

SCOPE OF WORK

All work for the **LILIENDAL ROAD REPAIR PROJECT** shall be done in accordance with the **STANDARD SPECIFICATIONS FOR CONSTRUCTION OF ROADS AND BRIDGES ON FEDERAL HIGHWAY PROJECTS (FP03)**.

Time frame for this project shall be Sixty (60) Calendar Days.

Prior to the commencement of Work by Contractor, contractor will have all applicable bonds, licenses, sureties and permits in place prior to the commencement of work.

1. Contractor shall be exclusively responsible for the safety, security, and condition of all of materials and equipment and personal stored/working on the construction site, and no such stored or loose materials shall be deemed a part of the Project until after the same have been properly installed by the Contractor in the Project, accepted and paid for by the Contractor. Contractor shall exclusively bear the risk of loss of such stored materials prior to proper installation even if the stored material has been paid for by the contractor.
2. Further, Contractor shall be responsible for any damages done to material, equipment or property by its workforce, subcontractors, or vendors.
3. Unless otherwise authorized in writing in advance by the Contractor, Contractor states that the Work performed under this Agreement will be performed by the Contractor and his regularly employed employees.
4. Not later than the time of delivery of materials to the job site, Contractor shall provide all "materials safety data sheets" pertaining to materials being brought onto the site. Contractor further agrees that it shall comply with all local, federal laws, ordinances and regulations in connection with the Contractor's Work including, but -not limited to OSHA Standards, Rules and Regulations.
5. During the term of this Agreement, Contractor shall pay particular attention to the daily clean up and removal of all trash and rubbish generated on the job site by the Contractor or its vendors. Contractor shall be responsible for the removal of all rubbish and trash it has generated, from its work area on a daily basis and place all such rubbish and trash in waste containers located throughout the Project. In the event Contractor fails to perform this daily cleaning and trash removal agreement, Contractor may assess a portion of the cost of daily clean up of the job site including, but not limited to, the cost of the maintenance of said trash and rubbish receptacles against the Contractor in the form of a negative change order after fair and prior notice has been given.
6. Upon the completion of the Contractor's Work, and when practical, the Contractor shall furnish the User Agency with a warranty acceptable in all respects to the User Agency to repair and/or -replace at the Contractor's sole expense all defects in materials and labor in the Contractor's Work appearing or occurring within one (1) year after the issuance of the certificate of occupancy of the premises upon which Subcontractor's Work is performed. Additionally, in the event the manufacturer of any material supplied by the Contractor to the Project exceeds the term of the Subcontractor's letter of credit or warranty, The Contractor shall further assign and deliver to the User Agency said manufacturer's warranty. Performance of warranty repair work and replacement of materials for defects

occurring within the warranty period shall be the Contractor's sole and exclusive responsibility at the Contractor's sole and exclusive expense.

8. Any Work that is in addition to the work required by this Subcontract shall be construed as extra work ("**EXTRA WORK**"). Extra Work will be subject to prior written approval by the Department of Public Works and shall be granted or denied prior to the execution of any such Extra Work. Approved Extra Work shall be subject to the execution of a change order signed by an authorized representative of the Contractor and the Owner or Contractor which shall be executed prior to the furnishing of such materials or performance of such labor or both. Any Extra Work not so authorized in advance shall be performed or furnished at the sole expense of the Contractor, and neither the Contractor nor the Owner shall be liable or responsible to the Contractor for the payment of any such Extra Work. Extra work must be approved before it is done.
9. All materials supplied or used by the Contractor in the performance of its Work shall be as specified and approved by the Department of Public Works. Contractor shall submit all such materials to the Department of Public Works for approval prior to the installation thereof on the premises unless otherwise agreed or waived by the Department of Public Works in writing. All work and materials will be per the plans and specifications provided unless authorized in writing prior to starting the work.
10. If job is subject to inclement weather it is the responsibility of the Contractor to keep track of these days and present to the Department of Public Works on a weekly basis to compare against their daily log. Days that are in agreement will be placed in a change order format and will be presented with scheduled monthly payment.
11. The Contractor is contracted to provide complete construction, including code requirements, and workmanship of equal or better finishes based on the VI Building Code and to the intent of the contract documents. It is common and known that items of importance are sometimes overlooked in drawings and in specifications. If missing items would normally be included in a particular scope of work, or required for the completion of a particular trades work, then it is included in this contract and not an opportunity for change order.
12. Contractor agrees to perform all work in a good and workmanlike manner and in accordance with the highest standards of the industry in their trades, and as a minimum, the work shall be in accordance with all local, national codes, laws, ordinance and regulations, whichever governs, whether or not so indicated in the plans and specifications. It is the intent that the work be completed in all respects for the use intended as a part of this general scope.
13. Contractor agrees to furnish all labor, supervision, fasteners, tools, taxes, equipment, fuel fees, licenses, insurance and all other costs as required to perform all work covered in the construction scope of the applicable division that this Contractor represents itself as having expert knowledge in and regular engagement with.
14. Contractor shall call and cause all required inspections for his own work and convey all inspection results to the DPW Inspector/Engineer. If unsatisfactory results are discovered, this Contractor will immediately suspend its construction activities until such work is corrected and inspections are passed.
15. Upon reward of this contract, Contractor shall perform due diligence and shall prepare all

necessary basic diagrams or layouts outlining his/her concerns. If value engineering or alterations to the plans/specifications is involved, such shall be presented to the Department of Public Works prior to the execution of the contract.

16. Contractor shall commence the work to be performed per the contract documents in accordance to the terms of this agreement commencing on the date specified and provided by the User Agency and shall complete all work by the finish date specified on the Construction Schedule or as adjusted from time to time by the Department of Public Works.
17. Under **NO CIRCUMSTANCES** will there be additional money granted for extra work without previous written authorization and executed change order from the User Agency.
18. Contractor shall be completely responsible and provide equipment for receiving, unloading, taking inventory, storing, protecting and signing for all materials installed under this agreement.
19. This Contractor will verify all detail and dimensions for fit of work in all regards.
20. Contractor acknowledges that he will provide the necessary manpower, required to maintain the project schedule in all phases of his work to include any required overtime.
21. Hard Hats are a requirement of this contract.
22. Provide Material Safety Data Sheets (MSDS) for all materials being provided or utilized under this Contract agreement. And its written OSHA policy and written Hazardous Materials Policy before work commences.
23. Contractor will keep onsite material stockpiles and building workspace stockpiles to a minimum, organized and out of the way so as not to impede any other trades, and as directed by the Construction Manager.
24. Contractor is responsible for loss, theft and damage of all materials installed or otherwise until such material has been installed, approved and paid for by Contractor.
25. Contractor reserves the right, to supplement work after proper notification of non-performance has been given.
26. Contractor will furnish the names of the Subcontractors it introduces to the project.
27. Contractor will disclose the amounts of money owed to each subcontractor and submit proper lien waivers.
28. Contractor shall make himself/herself available for either weekly or biweekly meetings (as mutually agreed upon with the Department of Public Works) to discuss project progress/concerns. Any problems deemed an emergency shall be **IMMEDIATELY** made known to the Department of Public Works.

The undersigned Contractor shall furnish all labor, equipment, machinery, material and miscellaneous items for the completion of the Project as outlined in the Contact Drawings, Specifications and Bid Schedule.

Section 151. — MOBILIZATION

Description

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

Measurement

151.02 Measure mobilization according to Subsection 109.02.

Payment

151.03 The accepted quantity, measured as provided in Subsection 109.02, will be paid at the contract price per unit of measurement for the Section 151 pay item shown in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Progress payments for mobilization 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 other bid items, 50 percent of the mobilization 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 other bid items, 100 percent of the mobilization item, or 10 percent of the original contract amount, whichever is less, will be paid.
- (d) Any portion of the mobilization item in excess of 10 percent of the original contract amount will be paid after final acceptance.

Section 154. — CONTRACTOR SAMPLING AND TESTING

Description

154.01 This work consists of obtaining samples for testing. When there is a contract pay item for Contractor testing included in the bid schedule, it also consists of testing and reporting required test results. It does not include Contractor quality control testing required under Section 153. However, include the work required under this Section in the Section 153 quality control plan.

Construction Requirements

154.02 Sampling. Sample material to be tested according to the Sampling and Testing Requirements tables included at the end of each section. The sampling schedules and times will be provided by the CO using a random number system. In addition, sample any material that appears defective or inconsistent with similar material being produced unless such material is voluntarily removed and replaced or corrected.

Sample and split samples according to AASHTO or other acceptable procedures. Allow the CO the opportunity to witness all sampling. Immediately perform splits when required. Deliver the Government's portion of the sample or split sample in an acceptable container suitable for shipment. Label all samples with the following information:

- (a) Project number;
- (b) Source of material;
- (c) Pay item number;
- (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.

154.03 Testing. When there is a contract pay item for Contractor testing included in the bid schedule, perform all tests required by the Sampling and Testing Requirements tables at the end of each section. Allow the CO the opportunity to witness all testing. Testing of trial samples may be required to demonstrate testing competence.

154.04 Records. Report test results on forms containing all sample information required by Subsection 154.02. Label clearly all interim measurements used to determine the results. Attach work sheets used to determine test values to the test result forms when submitted. When tests are on material being incorporated in the work, report test results within 24 hours except as specified in the Sampling and Testing Requirements tables. Payment for work may be delayed or the work suspended until test results are provided.

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

Measurement

154.06 Measure the Section 154 items listed in the bid schedule according to Subsection 109.02.

Payment

154.07 The accepted quantities will be paid at the contract price per unit of measurement for the Section 154 pay item 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 will be paid as follows:

(a) 25 percent of the item amount, not to exceed 0.5 percent of the original contract amount, will be paid after all 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 item amount will be prorated based on the total work completed.

Payment for all or part of this item may be retained if Government verification testing invalidates the Contractor testing.

Section 201. — CLEARING AND GRUBBING

Description

201.01 This work consists of clearing and grubbing within the clearing limits designated on 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 vegetation designated to remain is damaged or destroyed, repair or replace the vegetation in an acceptable manner. Where possible, preserve all 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 all trees so they fall within the clearing limits.
- (b) In areas of cut slope rounding, cut stumps flush with or below the final groundline.
- (c) In areas outside the excavation, embankment, and slope rounding limits, cut stumps to within 6 inches of the ground.
- (d) Trim tree branches that extend over the road surface and shoulders to attain a clear height of 20 feet. 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 all areas to be excavated except for cut slope rounding areas.

(b) Grub all embankment areas. Undisturbed stumps may be left in place if they protrude less than 6 inches above the original ground and will be covered with more than 4 feet of embankment.

(c) Grub pits, channel changes, and ditches only to the depth necessary for the excavation.

(d) Backfill stump holes and other grubbing holes with backfill material to the level of the surrounding ground according to Subsection 209.10. Compact backfill according to Subsection 209.11.

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 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 identified in the contract.

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 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
Concrete	601

Construction Requirements

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

Match mark members of salvaged structures. Furnish one set of drawings identifying the members and their respective match marks.

Stockpile salvaged material at a designated area on the project.

203.04 Removing Material. 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 permit debris to enter waterways, travel lanes open to public traffic, or areas designated not to be disturbed.

Raze and remove all buildings, foundations, pavements, sidewalks, curbs, fences, structures, and other obstructions interfering with the work and not designated to remain.

Where part of an existing culvert is removed, remove the entire culvert upstream from the removal. The remaining downstream culvert may be left in place if no portion of the culvert is within 4 feet of the subgrade, embankment slope, or new culvert or structure; and the culvert ends are sealed with concrete.

Remove structures and obstructions in the roadbed to 3 feet below subgrade elevation. Remove structures and obstructions outside the roadbed to 2 feet below finished ground or to the natural stream bottom.

Abandon existing manholes, inlets, catch basins, and spring boxes according to Subsection 604.07.

Except in excavation areas, backfill and compact cavities left by structure removal with backfill material to the level of the finished ground. Backfill excavated areas according to Subsection 209.10. Compact backfill according to Subsection 209.11.

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

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

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

Burn using high intensity burning processes that produce few emissions. Examples include incinerators, high stacking, or pit and ditch burning with forced air supplements. Provide a competent watchperson during the burning operations.

When burning is complete, extinguish the fire so no smoldering debris remains. Dispose of unburned material according to (a) above.

(c) Bury. Bury debris in trenches or pits in approved areas within the right-of-way. Do not bury debris inside the roadway prism limits, beneath drainage ditches, or in any areas subject to free-flowing water.

Place debris in alternating layers of 4 feet of debris covered with 2 feet 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 1 foot of compacted earth. Grade and shape the area. Seed and mulch disposal areas on Government property according to Section 625.

(d) Hazardous material. Furnish a copy of all disposal permits. Dispose of material according to Federal, State, and local regulations.

Section 203

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.

Concrete will be evaluated under Section 601.

Measurement

203.07 Measure the Section 203 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 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. All material excavated from within the right-of-way or easement areas, except subexcavation covered in (2) below 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 groundline in embankment sections. Subexcavation does not include the work required by Subsections 204.05, 204.06(b), and 204.06(c).

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

Backfill material	704.03
Select borrow	704.07
Select topping	704.08
Topping	704.05
Unclassified borrow	704.06
Water	725.01

Construction Requirements

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

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) General. Do not disturb material and vegetation outside the construction limits.

Incorporate only suitable material into embankments. Replace any shortage of suitable material caused by premature disposal of roadway excavation. Dispose of unsuitable or excess excavation material according to Subsection 204.14.

At the end of each day's operations, shape to drain and compact the work area to a uniform cross-section. Eliminate all ruts and low spots that could hold water.

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

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

204.07 Subexcavation. Excavate material to the limits designated by the CO. Take cross-sections according to Section 152. Prevent unsuitable material from becoming mixed with the backfill. Dispose of unsuitable material according to Subsection 204.14. Backfill the subexcavation with topping, or other suitable material. Compact the material according to Subsection 204.11.

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

Obtain borrow source acceptance according to Subsection 105.02. Develop and restore borrow sources according to Subsection 105.03. 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 less than 4 feet high over natural ground.** Remove topsoil and break up the ground surface to a minimum depth of 6 inches 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. Scarify or pulverize asphalt and concrete roads to 6 inches below the pavement. Reduce all particles to a maximum size of 6 inches 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 benches in the existing slope to a sufficient width to accommodate placement and compaction operations and equipment. Bench the slope as the embankment is placed and compacted in layers. Begin each bench at the intersection of the original ground and the vertical cut of the previous bench.

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 all 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:1¼H or steeper, compact the slopes as embankment construction progresses.

Where placing embankment on one side of abutments, wing walls, piers, or culvert headwalls, compact the material using methods that prevent excessive pressure against the structure.

Where placing embankment material on both sides of a concrete wall or box structure, conduct operations so compacted embankment material is at the same elevation on both sides of the structure.

Where structural pilings are placed in embankment locations, limit the maximum particle size to 4 inches.

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

Material composed predominately of boulders or rock fragments too large for 12-inch layers may be placed in layers up to 24 inches thick. Incorporate oversize boulders or rock fragments into the 24-inch layer by reducing them in size or placing them individually according to (c) below. Place sufficient earth and smaller rocks to fill the voids. Compact each layer according to Subsection 204.11 before placing the next layer.

(c) Individual rock fragments and boulders. Place individual rock fragments and boulders greater than 24 inches in diameter as follows:

- (1) Reduce rock to less than 48 inches 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 (b) above. Fill all the voids between rocks.
- (4) Compact each layer according to Subsection 204.11 before placing the next layer.

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

204.11 Compaction. For the purpose of compaction, use AASHTO T 27 to determine the amount of material retained on a No. 4 sieve. Compact as follows:

(a) More than 80 percent retained on a No. 4 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 per second and vibratory rollers at speeds less than 3 feet 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 impact per vibration and a minimum frequency of 1000 vibrations per minute.
- (2) Eight roller passes of a 20-ton compression-type roller.
- (3) Eight roller passes of a vibratory roller having a minimum dynamic force of 30,000 pounds impact per vibration and a minimum frequency of 1000 vibrations per minute.

Increase the compactive effort for layers deeper than 12 inches as follows:

- For each additional 6 inches or fraction thereof, increase the number of roller passes in (1) above by four passes.
- For each additional 6 inches or fraction thereof, increase the number of roller passes in (2) and (3) above, by eight passes.

(b) 50 to 80 percent retained on a No. 4 sieve. Use AASHTO T 99 to determine the optimum moisture content of the portion of the material passing a No. 4 sieve. Multiply this number by the percentage of material passing a No. 4 sieve, and add 2 percent to determine the optimum moisture content of the material. 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 rollers at speeds less than 6 feet per second and vibratory rollers at speeds less than 3 feet per second. Compact each layer of material full width according to (a) above.

(c) Less than 50 percent retained on a No. 4 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 all projecting roots, stumps, rock, or similar matter. Maintain all ditches in an open condition and free from leaves, sticks, and other debris.

Form furrow ditches by plowing or using other acceptable methods to produce a continuous furrow. Place all excavated material on the downhill side so the bottom of the ditch is approximately 18 inches below the crest of the loose material. Clean the ditch using a hand shovel, ditcher, 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 all earth slopes with uniform roughened surfaces, except as described in (b) below, with no noticeable break as viewed from the road. Except in solid rock, round tops and bottoms of all slopes including the slopes of drainage ditches. Round material overlaying solid rock to the extent practical. Scale all rock slopes.

If a slide or slipout occurs on a cut or embankment slope, remove or replace the material, and repair or restore all 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 by the contract, construct steps on slopes of $1\frac{1}{3}V:1H$ to $1V:2H$. Construct the steps approximately 18 inches high. Blend the steps into natural ground at the end of the cut. If the slope contains nonrippable 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 all material larger than 6 inches from the top 6 inches 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 ± 0.05 feet of the staked line and grade. Finish roadbeds that are compacted according to Subsection 204.11(a) to within ± 0.10 feet of the staked line

and grade. Finish ditch cross-sections to within ± 0.10 feet of the staked line and grade. Maintain proper ditch drainage.

204.14 Disposal of Unsuitable or Excess Material. Dispose of unsuitable or excess material legally off the project.

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 and testing 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.

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

Placing of conserved topsoil will be evaluated under Section 624.

Measurement

204.16 Measure the Section 204 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 shown in the bid schedule;
- (d) Ditches, except furrow ditches measured under a separate bid item;
- (e) Conserved topsoil;
- (f) Borrow material used in the work when a pay item for borrow is not shown in the bid schedule;
- (g) Loose scattered rocks removed and placed as required within the roadway;

(h) Conserved material taken from 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; and

(l) Material excavated outside the established slope limits.

(3) When both roadway excavation and embankment construction pay items are shown 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 shown 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 select topping. When measuring by the cubic yard measure in its original position. If borrow excavation is measured by the cubic yard 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 used in place of excess roadway excavation.

(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 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 in the hauling vehicle.

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.

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. The work includes preserving channels, shoring and bracing, constructing cofferdams, sealing foundations, dewatering, excavating, preparing foundations, backfilling, and subsequent removal of safety features and cofferdams.

Material

208.02 Conform to the following Sections and Subsections:

Concrete	552
Foundation fill	704.01
Grout	725.22(e)
Seal concrete	552
Structural backfill	704.04

Construction Requirements

208.03 Preparation for Structure Excavation. Clear the area of vegetation and obstructions according to Sections 201 and 203.

208.04 General. Excavate trenches or foundation pits to a width and length that allows room for work. When excavation is complete, request approval as to the character and suitability of the foundation material. The foundation shall provide a firm foundation of uniform density throughout its length and width.

Where necessary to blast rock, blast according to Section 205.

Follow OSHA safety regulations (29 CFR, Part 1926, Subpart P, Excavation) for sloping the sides of excavations, using shoring and bracing, and for using other safety features. When sides of excavations are sloped for safety considerations, provide 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 and submit working drawings and construction details according to Subsection 104.03.

Remove safety features when no longer necessary. Remove shoring and bracing to at least 2 feet below the surface of the finished ground.

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

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 2 feet from the edge of the excavation.

Dispose of unsuitable or excess material according to Subsection 204.14. If approved, suitable material may be used in embankment construction.

Remove all water as necessary to perform work.

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

- (a) Excavate 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 with structural backfill to original groundline.

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

Submit working drawings showing proposed methods and construction details of cofferdams according to Subsection 104.03 and Section 562. Cofferdams shall:

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

When no longer required, remove all cofferdam material down to the natural bed of the waterway. Remove cofferdam material outside the waterway to a minimum of 2 feet below the surface of the finished ground.

208.07 Foundation Seal. Where a foundation area cannot be pumped reasonably free of water, provide a foundation seal of seal concrete. Design seal concrete according to Subsection 552.03.

Furnish and place seal concrete according to Section 552. While placing a foundation seal, maintain the water level inside the cofferdam at the same level as the water outside the cofferdam. Where a foundation seal is placed in tidal water, vent or port the cofferdam at low water level.

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

208.08 Dewatering. While placing concrete, locate and operate the pumps outside the foundation form. If pumping is permitted from the interior of any foundation enclosure, pump in a manner to avoid removal or disturbance of concrete material.

208.09 Foundation Preparation. Prepare footing foundations as follows:

(a) **Footings placed on bedrock.** Cut the bottom of the excavation to the specified elevation: level, stepped, or serrated. Clean the foundation surface of loose or disintegrated material. Clean and grout all seams and crevices.

(b) **Footings placed on an excavated surface other than bedrock.** Do not disturb the bottom of the foundation excavation. Remove material to foundation grade, and compact the foundation immediately before concrete 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 all space between the limits of the footing and the remaining undisturbed material with concrete. If the excavation is below the top of the footing, fill only to the top of the excavation. 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, and replace it with foundation fill. Place foundation fill material in horizontal layers that, when compacted, do not exceed 6 inches in depth. Compact each layer according to Subsection 208.11.

(e) **Foundations using piles.** Excavate to the foundation elevation and drive the piles. Remove all loose and displaced material, and reshape the bottom of the excavation to the foundation elevation. Smooth and compact the bed to receive the footing.

208.10 Backfill. Backfill with structural backfill material.

Place backfill in horizontal layers that do not exceed 6 inches in compacted thickness. Compact each layer according to Subsection 208.11.

Bring structural backfill up 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 less than 7-days-old or until 80 percent of the design strength is achieved.

208.11 Compacting. Determine optimum moisture content and maximum 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.

208.12 Acceptance. See Table 208-1 for sampling and testing requirements.

Material for structural backfill and foundation fill 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.

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

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

Seal concrete will be evaluated under Section 552.

Measurement

208.13 Measure the Section 208 items listed in the bid schedule according to Subsection 109.02 and the following.

Measure structural excavation by the cubic yard in its original position. Do not include the following volumes in structure excavation:

- (a) Material excavated outside vertical planes located 18 inches outside and parallel to the limits of the footings or foundations;
- (b) Any 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 measurements of the original ground; or

- (e) Material rehandled, except when the contract specifically requires excavation after embankment placement.

Measure foundation fill and structural backfill by the cubic yard in place for the volume placed inside vertical planes located 18 inches outside and parallel to the limits of the footings or foundations.

Measure seal concrete under Section 552.

Payment

208.14 The accepted quantities measured as provided in Subsection 109.02 and above, will be paid at the contract price per unit of measurement for the Section 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 below the lowest elevation shown on the plans for each foundation structure. When the excavation exceeds 6 feet, either the Contractor or the CO may request an equitable price adjustment for the depth in excess of 6 feet.

Table 208-1
Sampling and Testing Requirements

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
Foundation fill (704.01)	Measured and tested for conformance (106.04)	Classification	---	AASHTO M 145	1 per soil type	Source of material	Yes, when requested	Before using in work
		Gradation	---	AASHTO T 27 & T 11	"	"	"	"
		Moisture-density	---	AASHTO T 99, method C ⁽¹⁾	"	"	"	"
		Compaction	---	AASHTO T 310 or other approved procedures	1 per 300 yd ³	In-place	---	Before placing next layer
Structural backfill (704.04)	Measured and tested for conformance (106.04)	Gradation	---	AASHTO T 27 & T 11	1 per soil type	Source of material	Yes, when requested	Before using in work
		Liquid limit	---	AASHTO T 89	"	"	"	"
		Moisture-density	---	AASHTO T 99, method C ⁽¹⁾	"	"	"	"
		Compaction	---	AASHTO T 310 or other approved procedures	2 per lift	In-place	---	Before placing next layer

(1) Minimum of 5 points per proctor.

Section 253. — GABIONS AND REVET MATTRESSES

Description

253.01 This work consists of constructing gabion structures and revet mattresses.

Material

253.02 Conform to the following Subsections:

Backfill material	704.03
Gabion and revet mattress material	720.02
Gabion and revet mattress rock	705.01
Geotextile type IV	714.01
Structural backfill	704.04

Construction Requirements

253.03 General. Survey according to Section 152 and verify the limits of the wall installation. Prepare and submit installation drawings according to Subsection 104.03. Perform the work under Section 209.

253.04 Basket Assembly. Do not damage wire coatings during basket assembly, structure erection, cell filling, or backfilling. Rotate the basket panels into position and join the vertical edges with fasteners according to Subsection 253.05. Temporary fasteners may be used for basket assembly if they are supplemented during structure erection with permanent fasteners according to Subsection 253.05.

Rotate the diaphragms into position and join the vertical edges according to Subsection 253.05.

253.05 Structure Erection. Place the empty gabion baskets on the foundation and interconnect the adjacent baskets along the top and vertical edges using permanent fasteners.

Where lacing wire is used, wrap the wire with alternating single and double loops every other mesh opening and not more than 6 inches apart. Where spiral binders are used, crimp the ends to secure the binders in place. Where alternate fasteners are used, space the fasteners in every mesh opening and not more than 6 inches apart.

In the same manner, interconnect each vertical layer of baskets to the underlying layer of baskets along the front, back, and sides. Stagger the vertical joints between baskets of adjacent rows and layers by at least one cell length.

253.06 Cell Filling. Remove all kinks and folds in the wire mesh, and properly align all the baskets. Place rock carefully in the basket cells to prevent bulging of the baskets and to minimize voids in the rock fill. Maintain the basket alignment.

Place internal connecting wires in each unrestrained exterior basket cell greater than 1 foot in height. This includes interior basket cells left temporarily unrestrained. Place internal connecting wires concurrently with rock placement.

Fill the cells in any row or layer so that no cell is filled more than 1 foot above an adjacent cell. Repeat this process until the basket is full and the lid bears on the final rock layer.

Secure the lid to the sides, ends, and diaphragms according to Subsection 253.05. Make all exposed basket surfaces smooth and neat with no sharp rock edges projecting through the wire mesh.

253.07 Backfilling. Place a geotextile over the back face of the gabion structure. Concurrently with the cell filling operation, backfill the area behind the gabion structure with structural backfill according to Subsection 209.10. Compact each layer according to Subsection 209.11 except use an acceptable lightweight mechanical or vibratory compactor within 3 feet of the gabion structure.

253.08 Revet Mattresses. Place a geotextile according to Section 207. Construct revet mattresses according to Subsections 253.04 through 253.06. Anchor the mattresses in place. Place geotextile against the vertical edges of the mattress and backfill against the geotextile using backfill material or other approved material. Overfill revet mattresses by 1 to 2 inches.

253.09 Acceptance. See Table 209-1 for sampling and testing requirements.

Material for gabion structures and revet mattresses will be evaluated under Subsections 106.02 and 106.03.

Construction of gabion structures and revet mattresses will be evaluated under Subsections 106.02 and 106.04.

Survey work will be evaluated under Section 152.

Geotextile will be evaluated under Subsection 207.

Structure excavation, structural backfill, and backfill material will be evaluated under Section 209.

Measurement

253.10 Measure the Section 253 items listed in the bid schedule according to Subsection 109.02 and the following as applicable.

Measure gabions by the square yard of front wall face or by the cubic yard in the structures.

Measure foundation fill under Section 208.

Payment

253.11 The accepted quantities will be paid at the contract price per unit of measurement for the Section 253 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Section 301. — UNTREATED AGGREGATE COURSES

Description

301.01 This work consists of constructing one or more courses of aggregate on a prepared surface.

Subbase and base aggregate grading is designated as shown in Table 703-2.

Material

301.02 Conform to the following Subsections:

Aggregate	703.05
Water	725.01

Construction Requirements

301.03 General. Prepare the surface on which the aggregate course is placed according to Section 204 or 303 as applicable.

After a representative quantity of aggregate is produced, submit proposed target values for the appropriate sieve sizes along with a representative 300-pound sample at least 14 days before incorporating the aggregate into the work.

Set target values within the gradation ranges shown in Table 703-2 or 703-3 for the required grading.

301.04 Mixing and Spreading. Determine the optimum moisture content according to AASHTO T 180, method D. Mix the aggregate and adjust the moisture content to obtain a uniform mixture with a moisture content within 2 percent of the optimum moisture content. Spread and shape the mixture on the prepared surface in a uniform layer.

Do not place the mixture in a layer exceeding 6 inches in compacted thickness. When more than one layer is necessary, compact each layer according to Subsection 301.05 before placing the next layer. Route hauling equipment uniformly over the full width of the surface to minimize rutting or uneven compaction.

301.05 Compacting. Determine the maximum density of the mixture according to AASHTO T 180, method D.

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

Compact each layer to at least 95 percent of maximum density. Determine the in-place density and moisture content according to AASHTO T 310 or other approved test procedures.

301.06 Surface Tolerance. If grade finishing stakes are required, finish the surface to within ± 0.05 feet from staked line and grade elevation.

If grade finishing stakes are not required, shape the surface to the required template and check the surface with a 10-foot straightedge. Defective areas are surface deviations in excess of 1/2 inch in 10 feet between any two contacts of the straightedge with the surface.

Correct all defective areas by loosening the material, adding or removing material, reshaping, and compacting.

301.07 Maintenance. Maintain the aggregate course to the correct line, grade, and cross-section by blading, watering, rolling, or any combination thereof until placement of the next course. Correct all defects according to Subsection 301.06.

301.08 Acceptance. See Table 301-1 for sampling and testing requirements and the acceptance quality characteristic category.

Aggregate gradation and surface course plasticity index will be evaluated under Subsection 106.05. Other aggregate quality properties will be evaluated under Subsections 106.02 and 106.04.

(a) Aggregate gradation. The upper and lower specification limits are equal to the calculated mean of all test results plus or minus the allowable deviations shown in Tables 703-2 and 703-3, except as follows:

(1) If the calculated mean value for any tested sieve exceeds the maximum gradation value shown in Table 703-2 or 703-3, the upper specification is equal to the maximum gradation value plus the allowable deviation, and the lower specification is equal to the maximum gradation value minus the allowable deviation.

(2) If the calculated mean value for any tested sieve is less than the minimum gradation value shown in Table 703-2 or 703-3, the upper specification is equal to the minimum gradation value plus the allowable deviation and the lower specification is equal to the minimum gradation value minus the allowable deviation.

(b) Plasticity index. The upper and lower specification limits for surface courses are shown in Table 703-3.

Section 301

Construction of untreated aggregate courses will be evaluated under Subsections 106.02 and 106.04.

Preparation of the surface on which the aggregate course is placed will be evaluated under Section 204 or 303 as applicable.

Measurement

301.09 Measure the Section 301 items listed in the bid schedule according to Subsection 109.02 and the following as applicable.

Measure aggregate by the cubic yard in the hauling vehicle.

Measure square yard width horizontally to include the top of aggregate width including designed widenings. Measure the square yard length horizontally along the centerline of the roadway.

Payment

301.10 The accepted quantities will be paid at the contract price per unit of measurement adjusted according to Subsection 106.05 for the Section 301 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Section 402. — HOT ASPHALT CONCRETE PAVEMENT BY HVEEM OR MARSHALL MIX DESIGN METHOD

Description

402.01 This work consists of constructing one or more courses of Hveem or Marshall hot asphalt concrete pavement.

The mix design method is designated as Hveem or Marshall. Hot asphalt concrete pavement class is designated as shown in Table 402-1. Aggregate grading is designated as shown in Table 703-4. Pavement smoothness/roughness type is designated as shown in Subsection 401.16. Asphalt binder is designated as shown in AASHTO M 20, M 226, or M 320.

Antistrip additive type is designated as shown in Subsection 702.08. Where no type is designated, use type 3 (lime).

Material

402.02 Conform to the following Subsections:

Aggregate	703.07
Antistrip additive	702.08
Asphalt binder	702.01
Mineral filler	725.05
Recycled asphalt pavement	703.19
Recycling agent	702.06

Construction Requirements

402.03 Composition of Mix (Job-Mix Formula). Furnish mixes of aggregate, asphalt binder, recycled asphalt pavement, and additives that meet the applicable material requirements, appropriate design parameters in Table 402-1, and are capable of being placed and compacted as specified.

(a) Recycled asphalt pavement use. See Subsection 401.03(a).

(b) Submission. Submit written job-mix formulas with Form FHWA 1607 (Hveem) or Form FHWA 1608 (Marshall) for approval at least 28 days before production. Include the location of all commercial mixing plants to be used and a separate job-mix formula for each plant. Include a signed statement prepared by the testing laboratory that certifies the proposed job-mix formula meets the requirements of the contract and

can be compacted in the field during production to meet contract requirements. For each job-mix formula, submit the following:

Table 402-1
Asphalt Concrete Mix Requirements

Design Parameters ⁽¹⁾	Class of Mix		
	A	B	C
(a) Hveem (AASHTO T 246 and T 247)			
(1) Stabilometer, minimum	37	35	30
(2) Percent air voids	3.0-5.0	3.0-5.0	3.0-5.0
(3) Voids in mineral aggregate, min. %	See Table 402-2		
(b) Marshall (AASHTO T 245)			
(1) Stability, pounds min.	1,800	1,200	1,000
(2) Flow, 0.01 inches	8-14	8-16	8-20
(3) Percent air voids	3.0-5.0	3.0-5.0	3.0-5.0
(4) Voids in mineral aggregate, min. %	See Table 402-2		
(5) Compaction, number of blows each end of test specimen	75	50	50
(c) Immersion – Compression (AASHTO T 165 and T 167)			
(1) Compressive strength, pounds per square inch min. (dry)	300	250	200
(2) Retained strength, min. %	70	70	70
(d) Dust-asphalt ratio ⁽²⁾	0.8-1.6	0.8-1.6	0.8-1.6

(1) The percent of air voids are based on AASHTO T 166, T 209, and T 269. Maximum specific gravity (density) will be based on AASHTO T 209.

(2) Dust-asphalt ratio is defined as the percent of material including nonliquid antistriper and mineral filler passing the No. 200 sieve divided by the percent of effective asphalt (calculated by mass of mix).

Table 402-2
Voids in Mineral Aggregate (VMA)
Marshall or Hveem Mix Design

Sieve Size ⁽¹⁾	Minimum Voids ⁽²⁾⁽³⁾ Percent	
	Marshall	Hveem
No. 4	18.0	16.0
3/8 inch	16.0	14.0
1/2 inch	15.0	13.0
3/4 inch	14.0	12.0
1 inch	13.0	11.0

(1) The largest sieve size listed in the applicable specification upon which any material is permitted to be retained.

(2) VMA to be determined according to *AI Manual Series No. 2 (MS-2)*.

(3) When a mineral filler or nonliquid antistrip is used, include the percentage specified in the calculation for compliance with the VMA.

(1) Aggregate and mineral filler.

(a) Target values:

(1) Target value for percent passing each sieve size for the aggregate blend; and

(2) Designate target values within the gradation band specified for the grading designation shown in Table 703-4.

(b) Aggregate sources. See Subsection 401.03(b)(1)(b).

(c) Stockpile gradations. See Subsection 401.03(b)(1)(c).

(d) Representative samples. See Subsection 401.03(b)(1)(d).

(e) Results of aggregate quality tests for contractor selected sources. See Subsection 401.03(b)(1)(e).

(2) Asphalt binder. See Subsection 401.03(b)(2).

(3) Antistrip additives. See Subsection 401.03(b)(3).

(4) Recycled asphalt pavement material. See Subsection 401.03(b)(4).

(c) Verification. The CO will review and may perform design verification testing. If verification testing is performed, the information supplied in the Contractor's design must agree with the verification test results within the tolerances shown below.

(1) Aggregate gradations. See Subsection 401.03(c)(1).

- (2) **Hveem stabilometer.** The Contractor's design stabilometer value at the contractor's selected design asphalt content is verified if it meets or exceeds the specification limit and differs from the CO's result by no more than six points and the average of the Contractor's results and the CO's results meets or exceeds the minimum contract specification.
- (3) **Hveem air void content.** The Contractor's design air void content is verified if it meets the contract specification of 3.0 to 5.0 percent and differs from the CO's result by no more than 2.0 percent, and the CO's result does not exceed the specification limits by more than 0.5 percent.
- (4) **Voids in mineral aggregate (VMA).** See Subsection 401.03(c)(2).
- (5) **Immersion-compression.** The Contractor's dry strength result is verified if the CO's result is above the minimum contract specification, or the average of the Contractor's and the CO's result is above the minimum contract specification and the two values differ by no more than 50 pounds per square inch. The Contractor's percent retained strength result is verified if the CO's result is above the minimum contract specification.
- (6) **Marshall air voids, stability, and flow.** The Contractor's results are verified if they meet the contract specifications in Table 402-1.
- (d) **Changes and resubmissions.** See Subsection 401.03(d).
- (e) **Acceptance.** See Subsection 401.03(e).
- 402.04 Mixing Plant.** See Subsection 401.04.
- 402.05 Pavers.** See Subsection 401.05.
- 402.06 Surface Preparation.** See Subsection 401.06.
- 402.07 Weather Limitations.** See Subsection 401.07.
- 402.08 Asphalt Preparation.** See Subsection 401.08.
- 402.09 Aggregate Preparation.** See Subsection 401.09.
- 402.10 Mixing.** See Subsection 401.10.
- 402.11 Hauling.** See Subsection 401.11.
- 402.12 Production Start-up Procedures.** See Subsection 401.12.
- (a) **Pre-paving conference.** See Subsection 401.12(a).
- (b) **Control Strip.** See Subsection 401.12(b).

(1) Mixture. Take and test at least three control strip asphalt concrete mix samples and evaluate according to Subsection 402.17. The mix is acceptable if the calculated pay factor for asphalt content and aggregate gradation is 0.90 or greater.

(2) Compaction. See Subsection 401.12(b)(2).

402.13 Placing and Finishing. See Subsection 401.13.

402.14 Compacting. See Subsection 401.14.

402.15 Joints, Trimming Edges, and Cleanup. See Subsection 401.15.

402.16 Pavement Smoothness/Roughness. See Subsection 401.16.

402.17 Acceptance. See Table 402-3 for sampling and testing requirements and the acceptance quality characteristic category.

Mineral filler, antistrip additive, and recycling agent will be evaluated under Subsections 106.02 and 106.03.

Asphalt binder will be evaluated under Subsections 106.03(a), 106.04, and 702.09.

Construction of the Hvcem or Marshall designed hot asphalt concrete pavement course will be evaluated under Subsections 106.02 and 106.04.

Asphalt content, aggregate gradation, density, and type I and II pavement smoothness will be evaluated under Subsection 106.05. Type III and IV pavement roughness and other aggregate quality properties will be evaluated under Subsections 106.02 and 106.04.

(a) Asphalt content. The upper and lower specification limits are the approved job-mix formula target value plus or minus 0.4 percent.

(b) Aggregate gradation. The upper and lower specification limits are the approved job-mix formula target values plus or minus the allowable deviations shown in Table 703-4. See Table 402-3 for the acceptance quality characteristics category.

(c) Density. The lower specification limit is 91 percent of the maximum specific gravity (density) determined according to AASHTO T 209 as part of the job-mix formula evaluation specified in Subsection 402.03.

(d) Pavement smoothness/roughness. The evaluation will be made after all defective areas are corrected. See Subsection 401.16.

Measurement

402.18 Measure the Section 402 items listed in the bid schedule according to Subsection 109.02.

Payment

402.19 The accepted quantities will be paid at the contract price per unit of measurement for the Section 402 pay items listed in the bid schedule except the hot asphalt concrete pavement contract unit bid price will be adjusted according to Subsections 106.05 and 401.16. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

Payment for hot asphalt concrete pavement will be made at a price determined by multiplying the contract unit bid price by the material pay factor. The material pay factor is the lowest single pay factor determined for asphalt content, specific gravity (density), or any individual sieve of the aggregate gradation.

When the bid schedule contains a pay item for hot asphalt concrete pavement, type I or II pavement smoothness, a separate adjustment will be made for pavement smoothness according to the following formula:

$$A = 32,700(PF_{\text{smooth}} - 1.00)(L)$$

where:

- A = Adjustment to contract payment in dollars for pavement smoothness.
- L = Total project length in lane miles of traveled way including excluded areas. Measure project length to 3 decimal places.
- PF_{smooth} = Pay factor for smoothness with respect to the upper specification limit determined according to Subsection 401.16 and 106.05 after completion of corrective work.

When the bid schedule contains a pay item for hot asphalt concrete pavement, type III or IV pavement roughness, a separate pay adjustment will be made. The dollar amount of the adjustment will be determined by summing the pay adjustment factors determined in Subsection 401.16 for each 0.1-mile and multiplying that sum by the contract unit bid price.

Section 609. — CURB AND GUTTER

Description

609.01 This work consists of constructing or resetting of curb, combination curb and gutter, or wheelstops.

Stone curb is designated as type I or II according to Subsection 705.06.

Material

609.02 Conform to the following Sections and Subsections:

Asphalt mixtures	404
Bed course	704.09
Concrete	601
Joint filler	712.01
Mortar	712.05
Precast concrete curbing and wheelstops	725.06
Reinforcing steel	709.01
Stone curbing	705.06

Construction Requirements

609.03 General. Excavate and backfill according to Section 209. Place and compact the bed course material. Compact the bed course with at least three passes of a lightweight mechanical tamper, roller, or vibratory system.

609.04 Stone and Precast Concrete Curb. Clean the curb material thoroughly and wet it just before setting. Set the curb in bed course so the face and top lines are to line and grade. Make the joints 1/2 to 1 inch wide and fill the joints with mortar.

Complete the first 25 feet of curb to demonstrate the ability to build a curb meeting these requirements. Do not continue construction until the 25-foot test section is approved.

Where a concrete pavement is constructed contiguous to the curb, construct the joints in the curb directly in line with the pavement expansion joints.

Make the curb joint 3/4 inch wide and fill it with expansion joint filler of the same nominal thickness as the pavement joint. Fill all voids between the joint filler and the curb with mortar.

609.05 Concrete Curb or Curb and Gutter. Perform work according to Section 601. The curb or curb and gutter may be cast-in-place or slip-formed.

(a) Cast-in-place. Use forms that extend for the full depth of the concrete. Use curved forms for curb with a radius of 300 feet or less.

(1) Contraction joints. Construct curb in sections of uniform 10-foot lengths. Construct contraction joints 1/8 inch wide. Use metal divider plates. When the curb is constructed adjacent to or on concrete pavement, match the contraction joints in the pavement.

(2) Expansion joints. Form expansion joints at intervals of 60 feet using a 3/4-inch thick preformed expansion joint filler. Where the curb is constructed adjacent to or on rigid pavement, match the expansion joints in the pavement.

Finish the concrete smooth and even with a wood float. Broom finish parallel to the curb line according to Subsection 552.14(c)(2). When an exposed aggregate finish is required, finish according to Subsection 552.14(c)(4). Leave forms in place for 24 hours or until the concrete has set sufficiently so the forms can be removed without harming the curb.

(b) Slip-formed. Use a self-propelled automatic curb machine or a paver with curb attachments. Use a machine that is heavy enough to obtain consolidation without the machine riding above the foundation.

Adjust the concrete aggregate gradation, if necessary, to produce a curb or curb and gutter that has well-defined web marks of water on the surface. Remove and replace sections with craters larger than 3/16 inch or other sections determined to be damaged or defective. Repairing surface craters and other defective sections by plastering is not permitted.

After the concrete has hardened sufficiently to permit sawing without damage, saw contraction joints according to (a)(1) above. Construct expansion joints according to (a)(2) above.

609.06 Asphalt Concrete Curb. Where curb is constructed on a pavement, place a tack coat according to Section 412 on the area under the curb.

Construct asphalt concrete curb according to Section 404. Use a self-propelled automatic curb machine or a paver with curb attachments that is heavy enough to compact a curb without riding above the foundation. Make the curb uniform in texture, shape, and density. Curb may be constructed by other means only in short sections or sections with short radii.

609.07 Resetting Stone or Precast Concrete Curb. Carefully remove, clean, and store the curb. Cut or fit the curb as necessary for installation. Replace all lost, damaged, or destroyed curb. Reset the curb according to Subsection 609.04.

609.08 Wheelstops. Pin the wheelstops in place with two 3.5-foot sections of No. 6 reinforcing steel or 3/4-inch steel rods. Reset wheelstops in the same manner.

609.09 Acceptance. See Table 609-1 for sampling and testing requirements.

Material for mortar will be evaluated under Subsections 106.02 and 106.03. Mortar will be evaluated under Subsection 106.04.

Precast units (curb and wheel stops) will be evaluated under Subsections 106.02 and 106.03.

Bed course material will be evaluated under Subsections 106.02 and 106.04.

Stone for stone curbing will be evaluated under Subsections 106.02 and 106.04.

Construction of curb and gutter, and wheelstops will be evaluated under Subsections 106.02 and 106.04.

Excavation and backfill will be evaluated under Section 209.

Asphalt mixture will be evaluated under Section 404.

Concrete will be evaluated under Section 601.

Measurement

609.10 Measure the Section 609 items listed in the bid schedule according to Subsection 109.02 and the following as applicable.

Make no deduction in length for drainage structures installed in the curb section or for driveway and handicap access ramp openings where the gutter is continuous across the opening.

Measure bed course material by the cubic yard in place.

Payment

609.11 The accepted quantities will be paid at the contract price per unit of measurement for the Section 609 pay items listed in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

(g) Furnish and maintain traffic control devices that meet the "acceptable" standard described in *Quality Standards for Work Zone Traffic Control Devices* published by ATSSA. Amend the ATSSA standards as follows:

(1) Repair or remove and replace "marginal" devices within 48 hours; and

(2) Repair or remove and replace "unacceptable" devices immediately.

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

(i) Furnish temporary traffic control devices that meet the NCHRP Report 350, *Recommended Procedures for the Safety Performance Evaluation of Highway Features*, for crashworthiness standards as applicable.

635.04 Advance Warning Arrow Panels. Perform the work described under MUTCD Part 6.

635.05 Barricades. Perform the work described under MUTCD Part 6. Use type III, VII, VIII, or IX retroreflective sheeting.

635.06 Cones and Tubular Markers. Perform the work described under MUTCD Part 6. Use 28-inch cones or tubular markers. Use type III, or VI retroreflective sheeting.

635.07 Construction Signs. Use type III, VII, VIII, or IX retroreflective sheeting. For roll-up signs, use type VI retroreflective sheeting. Remove or completely cover all unnecessary signs with metal, plywood, or other acceptable material.

Use crashworthy posts within the traversable area adjacent to traffic. Install posts according to Section 633.

635.08 Drums. Perform work described in MUTCD Part 6. Use plastic drums that are approximately 36 inches high and a minimum of 18 inches in diameter. Use type III or VI retroreflective sheeting.

635.09 Flaggers. Use flaggers certified by the American Traffic Safety Services Association, the National Safety Council, the International Municipal Signal Association, a state agency, or other acceptable organization. Perform the work described under MUTCD Part 6. Use type III, VII, VIII, or IX retroreflective sheeting on flagger paddles. Do not use flags.

635.10 Pilot Cars. Perform the work described under MUTCD Part 6. Use pilot car operators meeting the minimum qualifications of a flagger according to Subsection 635.09. Mount a rotating amber beacon on the roof of each pilot car. Do not use strobe light beacons.

(g) Furnish and maintain traffic control devices that meet the "acceptable" standard described in *Quality Standards for Work Zone Traffic Control Devices* published by ATSSA. Amend the ATSSA standards as follows:

(1) Repair or remove and replace "marginal" devices within 48 hours; and

(2) Repair or remove and replace "unacceptable" devices immediately.

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

(i) Furnish temporary traffic control devices that meet the NCHRP Report 350, *Recommended Procedures for the Safety Performance Evaluation of Highway Features*, for crashworthiness standards as applicable.

635.04 Advance Warning Arrow Panels. Perform the work described under MUTCD Part 6.

635.05 Barricades. Perform the work described under MUTCD Part 6. Use type III, VII, VIII, or IX retroreflective sheeting.

635.06 Cones and Tubular Markers. Perform the work described under MUTCD Part 6. Use 28-inch cones or tubular markers. Use type III, or VI retroreflective sheeting.

635.07 Construction Signs. Use type III, VII, VIII, or IX retroreflective sheeting. For roll-up signs, use type VI retroreflective sheeting. Remove or completely cover all unnecessary signs with metal, plywood, or other acceptable material.

Use crashworthy posts within the traversable area adjacent to traffic. Install posts according to Section 633.

635.08 Drums. Perform work described in MUTCD Part 6. Use plastic drums that are approximately 36 inches high and a minimum of 18 inches in diameter. Use type III or VI retroreflective sheeting.

635.09 Flaggers. Use flaggers certified by the American Traffic Safety Services Association, the National Safety Council, the International Municipal Signal Association, a state agency, or other acceptable organization. Perform the work described under MUTCD Part 6. Use type III, VII, VIII, or IX retroreflective sheeting on flagger paddles. Do not use flags.

635.10 Pilot Cars. Perform the work described under MUTCD Part 6. Use pilot car operators meeting the minimum qualifications of a flagger according to Subsection 635.09. Mount a rotating amber beacon on the roof of each pilot car. Do not use strobe light beacons.

Section 706. — CONCRETE AND PLASTIC PIPE

706.01 Non-Reinforced Concrete Pipe. Conform to AASHTO M 86 for the diameters and strength classes specified.

706.02 Reinforced Concrete Pipe. Conform to AASHTO M 170 for the diameters and strength classes specified. For precast reinforced concrete end sections, conform to cited specifications to the extent they apply.

706.03 Perforated Concrete Pipe. Conform to AASHTO M 175, type 1 or 2 and AASHTO M 86 for the diameters and strength classes specified.

706.04 Reinforced Arch-Shaped Concrete Pipe. Conform to AASHTO M 206 for the diameters and strength classes specified.

706.05 Reinforced Elliptically-Shaped Concrete Pipe. Conform to AASHTO M 207 for the diameters, placement design (horizontal or vertical), and strength classes specified.

706.06 Reinforced D-Load Concrete Pipe. Conform to AASHTO M 242 for the diameters specified.

706.07 Precast Reinforced Concrete Box Sections. Conform to AASHTO M 259 or M 273, as applicable, for dimensions and loading conditions specified.

706.08 Plastic Pipe. Furnish perforated and nonperforated plastic pipe conforming to the following for the sizes and types specified. For watertight joints, conform to ASTM D 3212.

(a) **Smooth wall polyethylene pipe.** Furnish 12- to 42-inch diameter pipe conforming to ASTM F 714 and minimum cell class, ASTM D 3350, 335434C.

(b) **Corrugated polyethylene pipe.** Furnish 12- to 36-inch diameter pipe conforming to AASHTO M 294. For sanitary sewer applications, furnish AASHTO M 294, type S pipe with watertight joints.

(c) **Profile wall (ribbed) polyethylene pipe.** Furnish 18- to 48-inch diameter pipe conforming to ASTM F 894 and minimum cell class, ASTM D 3350, 334433C or 335434C.

(d) **Corrugated polyethylene drainage tubing.** Furnish 3- to 10-inch diameter tubing conforming to AASHTO M 252.

(e) Smooth wall polyvinyl chloride pipe. Furnish 4- to 15-inch diameter pipe conforming to AASHTO M 278 and minimum cell class, ASTM D 1784, 12454 or 12364. For sanitary sewer applications, conform to ASTM D 3034.

(f) Profile wall (ribbed) polyvinyl chloride pipe. Furnish 4- to 48-inch diameter pipe conforming to AASHTO M 304 and minimum cell class, ASTM D 1784, 12454C or 12364C. For sanitary sewer applications, conform to ASTM F 794 or F 949.

(g) Acrylonitrile-butadiene-styrene (ABS) pipe. Conform to AASHTO M 264. For perforations, conform to AASHTO M 278.

Table 714-5
Physical Requirements For Temporary Silt Fence

Property	Test Method ASTM	Units	Specifications		
			Type V-A	Type V-B ⁽²⁾	Type V-C ⁽³⁾
Grab strength	D 4632	N			
Machine direction			400	550	550
Cross direction			400	450	450
Permittivity	D 4491	s ⁻¹	0.05	0.05	0.05
Apparent opening size	D 4751	mm	0.60 ⁽¹⁾	0.60 ⁽¹⁾	0.60 ⁽¹⁾
Ultraviolet stability	D 4355	%	70% after 500 hours of exposure		

(1) Maximum average roll value.

(2) Elongation at break ≥ 50 percent elongation (ASTM D 4632).

(3) Elongation at break < 50 percent elongation (ASTM D 4632).

Table 714-6
Physical Requirements For Paving Fabric

Property	Test Method	Units	Specifications Type VI
Grab strength	ASTM D 4632	N	500
Ultimate elongation	ASTM D 4632	%	50% at break
Asphalt retention	ASTM D 6140	L/m ²	0.90
Mass per unit area	ASTM D 5261	g/m ²	140
Melting point	ASTM D 276	°C	150

714.02 Geocomposite Drains. Furnish a drainage core with a subsurface drainage geotextile attached to or encapsulating the core. Include all necessary fittings and material to splice one sheet, panel, or roll to the next and to connect the geocomposite drain to the collector and outlet piping.

For the drainage core, use long chain synthetic polymers composed at least 85 percent by mass of polypropylene, polyester, polyamide, polyvinyl chloride, polyolefin, or polystyrene. Fabricate the core in sheets, panels, or rolls of adequate strength to resist installation stresses and long-term loading conditions. Build the core up in thickness by means of columns, cones, nubs, cusps, meshes, stiff filaments, or other configurations.

Table 714-4
Physical Requirements for Permanent Erosion Control Geotextile

Property	Test Method ASTM	Units	Specifications ⁽¹⁾					
			Type IV-A	Type IV-B	Type IV-C	Type IV-D	Type IV-E	Type IV-F
Grab strength	D 4632	N	1400/900	1400/900	1400/900	1100/700	1100/700	1100/700
Sewn seam strength	D 4632	N	1260/810	1260/810	1260/810	990/630	990/630	990/630
Tear strength	D 4533	N	500/350	500/350	500/350	400 ⁽³⁾ /250	400 ⁽³⁾ /250	400 ⁽³⁾ /250
Puncture strength	D 4833	N	500/350	500/350	500/350	400/250	400/250	400/250
Burst strength	D 3786	kPa	3500/1750	3500/1750	3500/1750	2750/1350	2750/1350	2750/1350
Permittivity	D 4491	s ⁻¹	0.7	0.2	0.1	0.7	0.2	0.1
Apparent opening size	D 4751	mm	0.43 ⁽²⁾	0.25 ⁽²⁾	0.22 ⁽²⁾	0.43 ⁽²⁾	0.25 ⁽²⁾	0.22 ⁽²⁾
Ultraviolet stability	D 4355	%	50 % after 500 hours of exposure					

(1) The first values in a column apply to geotextiles that break at <50 percent elongation (ASTM D 4632). The second values in a column apply to geotextiles that break at ≥ 50 elongation (ASTM D 4632).

(2) Maximum average roll value.

(3) The minimum average roll tear strength for woven monofilament geotextile is 245 N.

Table 714-3
Physical Requirements For Stabilization Geotextile

Property	Test Method ASTM	Units	Specifications ⁽¹⁾	
			Type III-A	Type III-B
Grab strength	D 4632	N	1400/900	1100/700
Sewn seam strength	D 4632	N	1260/810	990/630
Tear strength	D 4533	N	500/350	400 ⁽³⁾ /250
Puncture strength	D 4833	N	500/350	400/250
Burst strength	D 3786	kPa	3500/1700	2700/1300
Permittivity	D 4491	s ⁻¹	0.05	0.05
Apparent opening size	D 4751	mm	0.43 ⁽²⁾	0.43 ⁽²⁾
Ultraviolet stability	D 4355	%	50% after 500 hours of exposure	

(1) The first values in a column apply to geotextiles that break at < 50 percent elongation (ASTM D 4632). The second values in a column apply to geotextiles that break at ≥ 50 percent elongation (ASTM D 4632).

(2) Maximum average roll value.

(3) The minimum average tear strength for woven monofilament geotextile is 245 N.

In addition, when geotextile joints are sewn, submit the seam assembly description and a sample of the sewn material. This description shall include the seam type, seam allowance, stitch type, sewing thread tex ticket number(s) and type(s), stitch density, and stitch gauge. If the production seams are sewn in both the machine and cross-machine directions, provide sample sewn seams that are oriented in both the machine and cross-machine directions. Furnish a sewn sample that has at least 2 meters of sewn seam and is at least 1.5 meters wide. Sew the sample seams with the same equipment and procedures that are used to sew the production seams. For seams sewn on-site, conform to the manufacturer's recommendations. Obtain approval of the seam before installation.

Table 714-2
Physical Requirements For Separation Geotextile

Property	Test Method ASTM	Units	Specifications ⁽¹⁾		
			Type II-A	Type II-B	Type II-C
Grab strength	D 4632	N	1400/900	1100/700	800/500
Sewn seam strength	D 4632	N	1260/810	990/630	720/450
Tear strength	D 4533	N	500/350	400 ⁽³⁾ /250	300/180
Puncture strength	D 4833	N	500/350	400/250	300/180
Burst strength	D 3786	kPa	3500/1700	2700/1300	2100/950
Permittivity	D 4491	s ⁻¹	0.02	0.02	0.02
Apparent opening size	D 4751	mm	0.60 ⁽²⁾	0.60 ⁽²⁾	0.60 ⁽²⁾
Ultraviolet stability	D 4355	%	50% after 500 hours of exposure		

(1) The first values in a column apply to geotextiles that break at < 50 percent elongation (ASTM D 4632). The second values in a column apply to geotextiles that break at ≥ 50 percent elongation (ASTM D 4632).

(2) Maximum average roll value.

(3) The minimum average tear strength for woven monofilament geotextile is 245 N.

Section 714. — GEOTEXTILE AND GEOCOMPOSITE DRAIN MATERIAL

714.01 Geotextile. Use long-chain, synthetic polymers, composed at least 95 percent by mass of polyolefins or polyesters, to manufacture geotextile or the threads used to sew geotextile. Form the geotextile, including selvages, into a stable network such that the filaments or yarns retain their dimensional stability relative to each other.

(a) Physical requirements. Conform to the following tables for the type of geotextile specified:

(1) Type I (A - F) Subsurface drainage	Table 714-1
(2) Type II (A - C) Separation	Table 714-2
(3) Type III (A - B) Stabilization geotextile	Table 714-3
(4) Type IV (A - F) Permanent erosion control	Table 714-4
(5) Type V (A - C) Temporary silt fence	Table 714-5
(6) Type VI Paving fabric	Table 714-6

All property values, with the exception of apparent opening size (AOS), in these specifications represent minimum average roll values in the weakest principal direction (i.e., average test results of any roll in a lot sampled for conformance or quality assurance testing shall meet or exceed the specified values). Values for AOS represent maximum average roll values.

Elevate and protect rolls with a waterproof cover if stored outdoors. When using a geotextile for a permanent installation, limit the geotextile exposure to ultraviolet radiation to less than 10 days.

(b) Evaluation procedures. Geotextile will be evaluated under Subsection 106.03. Furnish a commercial certification including the name of the manufacturer, product name, style number, chemical composition of the filaments or yarns, and other pertinent information to fully describe the geotextile.

When samples are required, remove a 3-foot long, full-width sample from beyond the first outer wrap of the roll. Label the sample with the lot and batch number, date of sampling, project number, item number, manufacturer, and product name.

Table 714-1
Physical Requirements for Subsurface Drainage Geotextile

Property	Test Method ASTM	Units	Specifications ⁽¹⁾					
			Type I-A	Type I-B	Type I-C	Type I-D	Type I-E	Type I-F
Grab strength	D 4632	N	1100/700	1100/700	1100/700	800/500	800/500	800/500
Sewn seam strength	D 4362	N	990/630	990/630	990/630	720/450	720/450	720/450
Tear strength	D 4533	N	400 ⁽³⁾ /250	400 ⁽³⁾ /250	400 ⁽³⁾ /250	300/175	300/175	300/175
Puncture strength	D 4833	N	400/250	400/250	400/250	300/175	300/175	300/175
Burst strength	D 3786	kPa	2750/1350	2750/1350	2750/1350	2100/950	2100/950	2100/950
Permittivity	D 4491	s ⁻¹	0.5	0.2	0.1	0.5	0.2	0.1
Apparent opening size	D 4751	mm	0.43 ⁽²⁾	0.25 ⁽²⁾	0.22 ⁽²⁾	0.43 ⁽²⁾	0.25 ⁽²⁾	0.22 ⁽²⁾
Ultraviolet stability	D 4355	%	50 % after 500 hours of exposure					

(1) The first values in a column apply to geotextiles that break at < 50 percent elongation (ASTM D 4632). The second values in a column apply to geotextiles that break at ≥ 50 elongation (ASTM D 4632).

(2) Maximum average roll value.

(3) The minimum average roll tear strength for woven monofilament geotextile is 245 N.

In addition, when geotextile joints are sewn, submit the seam assembly description and a sample of the sewn material. This description shall include the seam type, seam allowance, stitch type, sewing thread tex ticket number(s) and type(s), stitch density, and stitch gauge. If the production seams are sewn in both the machine and cross-machine directions, provide sample sewn seams that are oriented in both the machine and cross-machine directions. Furnish a sewn sample that has at least 2 meters of sewn seam and is at least 1.5 meters wide. Sew the sample seams with the same equipment and procedures that are used to sew the production seams. For seams sewn on-site, conform to the manufacturer's recommendations. Obtain approval of the seam before installation.

Table 714-2
Physical Requirements For Separation Geotextile

Property	Test Method ASTM	Units	Specifications ⁽¹⁾		
			Type II-A	Type II-B	Type II-C
Grab strength	D 4632	N	1400/900	1100/700	800/500
Sewn seam strength	D 4632	N	1260/810	990/630	720/450
Tear strength	D 4533	N	500/350	400 ⁽³⁾ /250	300/180
Puncture strength	D 4833	N	500/350	400/250	300/180
Burst strength	D 3786	kPa	3500/1700	2700/1300	2100/950
Permittivity	D 4491	s ⁻¹	0.02	0.02	0.02
Apparent opening size	D 4751	mm	0.60 ⁽²⁾	0.60 ⁽²⁾	0.60 ⁽²⁾
Ultraviolet stability	D 4355	%	50% after 500 hours of exposure		

(1) The first values in a column apply to geotextiles that break at < 50 percent elongation (ASTM D 4632). The second values in a column apply to geotextiles that break at ≥ 50 percent elongation (ASTM D 4632).

(2) Maximum average roll value.

(3) The minimum average tear strength for woven monofilament geotextile is 245 N.

Table 714-3
Physical Requirements For Stabilization Geotextile

Property	Test Method ASTM	Units	Specifications ⁽¹⁾	
			Type III-A	Type III-B
Grab strength	D 4632	N	1400/900	1100/700
Sewn seam strength	D 4632	N	1260/810	990/630
Tear strength	D 4533	N	500/350	400 ⁽³⁾ /250
Puncture strength	D 4833	N	500/350	400/250
Burst strength	D 3786	kPa	3500/1700	2700/1300
Permittivity	D 4491	s ⁻¹	0.05	0.05
Apparent opening size	D 4751	mm	0.43 ⁽²⁾	0.43 ⁽²⁾
Ultraviolet stability	D 4355	%	50% after 500 hours of exposure	

(1) The first values in a column apply to geotextiles that break at < 50 percent elongation (ASTM D 4632). The second values in a column apply to geotextiles that break at ≥ 50 percent elongation (ASTM D 4632).

(2) Maximum average roll value.

(3) The minimum average tear strength for woven monofilament geotextile is 245 N.

Table 714-4
Physical Requirements for Permanent Erosion Control Geotextile

Property	Test Method ASTM	Units	Specifications ⁽¹⁾					
			Type IV-A	Type IV-B	Type IV-C	Type IV-D	Type IV-E	Type IV-F
Grab strength	D 4632	N	1400/900	1400/900	1400/900	1100/700	1100/700	1100/700
Sewn seam strength	D 4632	N	1260/810	1260/810	1260/810	990/630	990/630	990/630
Tear strength	D 4533	N	500/350	500/350	500/350	400 ⁽³⁾ /250	400 ⁽³⁾ /250	400 ⁽³⁾ /250
Puncture strength	D 4833	N	500/350	500/350	500/350	400/250	400/250	400/250
Burst strength	D 3786	kPa	3500/1750	3500/1750	3500/1750	2750/1350	2750/1350	2750/1350
Permittivity	D 4491	s ⁻¹	0.7	0.2	0.1	0.7	0.2	0.1
Apparent opening size	D 4751	mm	0.43 ⁽²⁾	0.25 ⁽²⁾	0.22 ⁽²⁾	0.43 ⁽²⁾	0.25 ⁽²⁾	0.22 ⁽²⁾
Ultraviolet stability	D 4355	%	50 % after 500 hours of exposure					

(1) The first values in a column apply to geotextiles that break at <50 percent elongation (ASTM D 4632). The second values in a column apply to geotextiles that break at ≥ 50 elongation (ASTM D 4632).

(2) Maximum average roll value.

(3) The minimum average roll tear strength for woven monofilament geotextile is 245 N.

Table 714-5
Physical Requirements For Temporary Silt Fence

Property	Test Method ASTM	Units	Specifications		
			Type V-A	Type V-B ⁽²⁾	Type V-C ⁽³⁾
Grab strength	D 4632	N			
Machine direction			400	550	550
Cross direction			400	450	450
Permittivity	D 4491	s ⁻¹	0.05	0.05	0.05
Apparent opening size	D 4751	mm	0.60 ⁽¹⁾	0.60 ⁽¹⁾	0.60 ⁽¹⁾
Ultraviolet stability	D 4355	%	70% after 500 hours of exposure		

(1) Maximum average roll value.

(2) Elongation at break $\geq$ 50 percent elongation (ASTM D 4632).

(3) Elongation at break < 50 percent elongation (ASTM D 4632).

Table 714-6
Physical Requirements For Paving Fabric

Property	Test Method	Units	Specifications Type VI
Grab strength	ASTM D 4632	N	500
Ultimate elongation	ASTM D 4632	%	50% at break
Asphalt retention	ASTM D 6140	L/m ²	0.90
Mass per unit area	ASTM D 5261	g/m ²	140
Melting point	ASTM D 276	°C	150

714.02 Geocomposite Drains. Furnish a drainage core with a subsurface drainage geotextile attached to or encapsulating the core. Include all necessary fittings and material to splice one sheet, panel, or roll to the next and to connect the geocomposite drain to the collector and outlet piping.

For the drainage core, use long chain synthetic polymers composed at least 85 percent by mass of polypropylene, polyester, polyamide, polyvinyl chloride, polyolefin, or polystyrene. Fabricate the core in sheets, panels, or rolls of adequate strength to resist installation stresses and long-term loading conditions. Build the core up in thickness by means of columns, cones, nubs, cusps, meshes, stiff filaments, or other configurations.

Furnish geocomposite drains with a minimum compressive strength of 40 pounds per square inch when tested according to ASTM D 1621, procedure A. Furnish splices, fittings, and connections with sufficient strength to maintain the integrity of the system during construction handling and permanent loading without impeding flow or damaging the core.

Elevate and protect sheets, panels, or rolls with a waterproof and ultraviolet resistant cover if stored outdoors.

When using a geocomposite drain for a permanent installation, limit the geocomposite exposure to ultraviolet radiation to less than 10 days.

Geocomposites will be evaluated under Subsection 106.03. When samples are required, provide a 3-foot square sample from products supplied as sheets or panels or a 3-foot length full-roll width sample from products supplied in rolls. Label the sample with the lot and batch number, date of sampling, project number, item number, manufacturer, and product name.

(a) Geocomposite underdrains. The horizontal and vertical flow of water within the core shall interconnect at all times for the full height of the core. The drainage core with the geotextile fully encapsulating the core shall provide a minimum flow rate of 5 gallons per minute per foot of width when tested according to ASTM D 4716 under the following test conditions:

- (1) 14-inch long specimen;
- (2) Applied load of 7.25 pounds per square inch;
- (3) Gradient of 1.0;
- (4) 100-hour seating period; and
- (5) Rubber membrane between platens and geocomposite.

Firmly attach the geotextile to the core so folding, wrinkling, or other movement cannot occur either during handling or after placement. Achieve bonding using nonwater-soluble adhesive, heat sealing, or other methods recommended by the manufacturer. Do not use adhesive on areas of the geotextile fabric where flow is intended to occur.

If heat sealing is used, do not weaken the geotextile below the required strength values. Extend the geotextile below the bottom of the core a length sufficient to completely encapsulate the collector pipe.

(b) Geocomposite sheet drains. The horizontal and vertical flow of water within the sheet drain shall interconnect at all times for the full height of the core. The drainage core with the geotextile laminated to one side of the core shall provide a minimum

flow rate of 5 gallons per minute per foot of width when tested according to ASTM D 4716 under test conditions (1) through (5) in (a) above.

If core construction separates the flow channel into two or more sections, only the flow rate on the in-flow face is considered in determining the core's acceptability.

Firmly attach the geotextile to the core so folding, wrinkling, or other movement cannot occur either during handling or after placement. Achieve bonding using nonwater-soluble adhesive, heat sealing, or other method recommended by the manufacturer. Do not use adhesive on areas of the geotextile fabric where flow is intended to occur.

If heat sealing is used, do not weaken the geotextile below the required strength values. Extend the geotextile below the bottom of the core length sufficient to completely encapsulate the collector pipe.

(c) Geocomposite pavement edge drains. The geotextile shall tightly encapsulate the geocomposite edge drain. The edge drains shall permit in-flow from both sides. The drain core with the geotextile in place shall provide a minimum flow rate of 15 gallons per minute per foot of width when tested according to ASTM D 4716 under test conditions (1) through (5) in (a) above, except the gradient shall be 0.1.

If the geocomposite polymer core separates the flow channel into two or more parts, consider only the tested flow rate of the channel facing the pavement.

All pipe and pipe fittings used for an outlet to the edge drain shall be non-perforated plastic pipe conforming to Subsection 706.08.

The solvent cement for the outlet pipe and fittings shall be according to ASTM D 2564. The material composition of the outlet fittings shall be compatible for direct solvent welding to PVC.