type, seam allowance, stitch type, sewing thread tex ticket numbers and types, stitch density, and stitch gauge.

**(b) Sewn seam samples.** Sew seam samples using the same equipment and procedures used to sew production seams. Submit samples that have at least 6 feet (1.8 meters) of sewn seam and are at least 5 feet (1.5 meters) wide. If production seams are sewn in both the machine and cross-machine directions, provide sewn seam samples that are oriented in both the machine and cross-machine directions.

Replace or repair geosynthetic that is torn or punctured. Remove the damaged area and place a patch of the same type of geosynthetic overlapping 36 inches (900 millimeters) beyond the damaged area or sew a seam around the damaged area.

### 207.04 Geotextile and Geogrid Separation and Stabilization Applications.

**(a) Surface preparation.** Before placing the geotextile, geogrid, or both, prepare the surface as follows:

**(1) Existing ground.** Cut trees and shrubs flush with the ground surface. Do not remove the topsoil and vegetation mat. Clear the area of vegetation and obstructions according to Sections 201 and 203. Remove sharp objects and large rocks. Fill depressions or holes with suitable material to provide a smooth surface.

**(2) Subgrade.** Prepare the subgrade according to Subsections 204.13(c) and (d).

**(3) Subexcavation.** Perform subexcavation according to Subsection 204.07.

**(b) Geotextile or geogrid placement.** Place geogrid on top of geotextile when both are shown at the same elevation in the plans. Place the geosynthetic smooth, taut, and wrinkle free on the underlying surface. Conform to curves. Overlap in the direction of construction. Overlap at least 24 inches (600 millimeters) at the ends and sides of adjoining sheets or sew the joints according to the manufacturer's recommendations. Do not place longitudinal overlaps below anticipated wheel loads. Hold the geosynthetic in place with pins, staples, or piles of cover material.

**(c) Backfilling.**

**(1) First layer placement and compaction.** End dump the backfill material onto the geotextile or geogrid from the edge of the geosynthetic or from previously placed cover material. Do not operate equipment directly on the geosynthetic. Spread the end-dumped pile of cover material maintaining a 12 inch (300 millimeters) lift over the geosynthetic. Avoid sudden stops, starts, or turns of the construction equipment. Fill ruts from construction equipment with additional cover material. Do not blade material down to remove ruts. If rutting exceeds 3 inches (75 millimeters) during placement, decrease the construction equipment size, decrease the equipment weight, or increase the first lift thickness as directed by the CO.

Compact according to Subsection 204.11. Do not use sheepfoot or studded compaction equipment. Compact the cover material with pneumatic-tire or nonvibratory smooth drum rollers.

**(2) Subsequent layer placement and compaction.** Place subsequent layers according to Subsection 204.10.

Compact according to Subsection 204.11. Vibratory rollers may be used unless pumping or foundation failures occur. Repair damaged areas and then use only nonvibratory rollers.

**207.05 Reinforcement Geotextile and Geogrid.** See Section 261 for reinforcement geotextile and geogrid placement.

**207.06 Geotextile Filter Applications.**

**(a) Geotextile placement.** For slope or wave protection, place the long dimension of the geotextile down the slope. For stream bank protection, place the long dimension of the geotextile parallel to the centerline of the channel.

Overlap or sow seams at the ends and sides of adjoining sheets.

**(1) Overlapping.** Overlap the uphill or upstream sheet over the downhill or downstream sheet. For above water applications, overlap the geotextile at least 12 inches (300 millimeters). For underwater applications, overlap the geotextile at least 36 inches (900 millimeters).

**(2) Sewing.** Sew the geotextile seam according to the manufacturer's recommendations.

Offset end joints of adjacent sheets at least 5 feet (1.5 meters). Use key trenches or aprons at the crest and toe of slopes to hold the geotextile in place. As an alternative use anchor pins, at least 18 inches (450 millimeters) long and spaced at 36 inch (900 millimeters) centers to hold the geotextile sheets in place.

**(b) Backfilling.** Place aggregate, slope protection, or riprap on the geotextile starting at the toe of the slope and proceeding upward. Place riprap onto the geotextile from a height of less than 12 inches (300 millimeters). Place slope protection rock or aggregate backfill onto the geotextile from a height less than 36 inch (900 millimeters). Do not allow stones weighing more than 100 pounds (45 kilograms) to roll down the slope. In underwater applications, place the geotextile and cover material in the same day.

**207.07 Geomembrane Applications.** Submit a geomembrane installation plan at least 10 days before installing the geomembrane. Include a drawing of the panel layout identifying the location of seams. Include a seam detail and a written description of the seaming procedure.

**(a) Surface preparation.** Provide a smooth, flat, firm, unyielding foundation for the geomembrane with no sudden, sharp, or abrupt changes or break in grade. Remove rocks, stones, sticks, sharp objects, and debris protruding more than ½ inch (13 millimeters) above the prepared surface.

**(b) Geomembrane placement.** Orient seams parallel to the line of maximum slope. Use sandbags or piles of cover material to hold the geomembrane in place. Do not drive equipment directly on the geomembrane.

**(c) Backfilling.** Place backfill material within the same work shift that the geomembrane is installed. End dump backfill material onto the edge of previously placed cover material and roll it into place. Do not push material along the geomembrane which can result in damage or wrinkling.

**207.08 Acceptance.** Geosynthetics will be evaluated under Subsection 106.03. Submit a production certification with each shipment of geosynthetics.

Geosynthetic installation will be evaluated under Subsections 106.02 and 106.04.

Sewn joints will be evaluated under Subsection 106.02.

### **Measurement**

**207.09** Measure the Section 207 pay items listed in the bid schedule according to Subsection 109.02.

When measuring geosynthetics by the square yard (square meter), measure on the plane parallel to the slope face.

Do not measure overlapping material.

### **Payment**

**207.10** The accepted quantities will be paid at the contract price per unit of measurement for the Section 207 pay item listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

## **Section 208. — STRUCTURE EXCAVATION AND BACKFILL FOR SELECTED MAJOR STRUCTURES**

### **Description**

**208.01** This work consists of excavating material for the construction of selected structures. This work also includes preserving channels, shoring and bracing, constructing cofferdams, sealing foundations, dewatering, preparing foundations, backfilling, and subsequent removal of safety features and cofferdams.

### **Material**

**208.02** Conform to the following Section and Subsections:

Foundation fill	704.01
Neat hydraulic cement grout	725.13(a)(2)
Structural backfill	704.04
Structural concrete	552

### **Construction Requirements**

**208.03 General.** Follow OSHA safety regulations 29 CFR, Part 1926, Subpart P, *Excavations* for sloping the sides of excavations, using shoring and bracing, and using other safety features. When sides of excavations are sloped for safety considerations, submit one copy of the design that demonstrates conformity with OSHA regulations. Where support systems, shield systems, or other protective systems are to be used, design the shoring according to Section 562. Submit drawings and construction details according to Subsection 104.03.

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

Request approval from the CO as to the character and suitability of the foundation material when the excavation is complete. Provide a firm foundation of uniform density throughout its length and width.

Saw cut existing pavements or concrete structures adjacent to the area to be excavated that are designated to remain.

Where necessary, blast rock according to Section 205.

Conserve suitable material for structural backfill from excavated material. Do not deposit excavated material in or near a waterway. Do not stockpile excavated material or allow equipment closer than 24 inches (600 millimeters) from the edge of the excavation. Use suitable material in embankment construction when approved. Dispose of unsuitable or excess material according to Subsection 204.14.

Remove safety features when no longer necessary. Remove shoring and bracing to at least 24 inches (600 millimeters) below the surface of the finished ground.



**208.04 Channel Preservation.** Perform work in or next to a running waterway as follows:

- (a) Excavate and conserve material inside cofferdams, sheeting, or other separations (such as dikes or sandbags);
- (b) Do not disturb the natural bed of the waterway adjacent to the work; and
- (c) Backfill the excavation to original ground-line with conserved material.

**208.05 Cofferdams.** Use cofferdams when excavating under water or when the excavation is affected by groundwater.

Submit drawings showing proposed methods and construction details of cofferdams according to Subsection 104.03 and Section 562. Design and construct cofferdams that conform to the following:

- (a) Extend below the bottom of the footing;
- (b) Brace to withstand pressure without buckling and secured in place to prevent tipping or movement;
- (c) Construct watertight as practical;
- (d) Provide sufficient clearance for the placement of forms and the inspection of their exteriors;
- (e) Provide for dewatering;
- (f) Protect fresh concrete from damage; and
- (g) Prevent damage to the foundation by erosion.

Remove cofferdam material down to the natural bed of the waterway or to the top of seal, whichever is lower. Remove cofferdam material outside the waterway to at least 24 inches (600 millimeters) below the surface of the finished ground.

**208.06 Foundation Seal.** Seal the foundation area from water by placing seal concrete when the area cannot be pumped reasonably free of water. Design seal concrete mix according to Subsection 552.03.

Furnish and place seal concrete according to Section 552. Maintain the water level inside the cofferdam at the same level as the water outside the cofferdam while placing a foundation seal. Vent or port the cofferdam at low water level when a foundation seal is placed in tidal water.

Do not dewater a concrete-sealed cofferdam until the seal concrete strength is sufficient to withstand the hydrostatic pressure.

**208.07 Dewatering.** Remove water as necessary to perform the work. Dispose of water according to Federal, state, and local regulations.

**208.08 Foundation Preparation.** Prepare foundations as follows:

**(a) Footings placed on bedrock.** Excavate to the specified elevation. Clean the foundation surface of deleterious material. Clean and grout seams and crevices. Place foundation fill to provide a level bearing pad for footing.

**(b) Footings placed on an excavated surface other than bedrock.** Excavate material to foundation grade and compact the foundation before footing is placed.

**(c) Footings keyed into undisturbed material.** Excavate the foundation to the limits of the footing and compact the foundation. Where material does not stand vertically, fill the space between the limits of the footing and the undisturbed material with concrete. Fill only to the top of the excavation if the excavation is below the top of the footing. Concrete placed against steel sheet piles in cofferdams is considered as being against undisturbed material.

**(d) Unstable material below footing elevation.** Excavate unstable material below foundation grade as directed by the CO and backfill with foundation fill. Place foundation fill in horizontal layers that do not exceed 6 inches (150 millimeters) in compacted thickness. Compact each layer according to Subsection 208.10.

**(e) Foundations using piles.** Where foundation seals are required drive the piles before placing seal concrete unless otherwise specified. Remove loose and displaced material and reshape the bottom of the excavation to the foundation elevation. Grade and compact the bed to receive the footing.

**208.09 Backfill.** Place structural backfill in horizontal layers that do not exceed 6 inches (150 millimeters) in compacted thickness. Compact each layer according to Subsection 208.10.

Place structural backfill layers evenly on all sides of the structure as appropriate. Extend each layer to the limits of the excavation or to natural ground.

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

Backfill in or next to a running waterway according to Subsection 208.04.

**208.10 Compacting.** Determine optimum moisture content and maximum dry density according to AASHTO T 99, Method C. Adjust the moisture content of the backfill material to a moisture content suitable for compaction.

Compact material placed in all layers 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.

Do not apply density requirements as measured by AASHTO T 310 to material incapable of being tested or compacted to maximum values determined by AASHTO T 99. For these material, fill the voids around the rocky material in each layer with earth or other fine material. Compact each layer until there is no visible evidence of further consolidation.

**208.11 Acceptance.** See Table 208-1 for sampling, testing, and acceptance requirements.

Material for structural backfill and foundation fill will be evaluated under Subsections 106.02 and 106.04.

Material for grout will be evaluated under Subsections 106.02 and 106.03. Grout will be evaluated under Subsections 106.02 and 106.04.

Structure excavation and backfill work 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.

Shoring, bracing, and cofferdams will be evaluated under Section 562.

### **Measurement**

**208.12** Measure the Section 208 pay items listed in the bid schedule according to Subsection 109.02 and the following as applicable:

When measuring structural excavation by the cubic yard (cubic meter) in its original position; do not include the following volumes in structure excavation:

- (a) Material excavated outside the vertical planes located 18 inches (450 millimeters) outside and parallel to the limits of the footings or foundations;
- (b) Material included within the staked limits of the excavation (such as contiguous channel changes and ditches) for which measurement is covered under other Sections;
- (c) Water or other liquid material;
- (d) Material excavated before measurement of the original ground;
- (e) Material re-handled, except when the contract specifically requires excavation after embankment placement; or
- (f) Excavation for cofferdam seals.

When measuring foundation fill and structural backfill by the cubic yard (cubic meter) in place; measure the volume placed inside the vertical planes located 18 inches (450 millimeters) outside and parallel to the limits of the footings or foundations.

### **Payment**

**208.13** The accepted quantities will be paid at the contract price per unit of measurement for the Section 208 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Payment for structure excavation, shoring and bracing, and cofferdams will be full compensation for excavation to a depth of 6 feet (1.8 meters) below the lowest elevation shown in the plans for each foundation structure. When the excavation exceeds 6 feet (1.8 meters), either the Contractor or the CO may request an equitable price adjustment for the depth in excess of 6 feet (1.8 meters).

**Table 208-1  
Sampling, Testing, and Acceptance Requirements**

<b>Material or Product (Subsection)</b>	<b>Type of Acceptance (Subsection)</b>	<b>Characteristic</b>	<b>Category</b>	<b>Test Methods Specifications</b>	<b>Sampling Frequency</b>	<b>Point of Sampling</b>	<b>Split Sample</b>	<b>Reporting Time</b>
<b>Source</b>								
Foundation fill <sup>(1)</sup> (704.01)	Measured and tested for conformance (106.04 & 105)	Classification  Gradation	–	AASHTO M 145  AASHTO T 27 & T 11	1 per soil type  "	Source of material  "	Yes  "	Before using in work  "
Structural backfill <sup>(1)</sup> (704.04)	"	Plasticity index  Gradation	–	AASHTO R 58, T 89, & T 90 AASHTO T 27 & T 11	"  "	"  "	"  "	"  "
<b>Production</b>								
Foundation fill (704.01)	Measured and tested for conformance (106.04)	Moisture-density  Density	–	AASHTO T 99, Method C <sup>(2)</sup> AASHTO T 310 or other approved procedures	1 per soil type  1 per 300 yd <sup>3</sup> (250 m <sup>3</sup> )	Source of material  In-place	Yes  No	Before using in work  Before placing next layer
Structural backfill (704.04)	"	Moisture-density  Density	–	AASHTO T 99, Method C <sup>(2)</sup> AASHTO T 310 or other approved procedures	1 per soil type  2 per lift	Source of material  In-place	Yes  No	Before using in work  Before placing next layer

(1) Not required when using Government-provided source.

(2) Minimum of 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.