

MISCELLANEOUS ITEMS

ITEM P-602 EMULSIFIED ASPHALT PRIME COAT

DESCRIPTION

602-1.1 This item shall consist of an application of liquid asphalt material on the prepared base course according to these Specifications and in reasonably close conformity to the lines shown on the Plans.

MATERIALS

602-2.1 LIQUID ASPHALT MATERIAL. The types, grades, controlling specifications, and application temperatures for the prime coat are given in Table 602-1. Provide the specific prime coat material designated in the Plans.

TABLE 602-1. MATERIALS

Type and Grade	Specification	Application Temperatures \\ °F	Application Rate gal/yd ²
Emulsified Asphalt			
SS-1, SS-1h	AASHTO M 140	70-160	0.27 to 0.53
MS-2, HFMS-1	AASHTO M 140	70-160	0.27 to 0.53
CSS-1, CSS-1h	AASHTO M 208	70-160	0.27 to 0.53
CMS-2	AASHTO M 208	70-160	0.27 to 0.53
CMS-2s	\\2\\	70-160	0.22 to 0.44
Cutback Asphalt			
RC-30	ASTM D2028	80+	0.27 to 0.53
RC-70	ASTM D2028	120+	0.27 to 0.53
RC-250	ASTM D2028	165+	0.27 to 0.53
MC-30	ASTM D2027	80+	0.11 to 0.33

\\1\\ The maximum temperature for cutback asphalt shall be that at which fogging occurs.

\\2\\ CMS-2s shall meet the following specifications: Viscosity, Saybolt Furol, of 50 to 450 at 122 °F when tested under AASHTO T 59. Particle charge test of Positive when tested under AASHTO T 59. Sieve test maximum of 0.10% when tested under AASHTO T 59. Oil distillate, by volume of emulsion, of 20% maximum when tested under AASHTO T 59. Residue of 65% minimum when tested under AASHTO T 59. Penetration of 100 to 250 at 77 °F, 100 g, 5 s when tested under ASTM D5. Ductility of 40 cm minimum at 77 °F when tested under ASTM D113. Solubility in trichloroethylene of 97.5% minimum.

The Contractor shall provide samples of the prime coat material and a copy of the manufacturer's Certificate of Analysis (COA) for each carload or equivalent of the liquid asphalt material to the Engineer for review and acceptance before the liquid asphalt material is applied. The furnishing of the COA for the liquid asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

CONSTRUCTION METHODS

602-3.1 WEATHER LIMITATIONS. The prime coat shall be applied only when the existing surface is dry or contains sufficient moisture to get uniform distribution, when the surface temperature is above 45 °F, and when the weather is not foggy or rainy. The temperature requirements may be waived, but only when so directed by the Engineer.

602-3.2 EQUIPMENT. The equipment used by the Contractor shall include a self-powered pressure distributor and equipment for heating the prime coat.

The distributor shall be designed, equipped, maintained, calibrated within the past year to ASTM D2995, and operated so that prime coat at even heat may be applied uniformly on variable widths of surface at the specified rate. The allowable variation from the specified rate shall not exceed 5%. Distributor equipment shall include a tachometer, pressure gages, volume-measuring devices or a calibrated tank, and a thermometer for measuring temperatures of tank contents. The distributor shall be self-powered and shall be equipped with a power unit for the pump and full circulation spray bars adjustable laterally and vertically.

A power broom and/or blower shall be provided for any required cleaning of the surface to be treated.

602-3.3 APPLICATION OF PRIME COAT. Immediately before applying the prime coat, the full width of the surface to be primed shall be swept with a power broom to remove all loose dirt and other objectionable material.

The prime coat including solvent shall be uniformly applied with an asphalt distributor at the rate specified in Table 602-1, depending on the base course surface texture. The type of liquid asphalt material and application rate shall be approved by the Engineer prior to application.

Following the application, the primed surface shall be allowed to cure not less than 48 hours without being disturbed or for such additional time as may be necessary to permit the drying out of the prime until it will not be picked up by traffic or equipment. This period shall be determined by the Engineer. The surface shall then be maintained by the Contractor until the surfacing has been placed. Suitable precautions shall be taken by the Contractor to protect the primed surface against damage during this interval, including supplying, spreading, and removing any sand necessary to blot up excess prime coat.

602-3.4 TRIAL APPLICATION RATES. The Contractor shall conduct a trial application in the presence of the Engineer to demonstrate the liquid asphalt material can be satisfactorily applied within the application range specified in Table 602-1 for the specified material.

602-3.5 FREIGHT AND WAYBILLS. Before the final estimate is allowed, the Contractor shall file with the Engineer receipted bills when railroad shipments are made, and certified waybills when materials are received in any other manner, of the prime coat actually used in the construction covered by the contract. The Contractor shall not remove prime coat from the tank car or storage tank until the initial outage and temperature measurements have been taken by the Engineer, nor shall the car or tank be released until the final outage has been taken by the Engineer.

Copies of freight bills and waybills shall be furnished to the Engineer during the progress of the work.

METHOD OF MEASUREMENT

602-4.1 Prime coat will be measured by the ton, according to Subsection GCP-90-02. Removing any sand necessary to blot up excess prime coat is subsidiary to the work. Water added to emulsified asphalt will not be measured for payment.

BASIS OF PAYMENT

602-5.1 Payment will be made at the contract unit price per ton for accepted prime coat.

Payment will be made under:

Item P602.010.0010	Prime Coat, CSS-1 – per ton
Item P602.010.0020	Prime Coat, CSS-1h – per ton
Item P602.010.0030	Prime Coat, SS-1 – per ton
Item P602.010.0040	Prime Coat, SS-1h – per ton

TESTING REQUIREMENTS

AASHTO T59 Test for Emulsified Asphalts

ASTM D5	Penetration of Bituminous Materials
ASTM D113	Ductility of Asphalt Materials
ASTM D2995	Estimating Application Rate and Residual Application Rate of Bituminous Distributors

MATERIAL REQUIREMENTS

AASHTO M140	Emulsified Asphalt
AASHTO M208	Cationic Emulsified Asphalt
ASTM D2027	Cutback Asphalt (Medium-Curing Type)
ASTM D2028	Cutback Asphalt (Rapid Curing Type)

ITEM P-603 EMULSIFIED ASPHALT TACK COAT

DESCRIPTION

603-1.1 This item shall consist of preparing and treating an asphalt or concrete surface with liquid asphalt material in accordance with these Specifications and in reasonably close conformity to the lines shown on the Plans.

MATERIALS

603-2.1 ASPHALT MATERIALS. The asphalt material shall be an emulsified asphalt or cutback asphalt as specified in Table 603-1 as an asphalt application for tack coat appropriate to local conditions. Provide the specific tack coat material designated on the Plans.

The tack coat material shall not be diluted. The Contractor shall provide samples of the tack coat material and a copy of the manufacturer's Certificate of Analysis (COA) for the asphalt material to the Engineer for review and acceptance before the asphalt material is applied. The furnishing of COA for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

TABLE 603-1. MATERIALS

Type and Grade	Specification	Application Temperature °F
Emulsified Asphalt		
SS-1, SS-1h	AASHTO M 140	75-130
CSS-1, CSS-1h	AASHTO M 208	75-130
STE-1	\1\	68-140
Cutback Asphalt		
RC-70	AASHTO M 81	120-160

Note /1/ Special Tack Emulsion, STE-1. Meet the following, when tested using AASHTO T 59:

TESTS ON EMULSION

Viscosity @ 77 °F, SSF	30, max.
Storage Stability, 1 day, %	1, max.
Demulsibility, 35 mL 0.8% SDS, %	25, min.
Particle Charge	Positive*
Sieve Test, % Retained	0.10, max.
Distillation Oil by Vol. of Emulsion, %	5, max.
Distillation Residue by Wt. of Emulsion, %	45, min.

TESTS ON RESIDUE

Penetration @ 77 °F	100-250 (when tested under ASTM D5)
Ductility @ 77 °F, 5 cm/min., cm	40, min (when tested under ASTM D113)
Solubility in TCE, %	97.5, min.

* If Particle Charge test is inconclusive, material having a max. pH value of 6.7 is acceptable.

CONSTRUCTION METHODS

603-3.1 WEATHER LIMITATIONS. The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is 50°F or above; the temperature has not been below 35°F for the 12

hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the Engineer.

603-3.2 EQUIPMENT. The Contractor shall provide equipment for heating and applying the tack coat material. The tack coat shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour or seven hundred (700) feet per minute.

The equipment will be tested under pressure for leaks and to ensure proper set-up before use to verify truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate for application, spray-bar height and pressure and pump speed, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use.

The distributor truck shall be equipped with a minimum 12-foot spreader spray bar with individual nozzle control with computer-controlled application rates. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy. If the distributor is not equipped with an operable quick shutoff valve, the prime operations shall be started and stopped on building paper.

The distributor truck shall be equipped to effectively heat and mix the material to the required temperature prior to application as required. Heating and mixing shall be done in accordance with the manufacturer's recommendations. Do not overheat or over mix the material.

The distributor shall be equipped with a hand sprayer.

Asphalt distributors must be calibrated annually in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the Engineer.

A power broom and/or power blower shall be provided suitable for cleaning the surfaces to which the asphalt tack coat is to be applied.

603-3.3 APPLICATION OF TACK COAT MATERIAL. The tack coat material shall not be diluted. Immediately before applying the tack coat, the full width of surface to be treated shall be swept with a power broom and/or power blower to remove all loose dirt and other objectionable material.

The tack coat material shall be uniformly applied with an asphalt distributor at the rates appropriate for the conditions and surface specified in Table 603-2 below. The type of liquid asphalt material and application rate shall be approved by the Engineer prior to application.

TABLE 603-2. APPLICATION RATE

Surface Type	Residual Rate, gal/SY	Application Bar Rate, gal/SY
New asphalt	0.02-0.05	0.03-0.07
Existing asphalt	0.04-0.07	0.06-0.11
Milled Surface	0.04-0.08	0.06-0.12
Concrete	0.03-0.05	0.05-0.08

After application of the tack coat, the surface shall be allowed to cure without being disturbed for the period of time necessary to permit drying and setting of the tack coat. This period shall be determined by the Engineer. The Contractor shall protect the tack coat and maintain the surface until the next course has been placed. When the tack coat has been disturbed by the Contractor, tack coat shall be reapplied at the Contractor's expense.

603-3.4 FREIGHT AND WAYBILLS. The Contractor shall submit waybills and delivery tickets, during progress of the work. Before the final statement is allowed, file with the Engineer certified waybills and certified delivery tickets for all tack coat materials used in the construction of the pavement covered by the contract. Do not remove tack coat material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

METHOD OF MEASUREMENT

603-4.1 The liquid asphalt material for tack coat shall be measured by the ton according to GCP Subsection 90-02. The liquid asphalt material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10% over the specified application rate. Any amount of liquid asphalt material more than 10% over the specified application rate for each application will be deducted from the measured quantities, except for irregular areas where hand spraying of the emulsified asphalt material is necessary. Water added to emulsified asphalt will not be measured for payment.

BASIS OF PAYMENT

603.5-1 Payment shall be made at the contract unit price per ton of accepted tack coat material.

Payment will be made under:

Item P603.010.0010	Tack Coat, STE-1 – per ton
Item P603.010.0020	Tack Coat, SS-1 – per ton
Item P603.010.0030	Tack Coat, SS-1h – per ton
Item P603.010.0040	Tack Coat, CSS-1 – per ton

References

AASHTO M 81	Cutback Asphalt (Rapid-Curing Type)
AASHTO M 140	Emulsified Asphalt
AASHTO M 208	Cationic Emulsified Asphalt
AASHTO T 59	Test for Emulsified Asphalts
ASTM D5	Penetration of Bituminous Materials
ASTM D113	Ductility of Asphalt Materials
ASTM D2995	Estimating Application Rate and Residual Application Rate of Bituminous Distributors

ITEM P-605 JOINT SEALANTS FOR PAVEMENTS

DESCRIPTION

605-1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints in pavement; joints between different types of pavements; and cracks in existing pavement.

MATERIALS

605-2.1 JOINT SEALANTS. Joint sealing material shall meet the requirements of ASTM D6690 for sealing joints or cracks in Asphalt or Portland Cement Concrete Pavements. Joint sealing material shall meet the requirements of ASTM D7116 for sealing joints or cracks in Portland Cement Concrete Pavements only where fueling occurs.

Each lot or batch of sealing compound shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, and the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the compound meets the requirements of this specification.

605-2.2 BACKER ROD. The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant in accordance with ASTM D5249. The backer-rod material shall be $25\% \pm 5\%$ larger in diameter than the nominal width of the joint.

605-2.3 BOND BREAKING TAPES. Provide a bond breaking tape, or separating material that is a flexible, non-shrinkable, non-absorbing, non-staining, and non-reacting adhesive-backed tape. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The bond breaker tape shall be approximately 1/8 inch wider than the nominal width of the joint and shall not bond to the joint sealant.

605-2.4 BACKUP MATERIAL. Provide backup material that is a compressible, non-shrinking, non-staining, non-absorbing material, nonreactive with the joint sealant. The material shall have a melting point at least 5°F greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The material shall have a water absorption of not more than 5% of the sample weight when tested in accordance with ASTM C509. The backup material shall be $25 \pm 5\%$ larger in diameter than the nominal width of the crack.

CONSTRUCTION METHODS

605-3.1 TIME OF APPLICATION. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be above 50 °F and rising at the time of installation of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

605-3.2 EQUIPMENT. Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, at least 15 days prior to use on the project.

- a. **Tractor-mounted routing tool.** Provide a routing tool, used for removing old sealant from the joints, of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

- b. **Concrete saw.** Provide a self-propelled power saw, with water-cooled diamond or abrasive saw blades, for cutting joints to the depths and widths specified.
- c. **Sandblasting equipment.** The Contractor must demonstrate sandblasting equipment including the air compressor, hose, guide, and nozzle size, under job conditions, before approval in accordance with subsection 605-3.3. The Contractor shall demonstrate, in the presence of the Engineer, that the method cleans the joint and does not damage the joint.
- d. **Waterblasting equipment.** The Contractor must demonstrate waterblasting equipment including the pumps, hose, guide, and nozzle size, under job conditions, before approval in accordance with subsection 605-3.3. The Contractor shall demonstrate, in the presence of the Engineer, that the method cleans the joint and does not damage the joint.
- e. **Hand tools.** Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces. Hand tools should be carefully evaluated for potential spalling effects prior to approval for use.
- f. **Hot-poured sealing equipment.** The unit applicators used for heating and installing ASTM D6690 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.
- g. **Cold-applied, single-component sealing equipment.** The equipment for installing ASTM D5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

605-3.3 PREPARATION OF JOINTS. Pavement joints for application of material in this specification must be dry, clean of all scale, dirt, dust, curing compound, and other foreign matter. Demonstrate, in the presence of the Engineer, that the method cleans the joint and does not damage the joint.

- a. **Sawing.** All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.
- b. **Sealing.** Immediately before sealing, the joints shall be thoroughly cleaned of all laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by tractor-mounted routing equipment, concrete saw, sandblasting (if permitted), waterblasting, or by wire brushing. Upon completion of cleaning, the joints shall be blown out with compressed air. The joint faces shall be surface dry when the seal is applied.
- c. **Backer Rod.** When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a backer rod or backup material to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backer rod or backup material is placed at the specified depth and is not stretched or twisted during installation.

- d. **Bond-breaking tape.** Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-breaker separating tape to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

Prior to resealing joints, the existing joint sealant shall be removed to the depth as shown on the Plans. If joint sealant other than that originally used is specified, all existing joint sealant shall be removed.

605-3.4 INSTALLATION OF SEALANT. Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the Engineer before sealing is allowed.

Perform a final cleaning with compressed air not more than 50 feet ahead of the joint sealing operations. Fill the joints from the bottom up to 1/8 inch \pm 1/16 inch below the top of pavement surface; or bottom of groove for grooved pavement. Remove and discard excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Engineer. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

The joint sealant shall be applied uniformly solid from bottom to top and shall be filled without formation of entrapped air or voids. Backer rod or backup material shall be placed as shown on the Plans and shall be non-adhesive to the concrete or the sealant material. The heating kettle shall be an indirect heating type, constructed as a double boiler. A positive temperature control and mechanical agitation shall be provided. The sealant shall not be heated to within 20°F below the safe heating temperature. The safe heating temperature can be obtained from the manufacturer's shipping container. A direct connecting pressure type extruding device with nozzles shaped for insertion into the joint shall be provided. Any sealant spilled on the surface of the pavement shall be removed immediately.

605-3.5 INSPECTION. The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion or return to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the Department.

605-3.6 CLEAN-UP. Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

METHOD OF MEASUREMENT

605-4.1 Joint sealing material will be measured by the linear foot of sealant in place, complete, and accepted.

BASIS OF PAYMENT

605-5.1 Payment for joint sealing material will be made at the contract unit price per linear foot, and according to GCP Section 90.

Payment will be made under:

Item P605.010.0000	Joint Sealing Filler – per linear foot
Item P605.020.0000	Joint Sealing Filler – per lump sum

TESTING REQUIREMENTS

ASTM D789 Determination of Relative Viscosity of Concentrated Polyamide (PA) Solutions

MATERIAL REQUIREMENTS

ASTM C509	Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D5249	Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
ASTM D5893	Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D6690	Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM D7116	Joint Sealants, Hot Applied, Jet Fuel Resistant Types, for Portland Cement Concrete Pavements

ITEM P-606 ADHESIVE COMPOUNDS, TWO-COMPONENT FOR SEALING WIRE AND LIGHTS IN PAVEMENT

DESCRIPTION

606-1.1 This specification covers two types of material: a liquid suitable for sealing electrical wire in saw cuts in pavement and sealing light fixtures or bases in pavement; a paste suitable for embedding light fixtures and aircraft tie-downs in the pavement. Both types of material are two-component filled formulas with the characteristics specified in Subsection 606-2.4. Materials supplied for use with asphalt and/or concrete pavements must be formulated so they are compatible with the asphalt and/or concrete.

EQUIPMENT AND MATERIALS

606-2.1 CURING. When pre-warmed to 77°F, mixed, and placed according to manufacturer's directions, the materials shall cure at temperatures of 45°F or above without the application of external heat.

606-2.2 STORAGE. The adhesive components shall not be stored at temperatures over 86°F, unless otherwise specified by the manufacturer.

606-2.3 CAUTION. Installation and use shall be according to the manufacturer's recommended procedures. Avoid prolonged or repeated contact with skin. In case of contact, wash with soap and flush with water. If taken internally, call doctor. Keep away from heat or flame. Avoid vapor. Use in well-ventilated areas. Keep in cool place. Keep away from children.

606-2.4 CHARACTERISTICS. When mixed and cured according to the manufacturer's directions, the materials shall have the following properties shown in Table 606-1.

TABLE 606-1. PROPERTY REQUIREMENTS

Physical or Electrical Property	Minimum	Maximum	ASTM Method
Tensile			
Portland Cement Concrete	1,000 psi		D638
Asphalt Concrete	500 psi		
Elongation			
Portland Cement Concrete	8% \1\		D638
Hot Mix Asphalt	50%		D638
Coef. of cub. exp., cm ³ /cm ³ /°C	0.00090	0.00120	D1168-08
Coef. of lin. exp., cm/cm/°C	0.00030	0.00040	D1168-08
Dielectric strength, short time test	350 volts/mil.		D149
Arc resistance	125 secs.		D495
Pull-off			
Adhesion to steel	1,000 psi		
Adhesion to Portland cement concrete	200 psi		
Adhesion to asphalt concrete	(no test available)		
Adhesion to aluminum	250 psi		

\1\ 20% or more (without filler) for formulations to be supplied for areas subject to freezing.

SAMPLING, INSPECTION, AND TEST PROCEDURES

606-3.1 TENSILE PROPERTIES. Tests for tensile strength and elongation shall be conducted according to ASTM D638.

606-3.2 EXPANSION. Tests for coefficients of linear and cubical expansion shall be conducted according to ASTM D1168-08, Method B, except that mercury shall be used instead of glycerin. The test

specimen(s) shall be mixed in the proportions specified by the manufacturer, and cured in a glass tube approximately 2 inches long by 3/8 inch in diameter. The interior of the tube shall be precoated with a silicone mold release agent. The hardened sample shall be removed from the tube and aged at room temperature for 1 week before conducting the test. The test temperature range shall be from 35°F to 140°F.

606-3.3 TEST FOR DIELECTRIC STRENGTH. Test for dielectric strength shall be conducted according to ASTM D149 for sealing compounds to be furnished for sealing electrical wires in pavement.

606-3.4 TEST FOR ARC RESISTANCE. Test for arc resistance shall be conducted according to ASTM D495 for sealing compounds to be furnished for sealing electrical wires in pavement.

606-3.5 TEST FOR ADHESION TO STEEL. The ends of two smooth, clean, steel specimens (approximately 1-inch by 1-inch by 6 inches) are bonded together with adhesive mixture and allowed to cure at room temperature for a period of time to meet formulation requirements and then tested to failure on a Riehle (or similar) tensile tester. The thickness of adhesive to be tested shall be 1/4-inch.

606-3.6 ADHESION TO PORTLAND CEMENT CONCRETE.

- a. **Concrete Test Block Preparation.** The aggregate grading shall be as shown in Table 606-2.

The coarse aggregate shall consist of crushed rock having a minimum of 75% of the particles with at least one fractured face and having a water absorption of not more than 1.5%. The fine aggregate shall consist of crushed sand manufactured from the same parent rock as the coarse aggregate. The concrete shall have a water-cement ratio of 5.5 gallons of water per bag of cement, a cement factor of 6, plus or minus 0.5, bags of cement per cubic yard of concrete, and a slump of 2-1/2 inches plus or minus 1/2 inch. The ratio of fine aggregate to total aggregate shall be approximately 40% by solid volume. The air content shall be 5.0%, plus or minus 0.5%, and it shall be obtained by the addition to the batch of an air-entraining admixture such as Vinsol® resin. The mold shall be metal with a metal base plate.

Means shall be provided for securing the base plate to the mold. The assembled mold and base plate shall be watertight and shall be oiled with mineral oil before use. The inside measurement of the mold shall be such that several 1-inch by 2-inch by 3-inch test blocks can be cut from the specimen with a concrete saw having a diamond blade. The concrete shall be prepared and cured according to AASHTO R 39.

TABLE 606-2. AGGREGATE FOR BOND TEST BLOCKS

Type	Sieve Size	Percent Passing
Coarse Aggregate	3/4 in.	97 to 100
	1/2 in.	63 to 69
	3/8 in.	30 to 36
	No. 4	0 to 3
Fine Aggregate	No. 4	100
	No. 8	82 to 88
	No. 16	60 to 70
	No. 30	40 to 50
	No. 50	16 to 26
	No. 100	5 to 9

- b. **Bond Test.** Prior to use, oven-dry the test blocks to constant weight at a temperature of 220 to 230°F, cool to room temperature, 73.4 ±3°F, in a desiccator, and clean the surface of the blocks of film or powder by vigorous brushing with a stiff-bristled fiber brush. Two test blocks shall be bonded together on the 1-inch by 3-inch sawed face with the adhesive mixture and allowed to cure at room temperature for a period of time to meet formulation requirements and then tested to

failure in a Riehle (or similar) tensile tester. The thickness of the adhesive to be tested shall be 1/4 inch.

606-3.7 COMPATIBILITY WITH ASPHALT MIX. Test for compatibility with asphalt according to ASTM D5329.

606-3.8 CERTIFICATION. The Contractor shall furnish the vendor's certified test reports for each batch of material delivered to the project. The report shall certify that the material meets specification requirements and is suitable for use with Portland cement concrete or asphalt concrete pavements. The report shall be provided to and accepted by the Engineer before use of the material. In addition the Contractor shall obtain a statement from the supplier or manufacturer which guarantees the material for one year. The supplier or manufacturer shall furnish evidence that the material has performed satisfactorily on other projects.

606-3.9 APPLICATION. Adhesive shall be applied on a dry, clean surface, free of grease, dust, and other loose particles. The method of mixing and application shall be in strict accordance with the manufacturer's recommendations. When used with Item P-605, such as light can installation, Item P-605 shall not be applied until Item P-606 has fully cured.

METHOD OF MEASUREMENT

606-4.1 The adhesive compound will be measured according to GCP Section90 and by the pound of adhesive as specified, in place, complete and accepted with the following exceptions. When required in the installation of an in-runway lighting system, taxiway lighting system or portion thereof, or for aircraft tie-down, no measurement will be made for direct payment of adhesive, as the cost of furnishing and installing will be considered as a subsidiary obligation in the completion of the installation.

BASIS OF PAYMENT

606-5.1 Payment will be made, where applicable, at the contract unit price per pound for the adhesive. If the following pay item is absent from the bid schedule, no payment will be made.

Payment will be made under:

Item P606.010.0000	Adhesive Compound – per pound
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TESTING REQUIREMENTS

AASHTO R 39	Making and Curing Concrete Test Specimens in the Laboratory
ASTM D149	Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
ASTM D495	High-Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation
ASTM D638	Tensile Properties of Plastics
ASTM D1168-08	Hydrocarbon Waxes Used for Electrical Insulation
ASTM D5329	Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphalt Pavements and Portland Cement Concrete Pavements

ITEM P-610 CONCRETE FOR MISCELLANEOUS STRUCTURES

DESCRIPTION

610-1.1 This item shall consist of concrete and reinforcement, as shown on the plans, prepared and constructed in accordance with these Specifications. This specification shall be used for all concrete other than airfield pavement which are cast-in-place.

MATERIALS

610-2.1 GENERAL. Only approved materials, conforming to the requirements of these Specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Engineer before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

- a. **Reactivity.** Fine aggregate and coarse aggregates to be used in all concrete shall have been tested separately within six months of the project in accordance with ASTM C1260. Test results shall be submitted to the Engineer. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.08% at 14 days (16 days from casting). If the expansion either or both test specimen is greater than 0.08% at 14 days, but less than 0.20%, a minimum of 25% of Type F fly ash, or between 40% and 55% of slag cement shall be used in the concrete mix.

If the expansion is greater than 0.20%, the aggregates shall not be used, and test results for other aggregates must be submitted for evaluation; or aggregates that meet P-501 reactivity test requirements may be utilized.

610-2.2 COARSE AGGREGATE. The coarse aggregate for concrete shall meet the requirements of AASHTO M 80, Class A.

Coarse aggregate shall be well graded from coarse to fine, and shall meet AASHTO M 43, Number 57 or 67, when tested according to ATM 304.

610-2.2.1 COARSE AGGREGATE SUSCEPTIBILITY TO DURABILITY (D) CRACKING. Not Used.

610-2.3 FINE AGGREGATE. The fine aggregate for concrete shall meet all fine aggregate requirements of AASHTO M 6, Class A.

610-2.4 CEMENT. Cement shall conform to the requirements of AASHTO M 85.

610-2.5 CEMENTITIOUS MATERIALS.

- a. **Fly ash.** Fly ash shall meet the requirements of AASHTO M 295, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 15% and a total available alkali content less than 3% per AASHTO M 295. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive AASHTO M 295 reports for each source of fly ash proposed in the concrete mix, and shall furnish each additional report as they become available during

the project. The reports can be used for acceptance or the material may be tested independently by the Engineer.

- b. **Slag cement (ground granulated blast furnace (GGBF)).** Slag cement shall conform to AASHTO M 302, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

610-2.6 WATER. Water used in mixing or curing shall be from potable water sources. Water from 'Community' or 'Non-Transient Non-Community' sources regulated by the Alaska Department of Environmental Conservation Division of Environmental Health Drinking Water Program, or equivalent in other states, do not require testing under ASTM C1602. Other sources shall be tested in accordance with ASTM C1602 prior to use.

610-2.7 ADMIXTURES. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the Engineer may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the Engineer from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

- a. **Air-entraining admixtures.** Air-entraining admixtures shall meet the requirements of AASHTO M 154 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.
- b. **Water-reducing admixtures.** Water-reducing admixture shall meet the requirements of AASHTO M 194, Type A, B, or D. AASHTO M 194, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used. Water-reducing admixtures shall be added at the mixer separately from air-entraining admixtures according to the manufacturer's printed instructions.
- c. **Other chemical admixtures.** The use of set retarding, and set-accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of AASHTO M 194, Type A, B, or D and set-accelerating shall meet the requirements of AASHTO M 194, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

610-2.8 PREMOLDED JOINT MATERIAL. Premolded joint material for expansion joints shall meet the requirements of AASHTO M 213.

610-2.9 JOINT FILLER. The filler for joints shall meet the requirements of Item P-605.

610-2.10 STEEL REINFORCEMENT. Reinforcing shall consist of Deformed and Plain Carbon-Steel Bars conforming to the requirements of ASTM A615, Welded Steel Wire Fabric conforming to the requirements of ASTM A1064, Welded Deformed Steel Fabric conforming to the requirements of ASTM A1064, or Bar Mats conforming to the requirements of ASTM A184, as shown on the Plans.

610-2.11 MATERIALS FOR CURING CONCRETE. Curing materials shall conform to Table 610-1:

TABLE 610-1. MATERIALS FOR CURING CONCRETE

CURING MATERIAL	SPECIFICATION
Burlap Cloth made from Jute or Kenaf and Cotton Mats	AASHTO M 182, Class 4
Sheet Materials for Curing Concrete	ASTM C171
Liquid Membrane – Forming Compounds for Curing Concrete	ASTM C309, Type 1-D Class B, except do not use compounds containing linseed oil.

CONSTRUCTION METHODS

610-3.1 GENERAL. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the Engineer.

610-3.2 CONCRETE MIXTURE. The concrete shall develop a minimum compressive strength of 4,000 psi in 28 days as determined by test cylinders made according to ATM 506 and tested according to AASHTO T 22. The concrete shall contain not less than 470 pounds of cementitious material per cubic yard. The concrete shall contain 5.0% of entrained air, plus or minus 1.2%, as determined by ATM 505. Slump, as determined by ATM 503, shall match the mix design target value plus or minus 1 inch.

610-3.3 MIXING. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of AASHTO M 157.

The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F without the Engineer's approval. If approval is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F nor more than 100°F. The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material is not permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

610-3.4 FORMS. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the Engineer. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the Plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so that no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface.

610-3.5 PLACING REINFORCEMENT. All reinforcement shall be accurately placed, as shown on the Plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

Reinforcing bars shall be bent cold and shall conform accurately to the shape and dimensions shown on the diagram. In no case shall the radius of any bend be less than 4 times the diameter of the bar.

Place reinforcement as indicated on the Plans or as hereinafter specified. Rigidly block and wire in place, using metal or plastic supports or concrete blocks and securely tie at each intersection with annealed iron wire of at least 1/8 inch.

Do not splice bars at points not indicated on the Plans except with the consent of the Engineer. Such splices shall be at the points of minimum tensile stress and the lap shall be not less than 36 bar diameters.

Verify the quantity, size, and shape of the reinforcement against the structure drawings and make necessary corrections to the bar lists and bending schedules before ordering. Errors in the bar lists and/or bending schedules shall not be cause for adjustment of the contract prices.

If reinforcing bars are to be welded, follow AWS D12.1.

610-3.6 EMBEDDED ITEMS. Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

610-3.7 CONCRETE CONSISTENCY. The Contractor shall monitor the consistency of the concrete delivered to the project site; collect each batch ticket; check temperature; and perform slump tests on each truck at the project site in accordance with ATM 503.

610-3.8 PLACING CONCRETE. All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved by the Engineer. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet. Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

610-3.9 VIBRATION. Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309R, Guide for Consolidation of Concrete.

610-3.10 JOINTS. Joints shall be constructed as indicated on the plans.

610-3.11 FINISHING. All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated.

610-3.12 CURING AND PROTECTION. All concrete shall be properly cured in accordance with the recommendations in American Concrete Institute (ACI) 308R, Guide to External Curing of Concrete. The concrete shall be protected from damage until project acceptance.

610-3.13 COLD WEATHER PLACING. When concrete is placed at temperatures below 40°F, follow the cold weather concreting recommendations found in ACI 306R, Cold Weather Concreting.

610-3.14 HOT WEATHER PLACING. When concrete is placed at temperatures greater than 85°F, follow the hot weather concreting recommendations found in ACI 305R, Hot Weather Concreting.

ACCEPTANCE TESTING

610-4.1 ACCEPTANCE SAMPLING AND TESTING. Concrete for each day's placement will be accepted on the basis of the compressive strength specified in Subsection 610-3.2. The Engineer will sample the concrete in accordance with ATM 501; test the slump in accordance with ATM 503; test air content in accordance with ATM 505; make and cure compressive strength specimens in accordance with ATM 506; and test in accordance with AASHTO T 22. The Acceptance Testing laboratory will meet the requirements of ASTM C1077.

The Contractor shall provide adequate facilities for the initial curing of cylinders.

610-4.2 DEFECTIVE WORK. Any defective work that cannot be satisfactorily repaired as determined by the Engineer, shall be removed and replaced at the Contractor's expense. Defective work includes, but is

not limited to, uneven dimensions, honeycombing and other voids on the surface or edges of the concrete.

METHOD OF MEASUREMENT

610-5.1 Concrete will be measured by the number of cubic yards based on the dimensions shown on the plans of concrete complete in place and accepted, and according to GCP Section 90. When the pay items shown below are absent from the bid schedule, no measurement for payment will be made.

610-5.2 Reinforcing steel will be measured by the calculated theoretical number of pounds placed, as shown on the Plans, complete in place and accepted. The unit weight used for deformed bars will be the weight of plain square or round bars of equal nominal size. If so indicated on the Plans, the weight to be paid for will include the weight of metal pipes and drains, metal conduits and ducts, or similar materials indicated and included. When the pay items shown below are absent from the bid schedule, no measurement for payment will be made.

BASIS OF PAYMENT

610-6.1 Payment will be made at the contract unit price per cubic yard for structural portland cement concrete and per pound for reinforcing steel. If the following pay items are absent from the bid schedule, no payment will be made.

Payment will be made under:

Item P610.010.0000	Structural Portland Cement Concrete - per cubic yard
Item P610.020.0000	Steel Reinforcement - per pound
Item P610.030.0000	Standard Curb & Gutter – per linear foot
Item P610.040.0000	Depressed Curb and Gutter – per linear foot

References

ATM 304	WAQTC FOP for AASHTO T 27/T 11 Sieve Analysis of Fine and Coarse Aggregates
ATM 501	FOP for WAQTC TM 2 Sampling Freshly Mixed Concrete
ATM 503	WAQTC FOP for AASHTO T 119 Slump of Hydraulic-Cement Concrete
ATM 505	WAQTC FOP for AASHTO T 152 Air Content of Freshly Mixed Concrete by the Pressure Method
ATM 506	WAQTC FOP for AASHTO T 23 Making and Curing Concrete Test Specimens in the Field
AASHTO M 6	Fine Aggregate for Portland Cement Concrete
AASHTO M 43	Sizes of Aggregate for Road and Bridge Construction
AASHTO M 80	Coarse Aggregate for Portland Cement Concrete
AASHTO M 85	Portland Cement
AASHTO M 154	Air-Entraining Admixtures for Concrete
AASHTO M 157	Ready-Mixed Concrete
AASHTO M 182	Burlap Cloth made from Jute or Kenaf and Cotton Mats
AASHTO M 194	Chemical Admixture for Concrete
AASHTO M 213	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

AASHTO M 295	Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
AASHTO M 302	Slag Cement for Use in Concrete and Mortars
AASHTO T 22	Compressive Strength of Cylindrical Concrete Specimens
ASTM A184	Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A1064	Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C171	Sheet Materials for Curing Concrete
ASTM C309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C311	Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C1017	Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1260	Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1602	Mixing Water Used in the Production of Hydraulic Cement Concrete
AWS D12.1	Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 308R	Guide to External Curing of Concrete
ACI 309R	Guide for Consolidation of Concrete

ITEM P-620 RUNWAY AND TAXIWAY MARKING

DESCRIPTION

620-1.1 This item consists of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer. The terms “paint” and “marking material” as well as “painting” and “application of markings” are interchangeable throughout this specification. This item includes removal of existing painted markings from pavement surfaces as shown on the plans or as designated by the Engineer. Complete this work within the limitations of the project Construction Safety and Phasing Plan.

MATERIALS

620-2.1 MATERIALS ACCEPTANCE. The Contractor shall furnish manufacturer’s certified test reports, for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. This certification along with a copy of the paint manufacturer’s surface preparation; marking materials, including adhesion, flow promoting and/or floatation additive, and application requirements must be submitted and approved by the Engineer prior to the initial application of markings. The reports can be used for material acceptance or the Engineer may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the Engineer upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers that are easily quantifiable for inspection by the Engineer. Provide manufacturer certification (Material Safety Data Sheet) showing that each product does not contain mercury, lead, hexavalent chromium, halogenated solvents, nor any carcinogen as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.

620-2.2 MARKING MATERIALS. Paint shall be waterborne or solvent-base. Paint colors shall comply with Federal Standard No. 595, and Table 620-1. Use black paint to outline a border at least 6 inch wide around markings on all light colored pavements.

TABLE 620-1. MARKING MATERIALS

Paint ¹				Glass Beads ²	
Type	Color	Fed Std. 595 Number	Application Rate Maximum	Type	Application Rate Minimum
II	White	37925	115 ft ² /gal	Type I, Gradation A	7 lb/gal)
II	Red	31136	115 ft ² /gal	Type I, Gradation A	5 lb/gal
II	Yellow	33538 or 33655	115 ft ² /gal	Type I, Gradation A	7 lb/gal
II	Black	37038	115 ft ² /gal	Not used	Not Used
II	Pink	1 part 31136 to 2 parts 37925	115 ft ² /gal	Type I, Gradation A	5 lb/gal
II	Green	34108	115 ft ² /gal	Not Used	Not Used

¹ See subsection 620-2.2a

² See subsection 620-2.2b

a. Paint

(1) Waterborne. Paint shall meet the requirements of Federal Specification TT-P-1952F, Type II. The non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

(2) Solvent-Base. Paint shall meet the requirements of Commercial Item Description A-A-2886B Type II.

b. Reflective media. Glass beads shall meet the requirements for Federal Specification TT-B-1325D Type I, Gradation A.

Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

Glass beads shall not be used in black and green paint.

Glass beads shall comply with Table 620-1.

CONSTRUCTION METHODS

620-3.1 WEATHER LIMITATIONS. Painting shall only be performed when the surface is dry, and the ambient temperature and the pavement surface temperature meet the manufacturer's recommendations in accordance with subsection 620-2.1. Discontinue painting when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns. Do not apply markings when weather conditions are forecasted to not be within the manufacturers' recommendations for application and dry time.

620-3.2 EQUIPMENT. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless type marking machine with automatic glass bead dispensers suitable for application of traffic paint. It shall produce an even and uniform film thickness and appearance of both paint and glass beads at the required coverage and shall apply markings of uniform cross sections and clear-cut edges without running or spattering and without over spray. Marking equipment for both paint and glass beads shall be calibrated daily.

620-3.3 PREPARATION OF SURFACES. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other contaminants that would reduce the bond between the paint and the pavement.

a. PREPARATION OF NEW PAVEMENT SURFACES. The area to be painted shall be cleaned by broom, blower, water blasting, or by other methods approved by the Engineer to remove all contaminants, including PCC curing compounds, minimizing damage to the pavement surface. Areas which cannot be satisfactorily cleaned by brooming and blowing shall be scrubbed as directed with a 10% solution of tri-sodium phosphate or an equally suitable solution. After scrubbing, the solution shall be rinsed off and the surface dried prior to painting.

b. PREPARATION OF PAVEMENT TO REMOVE EXISTING MARKINGS. Where indicated on the plans, use high pressure water to remove all visible indications of existing painted markings from pavement surfaces. Do not paint over existing markings. Remove pavement markings to the fullest extent possible without materially damaging the pavement surface, color, or texture. Group adjacent markings together into a larger rectangular removal area in conformance with FAA AC 150/5340-1, paragraph 1.3.f. and Figure 1-1, Figure 1-2, Figure 1-3 and Figure 1-4. Collect and dispose of all loose or waste material as needed to prevent interference with drainage or to prevent dusty conditions under traffic, wind, or propellers. After removal of markings on asphalt

pavements, apply a fog seal or seal coat to 'block out' the removal area to eliminate 'ghost' markings.

- c. **PREPARATION OF PAVEMENT MARKINGS PRIOR TO REMARKING.** Prior to remarking existing markings, loose existing markings must be removed minimizing damage to the pavement surface, with a method approved by the Engineer. After removal, the surface shall be cleaned of all residue or debris according to 620-3.3.a.

Prior to the application of markings, the Contractor shall certify in writing that the surface is dry and free from dirt, grease, oil, laitance, or other foreign material that would prevent the bond of the paint to the pavement or existing markings. This certification along with a copy of the paint manufacturer's application and surface preparation requirements must be submitted to the Engineer prior to the initial application of markings.

620-3.4 LAYOUT OF MARKINGS. The proposed markings shall be laid out in advance of the paint application. Layout markings and glass beads in advance of paint application at the locations shown on the Plans according to the tolerances in section 620-3.5 and according to the requirements of G-135. Space control points at such intervals to ensure accurate location of all markings. Provide an experienced technician to supervise the location, alignment, layout dimensions, and application of the paint.

620-3.5 APPLICATION. A period of 7 days minimum shall elapse between placement of surface course or seal coat and application of the permanent paint markings. Paint shall be applied at the locations and to the dimensions and spacing shown on the Plans. Paint shall not be applied until the layout and condition of the surface has been approved by the Engineer.

The edges of the markings shall not vary from a straight line more than 1/2 inch in 50 feet, and marking dimensions and spacing shall be within the tolerances shown in Table 620-2:

TABLE 620-2. MARKING DIMENSIONS AND SPACING TOLERANCE

Dimension and Spacing	Tolerance
36 inch or less	±1/2 inch
greater than 36 inch to 6 feet	±1 inch
greater than 6 feet to 60 feet	±2 inch
greater than 60 feet	±3 inch

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 620-1. The addition of thinner will not be permitted.

Pressure apply glass beads upon the marked areas at the locations shown on the Plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 620-1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment and distribution should be performed.

Apply temporary markings, if required, as directed by the Engineer. If pavement is opened to traffic before the pavement curing period is complete, apply paint in two coats. Apply the first coat at least 12 hours after paving is completed at 30 to 50 percent of the total application rate. Apply an additional coat at 100 percent of the total application rate following pavement curing time and after pavement grooving operations in affected areas. The direction of the second application shall be 180 degrees from the first to ensure complete coverage. Apply glass beads, if required, in the second coat only.

Return all emptied containers to the paint storage area for checking by the Engineer. The containers shall not be removed from the airport or destroyed until authorized by the Engineer.

620-3.6 NOT USED.

620-3.7 CONTROL STRIP. Prior to the full application of airfield markings, the Contractor shall prepare a control strip in the presence of the Engineer. The Contractor shall demonstrate the surface preparation method and all striping equipment to be used on the project. The marking equipment must achieve the prescribed application rate of paint and population of glass beads, according to Table 620-1, that are properly embedded and evenly distributed across the full width of the marking. Prior to acceptance of the control strip, markings must be evaluated during darkness to ensure a uniform appearance.

620-3.8 RETRO-REFLECTANCE TESTING (PART 139 CERTIFICATED AIRPORTS ONLY). Reflectance shall be measured with a portable retro-reflectometer meeting ASTM E1710 (or equivalent). A total of 6 readings shall be taken over a 6 square foot area with 3 readings taken from each direction. The average of all readings which are within 30% of each other shall be equal to or above the minimum levels shown in Table 620-3.

TABLE 620-3. MINIMUM RETRO-REFLECTANCE VALUES

Material	Retro-reflectance mcd/m ² /lux		
	White	Yellow	Red
Initial Type I	300	175	35
All materials, remark when less than ¹	100	75	10

¹Prior to remarking determine if removal of contaminants on markings will restore retro-reflectance

620-3.9 PROTECTION AND CLEANUP. After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the Engineer. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and federal environmental statutes and regulations.

METHOD OF MEASUREMENT

620-4.1 RUNWAY AND TAXIWAY PAINTING BY UNIT AREA. If runway and taxiway painting by unit area appears in the bid schedule, then new painted markings will be so measured.

620-4.2 REFLECTIVE MEDIA. If reflective media by unit weight appears in the bid schedule, then this material will be so measured. If reflective media appears by lump sum in the bid schedule, or does not appear at all, it will not be measured.

620-4.3 RUNWAY AND TAXIWAY PAINTING BY LUMP SUM. If Runway and Taxiway painting by a lump-sum item appears in the bid schedule, new painted markings will not be measured for payment. Reflective media is subsidiary to the work.

620-4.4 PAINTED MARKING REMOVAL. If painted marking removal by unit area, it will be measured by area. If painted marking removal by lump sum appears in the bid schedule or is absent from the bid schedule, no measurement will be made and this item will be subsidiary to painting.

620-4.5 TEMPORARY RUNWAY AND TAXIWAY PAINTING. Lump Sum. Includes all necessary maintenance or reapplication of paint necessary during the time the numbers, markings, and stripes are required.

BASIS OF PAYMENT

620-5.1 Payment will be made at the respective contract unit or lump sum price for the pay items listed below that appear in the bid schedule.

Payment will be made under:

Item P620.010.0000	Runway and Taxiway Painting – per square foot
Item P620.020.0000	Runway and Taxiway Painting – per lump sum
Item P620.030.0000	Reflective Media – per pound
Item P620.040.0000	Reflective Media – per lump sum

TESTING REQUIREMENTS

ASTM C371	Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders
ASTM D92	Flash and Fire Points by Cleveland Open Cup
ASTM D711	No-Pick-Up Time of Traffic Paint
ASTM D968	Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Epoxy Content of Epoxy Resins
ASTM D2074	Total Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Rubber Products-Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM G53	Operating Light and Water-Exposure Apparatus (Florescent UV-Condensation Type) for Exposure of Nonmetallic Materials.
Federal Test Method Standard No. 141	Paint, Varnish, Lacquer and Related Materials; Methods of Inspection, Sampling and Testing

MATERIAL REQUIREMENTS

ASTM D476	Titanium Dioxide Pigments
Code of Federal Regulations	40 CFR Part 60, Appendix A-7, Method 24. Determination volatile matter content, water content, density, volume solids, and weight solids of surface coatings
Code of Federal Regulations	29 CFR Part 1910.1200 – Hazard Communications
Fed. Spec. TT-B-1325D	Beads (Glass Spheres) Retroreflective
Fed. Spec. TT-P1952F	Paint, traffic and Airfield Marking, Waterborne
Federal Standard 595	Colors used in Government Procurement
Commercial Item Description	A-A-2886B Paint, Traffic, Solvent Based
Advisory Circular 150/5340-1	Standard for Airport Markings

Advisory Circular 150/5320-12

[Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces](#)

ITEM P-621 SAW-CUT GROOVES

DESCRIPTION

621-1.1 This item consists of constructing saw-cut grooves to minimize hydroplaning during wet weather, providing a skid resistant surface in accordance with these specifications and at the locations shown on the plans, or as directed by the Engineer.

CONSTRUCTION METHODS

621-2.1 The Contractor shall submit to the Engineer the grooving sequence and method of placing guide lines to control grooving operation, according to Section 80-03, or as directed by the Engineer.

Transverse grooves saw-cut in the pavement must form a 1/4-inch wide by 1/4-inch deep by 1 1/2 inches center-to-center configuration. The grooves must be continuous for the entire runway length. They must be saw-cut transversely in the runway and high speed taxiway pavement to not less than 10 feet from the runway pavement edge, or as shown in the plans, to allow adequate space for equipment operation.

The saw-cut grooves must meet the following tolerances. The tolerances apply to each day's production and to each piece of grooving equipment used for production. The Contractor is responsible for all controls and process adjustments necessary to meet these tolerances.

- a. **Alignment tolerance.** Plus or minus 1-1/2 inches in alignment for 75 feet.
- b. **Groove tolerance.**
 - (1) **Depth.** The standard depth is 1/4-inch. At least 90 percent of the grooves must be at least 3/16 inch, at least 60 percent of the grooves must be at least 1/4 inch, and not more than 10 percent of the grooves may exceed 5/16-inch.
 - (2) **Width.** The standard width is 1/4-inch. At least 90 percent of the grooves must be at least 3/16-inch, at least 60 percent of the grooves must be at least 1/4-inch, and not more than 10 percent of the grooves may exceed 5/16-inch.
- c. **Center-to-center spacing.** The standard spacing is 1-1/2 inches.
 - (1) **Minimum spacing** 1-3/8 inches.
 - (2) **Maximum spacing** 1-1/2 inches.

Saw-cut grooves must not be closer than 3 inches or more than 9 inches from transverse paving joints. Grooves must not be closer than 6 inches and no more than 18 inches from in-pavement light fixtures. Grooves may be continued through longitudinal joints. Where neoprene compression seals have been installed and the compression seals are recessed sufficiently to prevent damage from the grooving operation, grooves may be continued through the longitudinal joints. Where neoprene compression seals have been installed and the compression seals are not recessed sufficiently to prevent damage from the grooving operation, grooves must not be closer than 3 inches or more than 5 inches from the longitudinal joints. Where lighting cables are installed, discontinue grooving across longitudinal or diagonal saw kerfs.

The Engineer may require the Contractor to submit a written report indicating the percentage of grooves that meet tolerances by measurement zone according to Table 621-1. If reporting is required, groove tolerance shall be measured at least three times per zone per day. The Engineer may require a report indicating how many times production was adjusted. It is expected that the Contractor will routinely spot check for compliance each time the equipment aligns for a grooving pass. The Engineer may determine a written report is not required.

Blade wear and surface variability may require more testing than the minimum of three per day per zone during each day's production.

621-2.2 ENVIRONMENTAL REQUIREMENTS. Grooving operations will not be permitted when freezing conditions prevent the immediate removal of debris and/or drainage of water from the grooved area.

621-2.3 CONTROL STRIP. Groove a control strip in an area of pavement outside of the trafficked area, or as approved by the Engineer. The area shall be as long as the width of the runway or taxiway, or at least 25 feet in length, by two passes of the grooving machine, or as required by the Engineer. Demonstrate the setup and alignment process, the grooving operation, and the waste slurry disposal.

621-2.4 EXISTING PAVEMENTS. Bumps, depressed areas, bad or faulted joints, and badly cracked and/or spalled areas in the pavement shall not be grooved until such areas are adequately repaired or replaced.

621-2.5 NEW PAVEMENTS. New asphalt and Portland cement concrete pavements shall be allowed to cure for a minimum of 30 days before grooving, to allow the material to become stable enough to prevent closing of the grooves under normal use. All grade corrections must be completed prior to grooving. Spalling along or tearing or raveling of the groove edges shall not be allowed.

The Engineer may allow grooving after a curing period of less than 30 days if it can be demonstrated that grooves are stable with no spalling along or tearing or raveling of the groove edges.

621-2.6 GROOVING MACHINE. Provide a grooving machine that is power driven, self-propelled, specifically designed and manufactured for pavement grooving, and has a self-contained and integrated continuous slurry vacuum system as the primary method for removing waste slurry. The grooving machine shall be equipped with diamond-saw cutting blade groove cutting head capable of making at least 18 inches in width of multiple parallel grooves in one pass of the machine. Thickness of the cutting blades shall be capable of making the required width and depth of grooves in one pass of the machine. The cutting head shall not contain a mixture of new and worn blades or blades of unequal wear or diameter. Match the blade type and configuration with the hardness of the existing airfield pavement. The wheels on the grooving machine shall be of a design that will not scar or spall the pavement. The machine must be equipped with devices to control depth of groove and alignment.

621-2.7 WATER SUPPLY. Water for the grooving operation shall be provided by the contractor.

621-2.8 CLEAN-UP. During and after installation of saw-cut grooves, the Contractor must remove from the pavement all debris, waste, and by-products generated by the operations to the satisfaction of the Engineer. Cleanup of waste material must be continuous during the grooving operation. Flush debris produced by the machine to the edge of the grooved area or pick it up as it forms. The dust coating remaining shall be picked up or flushed to the edge of the area if the resultant accumulation is not detrimental to the vegetation or storm drainage system. Accomplish all flushing operations in a manner to prevent erosion on the shoulders. Waste material must be disposed of in an approved manner. Waste material must not be allowed to enter the airport storm or sanitary sewer system. The Contractor must dispose of these wastes in strict compliance with all applicable state, local, and Federal environmental statutes and regulations.

621-2.9 REPAIR OF DAMAGED PAVEMENT. Grooving must be stopped and damaged pavement repaired at the Contractor's expense when directed by the Engineer.

ACCEPTANCE

621-3.1 ACCEPTANCE TESTING. Grooves will be accepted based on results of zone testing. All acceptance testing necessary to determine conformance with the groove tolerances specified will be performed by the Engineer.

Instruments for measuring groove width and depth must have a range of at least 0.5-inch and a resolution of at least 0.005-inch. Gage blocks or gages machined to standard grooves width, depth, and spacing may be used.

Instruments for measuring center-to-center spacing must have a range of at least 3 inches and a resolution of at least 0.02-inch.

The Engineer will measure grooves in five zones across the pavement width. Measurements will be made at least three times during each day's production. Measurements in all zones will be made for each cutting head on each piece of grooving equipment used for each day's production.

The five zones are as shown in Table 621-1:

TABLE 621-1. DEFINITION OF MEASUREMENT ZONES

ZONE Number	ZONE Position
Zone 1	Centerline to 5 feet left or right of the centerline.
Zone 2	5 feet 25 feet left of the centerline.
Zone 3	5 feet to 25 feet right of the centerline.
Zone 4	25 feet to edge of grooving left of the centerline.
Zone 5	25 feet to edge of grooving right of the centerline.

At a random location within each zone, five consecutive grooves sawed by each cutting head on each piece of grooving equipment will be measured for width, depth, and spacing. The five consecutive measurements must be located about the middle blade of each cutting head plus or minus 4 inches. Measurements will be made along a line perpendicular to the grooves.

- Width or depth measurements less than 0.170-inch will be considered less than 3/16-inch.
- Width or depth measurements more than 0.330-inch will be considered more than 5/16-inch.
- Width or depth measurements more than 0.235-inch will be considered more than 1/4inch.

Production must be adjusted when more than one groove on a cutting head fails to meet the standard depth, width, or spacing in more than one zone.

METHOD OF MEASUREMENT

621-4.1 Pavement saw-cut grooves will be measured either by neat line dimensions as shown in the Plans or as a single item of work. No deductions will be made for areas skipped to avoid joints or in-pavement fixtures.

BASIS OF PAYMENT

621-5.1 Payment will be made at the contract unit price or the lump sum price for pavement saw-cut grooves accepted by the Engineer.

Payment will be made under:

Item P621.010.0000	Saw-Cut Grooves - per square yard
Item P621.020.0000	Saw-Cut Grooves - per lump sum

ITEM P-633 SAND SEAL

DESCRIPTION

633-1.1 GENERAL. This item shall consist of a mixture of asphalt and mineral aggregate applied as a seal on new or existing (aged) asphalt concrete pavement. Apply asphalt after the pavement has been grooved unless a different sequencing is approved by the Engineer.

MATERIALS

633-2.1 SAND. The aggregate shall be dry, clean, angular, dust-free with a minimum Mohs hardness of 6. Meet the gradation requirements of Table 633-1, as determined by ATM 304, or approved by the Engineer:

TABLE 633-1

REQUIREMENTS FOR GRADING OF SAND

Sieve	Percent Passing by Weight
No. 8	100
No. 16	90 - 100
No. 40	0 - 20
No. 100	0 - 2

Manufacturer certification will be used for acceptance.

The Contractor shall submit the Manufacture Certification, including the aggregate gradation and Mohs Hardness, to the Engineer at least 15 days before beginning work and if requested by the Engineer, furnish a sample of the sanding material.

633-2.2 CUT-BACK ASPHALT. GSB 78 or meet the following:

Kinematic Viscosity at 140 degrees Fahrenheit (60°C), AASHTO T 201, cts.	10-30
Percent Water, AASHTO T 55, Maximum	0.5
Percent Residue by Distillation, AASHTO T 78, or Evaporation	30-45

The residue from distillation shall have the following properties:

Penetration at 25°C (77°F), AASHTO T 49, dmm	2-12
Softening Point, AASHTO T 53, of	180-200
Solubility in 1,1,1 Trichloroethylene, AASHTO T 44, %	99 min.
HCL Precipitation Value	18-25

The bituminous base residue shall contain not less than 35 percent gilsonite, and shall not contain any tall oil pitch. Curing time, under recommended application conditions, shall not exceed 4 hours. The Contractor shall furnish and submit to the Engineer, manufacturer's certification that the material is the type, grade, and quality specified for each load of bituminous material delivered. The certification shall show the shipment number, refinery, consignee, destination, contract number, and date of shipment. The Contractor shall submit to the Engineer, two 1-quart samples of ready-to-apply bituminous material for each batch applied and any additional samples requested by the Engineer.

633-2.3 EMULSIFIED ASPHALT. GSB 88 or meet the following:

Emulsion concentrate, in the undiluted state, shall have the following properties:

Saybolt furol viscosity at 77 degrees Fahrenheit (25°C), ASTM D7496, seconds.	20-100
Residue by distillation, ASTM D6997, or evaporation, ASTM D6934,	%57 min

Sieve test, ASTM D6933, %	0.2 max
pH, cationic,	2.0-6.5

Emulsion concentrate, diluted in the proportion of one part of concentrate to one part of hot water by volume and ready to apply, shall have the following properties:

Saybolt furol viscosity at 77 degrees Fahrenheit (25°C), ASTM D7496, seconds.....	10-50
Residue by distillation, ASTM D6997, or evaporation, ASTM D6934, %28-42
Sieve test, ASTM D6933, %01 max
Pumping stability test,	pass
Hot water temperature at or above 100 degrees.	

The residue from distillation shall have the following properties:

Viscosity at 275 degrees Fahrenheit (135°C), ASTM D4402, cts.....	1750 max
Solubility in 1,1,1 Trichloroethylene, ASTM D2404, %.....	97.5 max
Penetration ASTM D5, dmm.....	50 max
Asphaltenes, ASTM D2007, %.....	15 min
Saturates, ASTM D2007, %.....	15 max
Polar Compounds, ASTM D2007, %.....	25 min
Aromatics, ASTM D2007, %.....	15 min

Pumping stability test is tested by pumping 1 pint, (475 ml) of sealer material diluted 1 part concentrate to 1 part water, at 77°F (25°C), through a 1/4-inch gear pump operating 1750 rpm for 10 minutes with no significant separation or coagulation.

The bituminous base residue shall contain not less than 20 percent gilsonite, and shall not contain any tall oil pitch. Curing time, under recommended application conditions, shall not exceed 4 hours. The Contractor shall furnish and submit to the Engineer, manufacturer’s certification that the material is the type, grade, and quality specified for each load of bituminous material delivered. The certification shall show the shipment number, refinery, consignee, destination, contract number, and date of shipment. The Contractor shall submit to the Engineer, two 1-quart samples of ready-to-apply bituminous material for each batch applied and two 1-quart samples of concentrate for each load delivered. The Contractor shall submit any additional samples requested by the Engineer.

CONSTRUCTION REQUIREMENTS

633-3.1 WEATHER LIMITATIONS. The Sand Seal shall be applied only when the existing surface has been dry 4 hours, the pavement surface temperature is a minimum of 50° F, and at least three hours of daylight will remain after completing the application or as approved by the Engineer. Develop an expected cure time from a test strip, as described in 633-3.4. Stop application if the weather conditions change such that the cure time varies from the test strip and becomes unacceptable as determined by the Engineer. Do not apply when the wind speed exceeds 10 miles per hour. Do not apply Sand Seal after September 15 unless approved by the Engineer. Applying the Sand Seal the following summer will not incur a penalty.

633-3.2 PAVEMENT PREPARATION. The asphalt surface to be treated shall be free of all dirt, sand, weeds, grass and excessive oil and/or grease. The surface shall be cleaned with a power broom or power blower supplemented by a hand sweeping or any other means required to remove deleterious matter to the satisfaction of the Engineer. Any crack sealing shall be completed, prior to the surface cleaning and preparation for sealing. Prior to the full width Sand Seal application, fog seal (asphalt only) visible pavement joints and defective areas, as determined by the Engineer.

Cover as necessary existing runway edge lights, taxiway edge lights, informational signs, retro-reflective marking and in-pavement duct markers before applying the seal. If the seal gets on any light or marker it shall be cleaned immediately. The Contractor shall replace any light, sign or marker with equal equipment at the Contractor’s expense if cleaning is not satisfactory to the Engineer.

633-3.3 DISTRIBUTOR EQUIPMENT. The distributor shall be so designed, equipped, maintained and operated that asphalt material at even heat may be applied uniformly on variable widths of surface up to half the roadway width plus 6 inches, at the specified rate with uniform pressure and within specified tolerances.

- a. The distributor equipment shall include the following:
 - 1) Computerized control of liquid asphalt spread rates to automatically deliver specified delivery rates and capable of changing rates when so directed.
 - 2) Computer monitoring of spread rate, truck speed and distance traveled.
 - 3) A thermometer for measuring temperatures of the tank's contents, readily visible from outside the truck cab.
 - 4) Each nozzle in the spray bar shall be turned to make the constant angle with the longitudinal axis of the spray bar that is recommended by the manufacturer of the distributor. All nozzles in the spray bar shall be of the same manufacture, type and size. The spray bar height shall provide triple overlap of the asphalt being applied by the spray nozzles.
- b. Before the application of asphalt, the Contractor shall ensure that the distributor meets the following requirements:
 - 1) The spray bar can be maintained at a constant height throughout the entire operation.
 - 2) Spray bar nozzles are clean and in good working condition and sized for the application rate.
 - 3) The spray bar has been provided with a positive shutoff to prevent dribbling.
 - 4) The distributor is capable of maintaining a uniform speed.
- c. Calibration and adjustment requirements will include:
 - 1) The distributor will be inspected by the Engineer prior to the commencement of the operation. Any adjustments, maintenance and other requirements shall be performed prior to being used.
 - 2) The distributor shall be calibrated in accordance with the manufacturer's recommendations. The Engineer may require the Contractor to prove the accuracy of the distributor prior to commencing the asphalt application and any time thereafter if deemed necessary by the Engineer. Any change in settings on the distributor after calibrating will require that the distributor be recalibrated.
 - 3) Should any of the nozzles on the spray bar fail to provide a constant, uniform flow during the application of asphalt material, the distributor shall immediately cease application of the asphalt material. The distributor shall not be allowed to resume applying asphalt material until all of the nozzles are in good working order. Nozzle adjustments and/or repairs must be approved by the Engineer.
 - 4) The distributor truck shall be equipped with a 12-foot (3.6 m), minimum length, spreader bar with individual nozzle control. The distributor shall be equipped to hand spray areas identified by the Engineer.
- d. For sand applications:
 - 1) A sander shall be mounted directly on the back of the asphalt distributor

- 2) The sander shall be equipped with a variable control system to ensure reasonably even distribution of the sand at varying application widths and speeds. The sander controls shall be located in the cab of the distributor.
- 3) The sanding unit must have the ability to apply sand to the sealant without driving through the wet sealant.
- 4) The sander must have variable control mechanisms to regulate sand distribution, and should have a minimum hopper capacity of at least 3,000 pounds of sand.
- 5) Calibrate the sander prior to the start of the sand sealing.

633-3.4 TEST STRIP. Submit a Sand Seal application plan for approval prior to performing test strip. Perform a test strip, with calibrated equipment, prior to full production application. Provide a qualified manufacturer's representative to assist in construction of the test strip to determine the optimum application rate and the cure time. The test strip shall include application over pavement grooves to establish technique for uniform application on the grooved pavement. Test strip size will be determined by the Engineer. Full production may not begin until the test strip has been approved by the Engineer.

633-3.5 ASPHALT APPLICATION. Heat asphalt to Manufacturer's recommended application temperature and apply at the approximate rate of 0.10 to 0.15 gallons per square yard as directed by the Engineer. For emulsified asphalt, the ready to use sealing material shall be obtained by blending 1 part bituminous concentrate material to 1 part warm or hot water, by volume. Do not apply over and protect existing pavement markings.

633-3.6 SAND APPLICATION. Apply sand at the approximate rate of 0.3 pounds per square yard as determined by the test strip and approved by the Engineer. Apply immediately after asphalt is applied. Do not apply painted markings or permit traffic on the Sand Seal until the surface has cured as determined by the test strip and approved by the Engineer.

Hand work may be required or approved for applications around obstructions. For hand applications, push-type hand sanders will be allowed. The Contractor shall organize this work so the asphalt application by hand and the sanding operation work as a cohesive unit with the hand sanding immediately following the hand asphalt application. Sanding shall be done in a manner so as to prevent appreciable amounts of sand from going onto any pavement prior to the sealant being applied. Any deviation from this method must be pre-approved by the Engineer.

If required by the Engineer, perform test strips for friction testing in accordance with requirements specified by the Engineer. The number and size of test strips will be determined by the Engineer.

633-3.7 FREIGHT AND WAYBILLS. The Contractor shall provide the Engineer with certified waybills of the asphalt materials actually used in the construction. Copies of waybills shall be furnished to the Engineer during the progress of the work.

METHOD OF MEASUREMENT

633-4.1 The quantity of Sand Seal to be paid for will be the number of square yards of material actually applied and accepted by the Engineer as complying with the plans and specifications. Sand and the application of sand is not measured or paid for separately. Sand is subsidiary to pay item P-633a. If sweeping and/or blading of excess cover aggregate is required, this work is not measured or paid for directly, but is considered a subsidiary obligation.

BASIS OF PAYMENT

633-5.1 Payment will be made at the contract unit price per square yard for Sand Seal. This price will be full compensation for furnishing all materials, for all preparation, delivery, and application of these

materials, and for all labor, equipment, tools, and incidentals necessary to complete this item, including the furnishing and application of asphalt and sand and any other work necessary to complete this item.

Payment will be made under:

Item P633.010.0000	Cut-Back Asphalt Sand Seal – per square yard
Item P633.020.0000	Emulsified Asphalt Sand Seal – per square yard

TESTING REQUIREMENTS

ATM 304	WAQTC FOP for AASHTO T 27/T 11 Sieve Analysis of Fine and Coarse Aggregates *
AASHTO T 44	Solubility of Bituminous Materials
AASHTO T 49	Penetration of Bituminous Materials
AASHTO T 53	Softening Point of Bitumen (Ring-and-Ball Apparatus)
AASHTO T 55	Water in Petroleum Products and Bituminous Materials by Distillation
AASHTO T 78	Distillation of Cutback Asphaltic (Bituminous) Products
AASHTO T 201	Kinematic Viscosity of Asphalts (Bitumens)
ASTM D7496	Saybolt Furol Viscosity
ASTM D6997	Residue by Distillation
ASTM D6934	Residue by Evaporation
ASTM D6933	Sieve Test
ASTM D4402	Viscosity at Elevated Temperatures using Rotational Viscometer
ASTM D5	Penetration
ASTM D2007	Separation of Asphalt into Four Fractions.

ITEM P-634 LONGITUDINAL JOINT REPAIR

DESCRIPTION

634-1.1 This work includes all labor, equipment and materials needed for paving, cold planing, and placing tack coat for the longitudinal pavement joints on the taxiway and apron, as detailed in the Plans.

MATERIALS

634-2.1 Longitudinal joint repair shall be accomplished using Hot Mix Asphalt, Type [___], Class [___], and Tack Coat [___] as specified in Items P-401 Asphalt Mix Pavements and P-603 Emulsified Asphalt Tack Coat.

CONSTRUCTION REQUIREMENTS

634-3.1 Cold plane existing longitudinal pavement joints to the width and depth specified in the plans. Place tack coat on the cold planed surface meeting requirements described in P-603-3.3. Place, spread and compact the asphalt concrete mix on the cold planed surface at the thickness called for in the plans, meeting the construction methods requirements of P-401.

METHOD OF MEASUREMENT

634-4.1 Longitudinal joint repair will be measured by the linear foot at the center of the joints. All work and materials used in Item P634.010.0000, including those with separate bid items, are subsidiary and will not be measured separately for payment and will not be included in the QLA.

BASIS OF PAYMENT.

634-5.1 The accepted quantity will be paid for at the contract unit price for the pay items listed below, complete in place.

Payment for repairing joints will include labor, asphalt concrete mix (including oil), compaction, tack coat, cold planing, clean up, equipment, and other items necessary to complete the work as detailed in the plans.

Payment will be made under:

Item P634.010.0000 Longitudinal Joint Repair – per linear foot

ITEM P-635 PAVEMENT CRACK FILLING

DESCRIPTION

635-1.1 Prepare and fill cracks in existing asphalt concrete pavement after pavement cold planing is complete and prior to pavement overlay.

MATERIALS

635-2.1 CRACK FILLERS.

- a. **Sealant.** Provide sealant that meets the requirements of ASTM D6690, Joint Sealants, Hot-Poured, for Concrete and Asphalt Pavements.

Use CRAFCO Roadsaver 522 Sealant or approved equal. In addition to the requirements of this specification, use materials that have the following additional properties when heated to the safe heating temperature in accordance with ASTM D 5167:

<u>Test</u>	<u>Spec. Limits</u>
Cone Penetration, 77 deg F (ASTM D 5329)	100-150 dmm
Cone Penetration, 0 deg F (ASTM D 5329 modified)	25 dmm, min.
Flow, 140 deg F, 5h (ASTM D 5329)	3/8-inch, max.
Resilience, (ASTM D 5329)	30-60%
Bond, -20 deg F, 200% ext. (ASTM D 5329) 1/2-inch specimen	Pass 3 Cycles
Asphalt Compatibility (ASTM D 5329)	Pass
Recommended Pour Temperature	374 degrees F, min.
Safe Heating Temperature*	per manuf. instruct.
Unit weight at 60 deg F	8.9 lbs./gal., min.

* Provide sealant in containers that display a manufacturer's label with the safe heating temperature stated.

- b. **Hot Mix Asphalt.** Provide hot mix asphalt that meets the requirements of section P-401.

635-2.2 PREPARATORY MATERIALS.

- a. **Backer Rope.** Provide rope material that is strong, non-raveling, and similar to upholstery cord. Use rope with a diameter that is approximately 1/8-inch larger than the width of the crack.
- b. **Tack Coat.** Provide tack coat that meets the requirements of section P-603.

CONSTRUCTION REQUIREMENTS

635-3.1 After pavement cold planing, the Engineer will select the cracks to be prepared and filled. The preparation requirements and filler material used depends on the width of the crack to be filled. For cracks equal to or less than 3/4-inch in width, prepare and fill selected cracks with sealant. For cracks greater than 3/4-inch in width, prepare and fill selected cracks with hot mix asphalt.

635-3.2 PREPARATION.

- a. **Routing.** Rout out all cracks selected by the Engineer that are to be filled with sealant. Rout out cracks to a nominal 3/4-inch width and to a nominal depth of 1-1/2 inch. Avoid routing to a width greater than specified. Avoid any damage or raveling of the adjacent pavement surface.
- b. **Cleaning.** After routing and immediately prior to filling, use compressed air to remove any debris and moisture from cracks.

- c. **Tack Coat.** For cracks to be filled with hot mix asphalt, apply tack coat after cleaning and immediately prior to filling. Apply in accordance with section P-603.
- d. **Backer Rope.** Use of backer rope is optional with the Contractor. For cracks to be filled with crack sealant, place the rope after cleaning and prior to filling. Place the rope deep enough to leave approximately 1-1/4 inch from the surface of the pavement to the top of the rope.

635-3.3 FILLING.

- a. **Sealant.** Heat crack sealant material in a double wall oil bath heater equipped with an agitator, a temperature controller, and a recirculating pump. Place sealant in the crack to within 1/4-inch of the surface of the pavement. Remove any material that overfills to the surface of the pavement. Heat and apply crack sealant material in accordance with the manufacturer's instructions.
- b. **Hot Mix Asphalt.** Fill cracks with hot mix asphalt in accordance with section P-401.

METHOD OF MEASUREMENT

635-4.1 Pavement crack filler will be measured by the linear foot of crack filler in place, complete, and accepted.

BASIS OF PAYMENT

635-5.1 At the contract unit price per linear foot.

Payment will be made under:

Item P635.010.0000	Pavement Crack Filling – per linear foot
Item P635.020.0000	Pavement Crack Sealant Debris Removal – per hour

ITEM P-636 HIGH FLOAT SURFACE TREATMENT

DESCRIPTION

636-1.1 Construct a single course asphalt surface treatment (HFST).

MATERIALS

636-2.1 EMULSIFIED ASPHALT. Use HFMS-2s high float asphalt emulsion material that conforms to AASHTO M 140.

636-2.2 AGGREGATES. Use crushed stone or crushed gravel for cover coat material (cover aggregate) consisting of sound, tough, durable pebbles or rock fragments of uniform quality. Use material free from clay balls, vegetable matter, adherent films or coatings of dirt, clay, dust, or other deleterious matter that could impede adherence of the asphalt material. Wash the aggregate if necessary. Meet the following requirements:

L.A. Wear,%	AASHTO T 96	50, max.
Degradation Value	ATM 313	25, min.
Sodium Sulfate Loss,%	AASHTO T 104	9, max. (5 cycles)
Fracture,%	ATM 305	50, min. (single face)
Thin-Elongated Pieces	ATM 306	8, max.
Plasticity Index*	AASHTO T 90	3 max.

*Prepare material for AASHTO T 90 according to the wet preparation method, AASHTO T 146.

The test sampling locations(s) will be determined by the Engineer, before crushing operations begin. Cover stockpiles of cover coat material to exclude precipitation.

a. Gradation testing:

- (1) Acceptance Testing:** Determine the gradation by AASHTO T 27. Testing will be done upon notification by the Contractor that the crusher is ready for production.
- (2) Assurance Testing:** Determine the gradation by AASHTO T 27 and AASHTO T 88 except dry the material for the T 88 test within a temperature range of 90° to 100° F.

At least 15 days before beginning work, submit a representative 30-pound sample of the aggregate and 1-quart sample of the asphalt material proposed for use in the work. The Department will test the materials using ATM 414 as submitted (that is, without addition of anti-stripping additives). The Department will reject materials failing to meet or exceed 70% retention of the asphalt, unless you provide approved anti-stripping additives or employ other approved measures which correct this deficiency.

TABLE 636-1

REQUIREMENTS FOR GRADING OF COVER AGGREGATE FOR HIGH FLOAT SURFACE TREATMENT

Sieve	Percent Passing by Weight
1 in.	100
3/4 in.	75-95
3/8 in.	50-80
No. 4	35-65
No. 8	20-50
No. 40	8-30
No. 200	0-5
0.005 mm	0-3*

** Special Note on Gradation Testing: For acceptance testing, verify compliance with the minus 0.005 mm size fraction at least once for each source used. For assurance testing, use the entire gradation with each test.*

636-2.3 SURFACE TREATMENT BLOTTER MATERIAL. Use suitable, clean sand. Unless otherwise required by the Engineer, use sand passing the 8 mesh sieve, and having no more than 0.5% material passing the 200 mesh sieve. The material may be accepted in stockpile at the source. Gradation will be determined by AASHTO T-27.

636-2.4 DETERMINE HFST DESIGN COMPOSITION. Within two days after the start of cover aggregate crushing, submit a representative 70 lb sample of the cover aggregate and a 1 gallon sample of the high float asphalt emulsion proposed for use on the project. Fill the asphalt container to the brim so that it contains no air.

Submit changes in application rates warranted by changes in aggregate gradation, source of cover aggregate, or high float emulsion supplier in the same manner as the-original submittal.

636-2.5 COMPOSITION OF SURFACE TREATMENT. The initial application rates of asphalt and cover aggregate materials will be as determined by the Engineer per subsection 636-2.4. The Engineer may adjust application rates as required by field conditions.

The following table provides the pre HFST Design estimating factors, and specifies the tolerance allowed the Contractor for applying surface treatment material above or below the application rates determined by the Engineer.

Material	Pre-HFST Design Estimating Factor	Specified Tolerance
HFMS-2S Asphalt	0.75 gallon per sq. yard	±0.04 gallon per sq. yard
Cover Aggregate	75 lb per sq. yard	±3 lb per sq. yard

CONSTRUCTION REQUIREMENTS

636-3.1 GENERAL. Longitudinal joints are allowed only at the centerline. Accomplish work in a manner such that asphalt and cover aggregate applications are completed full width by the end of each shift.

636-3.2 WEATHER LIMITATIONS. Proceed only if ambient air temperature is 60°F or above. Measure temperatures in the shade away from any heat source.

Do not apply HFST during periods of rain, fog, mist or imminent rain or when weather conditions prevent the proper penetration of the asphalt material and/or adhesion of the cover aggregate.

Ensure that weather conditions allow for proper construction of the HFST and adequate curing time prior to inclement weather or freeze-up. Do not apply HFST before May 15 or after August 15.

636-3.3 EQUIPMENT.

- a. **Distributor.** Use a distributor that is designed, equipped, maintained and operated so that asphalt material at even heat is applied uniformly on variable widths of surface up to half the roadway, runway, or taxiway width plus 6 inches, at the specified rate, from 0.38 to 0.75 gallons per square yard, with uniform pressure and within specified tolerances.

Provide distributor equipment that meets the following:

- (1) Computerized control of liquid asphalt spread rates to automatically deliver specified delivery rates and capable of changing rates when so directed. Computer monitoring of spread rate, truck speed and distance traveled.

- (2) A thermometer for measuring temperatures of the tank's contents, readily visible from outside the truck cab.
- (3) Each nozzle in the spray bar is turned to make the constant angle with the longitudinal axis of the spray bar that is recommended by the manufacturer of the distributor. All nozzles in the spray bar are of the same manufacture, type and size. The spray bar height provides triple overlap of the asphalt emulsion being applied by the spray nozzles.

Before the application of asphalt, ensure that the distributor meets the following requirements:

- (4) The spray bar can be maintained at a constant height throughout the entire operation.
- (5) Spray bar nozzles are clean and in good working condition.
- (6) The spray bar is provided with a positive shutoff to prevent dribbling.
- (7) The distributor is capable of maintaining a uniform speed.

Calibration and adjustment requirements include:

- (8) The distributor will be inspected by the Engineer prior to the commencement of the operation. Perform any adjustments, maintenance and other requirements prior to use.
 - (9) Calibrate the distributor in accordance with the manufacturer's recommendations. The Engineer may require the Contractor to prove the accuracy of the distributor prior to commencing the asphalt application and any time thereafter if deemed necessary by the Engineer. Any change in settings on the distributor after calibrating will require that the distributor be recalibrated.
 - (10) Should any of the nozzles on the spray bar fail to provide a constant, uniform flow during the application of asphalt material, immediately cease application of the asphalt material. Do not allow the distributor to resume application of the asphalt material until all of the nozzles are in good working order. Nozzle adjustments and/or repairs must be approved by the Engineer.
- b. **Aggregate Spreader.** Provide an aggregate spreader that is capable of evenly applying cover aggregate material to the specified roadway, runway, or taxiway width in a maximum of two passes. Provide an aggregate spreader that is computer controlled to automatically maintain the specified delivery rate of cover aggregate regardless of variations in machine speed. Provide a spreader with sufficient size feed system to maintain cover aggregate in the spread hopper at all times. Provide a spread hopper that is equipped with augers or other approved equipment to prevent segregation of the cover aggregate materials.

Stopping the aggregate spreader to refill the receiving hopper will be permitted provided that the spreader is backed up at least 20 feet from the last cover aggregate application. The aggregate spreader will be permitted to slow down to allow trucks to backup and discharge loads into the receiving hopper. Provide an aggregate spreader that is constructed to eliminate material segregation in the various hoppers.

Immediately before using the aggregate spreader on the project, calibrate the aggregate spreader for the cover aggregate to be applied. Control the forward speed of the aggregate spreader during calibration to approximate the speed required to apply the cover aggregate over the asphalt material and maintain a continuous operation with the distributor. Calibrate the aggregate spreader in accordance with the manufacturer's recommendations. The Engineer may require the Contractor to prove the accuracy of the aggregate spreader.

Calibrate the aggregate spreader whenever directed by the Engineer and allow the Engineer to observe the procedure.

- c. **Rollers.** Utilize a minimum of three self-propelled pneumatic rollers weighing not less than 20,000 lbs, equipped with not less than nine tires staggered back and front, inflated to 60 psi. Inflate all tires to equal pressure, and equip each roller with a suitable tire pressure gauge for checking tire inflation pressure.

636-3.4 PREPARATION OF SURFACE. Apply HFST on sections of fully shaped and compacted grade. Allow the Engineer to approve grade prior to application of HFST. Apply HFST within 72 hours of approval of the grade. Areas of grade not surfaced within the 72 hour period are subject to reapproval by the Engineer. Roll the surface with a steel wheeled soil compactor immediately prior to application of asphalt materials. Do not leave windrows of materials that may impede drainage on or adjacent to the surface treatment area.

Apply HFST when the prepared surface is damp. Prior to the asphalt application, the Engineer may require dampening the surface by applying a fine spray of water to the prepared surface. Do not apply HFST to a wet surface or when rain or fog is present or imminent.

636-3.5 APPLYING HIGH FLOAT ASPHALT EMULSION MATERIAL. Ensure that the length of spread of high float asphalt emulsion (hereafter referred to as asphalt) material does not exceed that which trucks loaded with cover aggregate can immediately cover.

For the first pass over the segment of roadway, runway, or taxiway being surfaced, follow a string line, set either on the shoulder or on the centerline, whichever is on the driver's side of the distributor. Accomplish the second pass with the centerline joint on the driver's side of the distributor.

Do not allow any equipment or vehicles on sprayed asphalt at any time prior to cover aggregate application.

Do not spread asphalt material more than 6 inches wider than the width covered by the cover aggregate from the spreader. Do not allow operations to proceed in a manner that allows asphalt material to chill, set up, dry, or otherwise impair retention of the cover aggregate.

Park the distributor, when not spreading, so that the spray bar or mechanism will not drip asphalt material on the surface of the roadway, runway, or taxiway.

Apply asphalt material at temperatures between 150°F and 180°F.

Correct any skipped areas or deficiencies. Prevent an excess of asphalt material at junctions of spreads.

636-3.6 APPLICATION OF COVER AGGREGATE MATERIAL. Provide cover aggregate that has a temperature of no less than 40°F and a 3%-5% moisture content (by dry weight) at the time of application. If necessary, the cover aggregate shall be moistened or dried to achieve the specified moisture content.

Apply cover aggregate within 1.5 minutes after application of the asphalt material or as directed by the Engineer. Keep the increment as constant as possible, and adjust as needed to meet changing conditions. Whenever it is apparent that the time limit above will be exceeded, make a transverse joint by placing construction paper (roofing felt or similar product) on the prepared surface and ending the HFST operations on the paper. Remove the paper and dispose of properly. Touch up the edges of the applied HFST prior to restarting HFST operations.

Immediately after cover aggregate is spread, cover deficient areas with additional material. Begin pneumatic tire rolling for the full width of the aggregate immediately after placement of cover aggregate and continue until at least six complete coverages are obtained or until cover aggregate is bound tightly, to the satisfaction of the Engineer. Accomplish the rolling operation within 500 feet of the cover aggregate application. Slow the high float application operation if the rolling cannot be completed within this distance. Do not exceed 5 miles per hour with the pneumatic tire roller. Maintain a spare pneumatic tire roller on the project during high float application, in addition to those rollers necessary to accomplish this specification.

Accomplish spreading in such a manner that the tires of the trucks or aggregate spreader do not contact the uncovered and newly applied asphalt material.

Sweeping to remove excess cover aggregate is required. Sweep between two and three weeks following the application of cover coat material as directed by the Engineer. Remove ridges of loose aggregate created by traffic prior to sweeping, or uniformly spread ridges over the surface as they develop as directed by the Engineer.

636-3.7 APPLICATION OF BLOTTER MATERIAL. Due to weather, construction and/or materials problems, it is possible that the finished surface treatment may become unstable. To minimize development of damage to the surface, blotter material may be required. Apply blotter material as directed by the Engineer and immediately roll with a pneumatic-tired roller (as described above) with tire pressures adjusted to 90-100 psi.

636-3.8 TRAFFIC CONTROL. Do not operate construction equipment at speeds exceeding 15 miles per hour on a freshly applied surface treatment, for a period of up to 24 hours, as directed by the Engineer. Unless otherwise specified, keep public corridors open to traffic at all times. Do not allow traffic on freshly sprayed asphalt or cover aggregate material that is not fully compacted. As soon as final rolling of the HFST layer is accomplished, controlled traffic may be permitted to operate on the HFST surface. Control public traffic on the HFST so that speeds do not exceeding 15 miles per hour for a period of 12 hours or as directed by the Engineer.

METHOD OF MEASUREMENT

636-4.1 See Section 90.

Surface Treatment Blotter Material and water used for aggregate and surface preparation are not measured for payment; these items are considered subsidiary obligations.

If sweeping and/or blading of excess cover aggregate is required, this work is not measured or paid for directly, but is considered a subsidiary obligation.

BASIS OF PAYMENT

636-5.1 Water for emulsified asphalt is subsidiary.

Payment will be made under:

Item P636.010.0000	Asphalt for High Float Surface Treatment, Type HFMS-2s – per ton
Item P636.020.0000	Aggregate for High Float Surface Treatment, Grading B – per ton
Item P636.030.0000	High Float Surface Treatment – per square yard
Item P636.040.0000	Aggregate for High Float Surface Treatment – per cubic yard

TESTING REQUIREMENTS

ATM 305	Percentage of Fracture in Coarse Aggregate
ATM 306	Determining the Percentage of Flat and Elongated Particles in Coarse Aggregate (Alaska FOP for ASTM D 4791)
ATM 313	Degradation Value of Aggregate
ATM 414	Anti-Strip Requirements of Hot Mix Asphalt
AASHTO T 27	Sieve Analysis of Fine and Coarse Aggregates
AASHTO T 88	Particle Size Analysis of Soils
AASHTO T 90	Plastic Limit and Plasticity Index of Soils
AASHTO T 96	Resistance to Degradation of Small-size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
AASHTO T 104	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
AASHTO T 146	Wet Preparation of Disturbed Soil Samples for Test

MATERIAL REQUIREMENTS

AASHTO M 140

Emulsified Asphalt

ITEM P-640 SEGMENTED CIRCLE

DESCRIPTION

640-1.1 This item consists of furnishing and installing an airport segmented circle, according to the dimensions, design, details, and location shown on the Plans. Construct barrel-type or panel-type, as shown in the bid schedule.

If shown on the Plans, the segmented circle includes landing direction indicator, landing strip indicators, or traffic pattern indicators.

MATERIALS

640-2.1 BARREL-TYPE.

- a. **Barrels.** Cylindrical, steel, 55-gallon, undamaged, contaminant-free, and rust-free.
- b. **Primer Paint.** Zinc Oxide, raw linseed oil, and alkyd primer, meeting SSPC-Paint 25.
- c. **Finish Paint.** Aviation Gloss Orange, No. 12197, meeting Federal Standard 595.

640-2.2 PANEL-TYPE.

- a. **Panels.** Sheet aluminum with a reflective covering and meeting the following requirements:
 - (1) Use 0.080-inch thick, alloy 6061-T6, 5052-H36, 5052-H38, or recycled aluminum meeting alloy 3105, as specified in ASTM B209.
 - (2) Make each panel a continuous sheet for the length and width shown on the Plans. Furnish panels that are cut to size and shape and free of buckles, warp, dents, cockles, burrs and any other defects resulting from fabrication. Complete all possible fabrication including shearing, cutting and hole punching prior to preparing the base metal for painting and application of reflective sheeting.
 - (3) Treat the aluminum base metal sheets with coating for aluminum conforming to the requirements of ASTM B921, Class 2. After cleaning and coating operations, protect the panels at all times from contact or exposure to greases, oils, dust or other contaminants.
 - (4) Prepare both sides of each panel and cover with orange retroreflective sheeting, meeting the requirements of ASTM D4956, Type IV, as recommended by the manufacturer in the configuration shown on the plans.
- b. **Frames.** Perforated, galvanized, square steel tubing with the dimensions shown on the Plans and meeting the following requirements:
 - (1) Fabricate square tube with cold-rolled carbon steel sheets, 12 gage, commercial quality, meeting ASTM A653, coating designation G 90. Form tubes, roll to size, and continuously weld for the entire length.
 - (2) Perforate all members for their entire length with 7/16-inch diameter holes on 1-inch centers.
 - (3) Furnish members that are straight and with a smooth, uniform finish with no splices.
 - (4) Ensure that all perforations and cut off ends are free from burrs.
- c. **Hardware and Fasteners.** Hardware and fasteners shall meet the following requirements:
 - (1) Gusset and splice plates shall be 1/4-inch thick steel, ASTM A36, galvanized.

- (2) Fasteners shall be hot dip galvanized, Grade 2, 3/8-inch diameter bolts; with two 1-inch diameter washers and one nut, each bolt. Provide bolt lengths as required to fasten members.

CONSTRUCTION METHODS

640-3.1 GENERAL. The site may be either on a prepared pad constructed for that purpose under separate item or on natural ground, whichever is shown on the Plans.

If the segmented circle is to be placed on original ground, clear the site of all brush and vegetation to the limits shown on the Plans and level the site.

Use material excavated for installation of barrels or stanchions as backfill. Spread excess material evenly over ground adjacent to the barrels, stanchions, or pad so as to leave the site in a neat condition.

640-3.2 BARREL-TYPE. Clean the outside of each barrel with an approved solvent and paint with 1 coat of primer paint and 2 coats of finish paint.

Cut hole maximum of 6 inches in bottom of barrel. Fill barrel one third with clean sand or gravel. Bury the bottom one third of barrel at the location and in the configuration shown on the Plans.

640-3.3 PANEL-TYPE. Prepare and assemble panels, perforated steel tubes, and hardware as shown in the Plans. Bury stanchions to the depth, at the location, and in the configuration shown on the Plans.

640-4.1 METHOD OF MEASUREMENT. Segmented circle will not be measured for payment.

640-5.1 BASIS OF PAYMENT. Payment will be made at the contract lump sum price shown on the bid schedule. Clearing of the site is paid for under Item P-151 Clearing and Grubbing. If Item P-151 is not included in the bid schedule, clearing is subsidiary.

Payment will be made under:

Item P640.010.0000	Segmented Circle (Barrel-Type) – per lump sum
Item P640.020.0000	Segmented Circle (Panel-Type) – per lump sum
Item P640.030.0000	Segmented Circle (Panel Only) – per square foot

MATERIAL REQUIREMENTS

ASTM D4956	Standard Specification for Retroreflective Sheeting for Traffic Control
ASTM A36	Structural Steel
ASTM A653	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A924	Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B209	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B921	Standard Specification for Non-hexavalent Chromium Conversion Coatings on Aluminum and Aluminum Alloys
Federal Standard 595	Colors Used in Government Procurement
SSPC – Paint 25	Specification for Zinc Oxide, Raw Linseed Oil, and Alkyd Primer (Without Lead and Chromate Pigments)

ITEM P-641 EROSION, SEDIMENT, AND POLLUTION CONTROL

641-1.1 DESCRIPTION. Provide project administration and Work relating to control of erosion, sedimentation, and discharge of pollutants, according to this section and applicable local, state, and federal requirements, including the APDES Construction General Permit. The state APDES program is administered by DEC. Section 301(a) of the Clean Water Act (CWA) and 18 AAC 83.015 provide that the discharge of pollutants to water of the U.S. is unlawful except as allowed by the CGP.

Temporary erosion control measures shall be in accordance with the Erosion and Sediment Control Plan; the approved Construction Safety and Phasing Plan (CSPP), and AC 150/5370-2, *Operational Safety on Airports During Construction*. The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary erosion and sediment control measures may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites, when such areas are included in the Project Zone.

Temporary control measures shall be designed, installed and maintained:

- a. outside of safety areas of active runways and taxiways, and
- b. to minimize the creation of wildlife attractants that have the potential to attract hazardous wildlife on or near airports.

DEFINITIONS AND TERMS

641-1.2 These definitions apply only to Item P-641.

ACTIVE TREATMENT SYSTEM (ATS) OPERATOR. The Contractor's qualified representative who is responsible for maintaining and operating an active treatment system (as defined in the CGP) for stormwater runoff.

ALASKA CERTIFIED EROSION AND SEDIMENT CONTROL LEAD (AK-CESCL). A person who has completed training, testing, and other requirements of, and is currently certified as, an AK-CESCL from an AK-CESCL Training Program (a program developed under a Memorandum of Understanding between the Department and others). The Department recognizes AK-CESCLs as "qualified personnel" required by the CGP. An AK-CESCL must be recertified every three years. (See Qualified Person.)

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION (DEC). The state agency authorized by EPA to administer the Clean Water Act's National Pollutant Discharge Elimination System.

ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM (APDES). A system administered by DEC that issues and tracks permits for stormwater discharges.

BEST MANAGEMENT PRACTICES (BMPS). Temporary or permanent structural and non-structural devices, schedules of activities, prohibition of practices, maintenance procedures, and other management practices to prevent or minimize the discharge of pollutants to waters of the United States. BMPs also include, but are not limited to, treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from material storage.

CLEAN WATER ACT (CWA). Federal Water Pollution Control Amendments of 1972, as amended (33 U.S.C. 1251 et seq.).

CONSTRUCTION ACTIVITY. Physical activity by the Contractor, Subcontractor or utility company; that may result in erosion, sedimentation, or a discharge of pollutants into stormwater. Construction Activity includes soil disturbing activities (e.g. clearing, grubbing, grading, excavating); and establishment of construction

materials or equipment storage or maintenance areas (e.g. material piles, borrow area, concrete truck chute washdown, fueling); and industrial activities that may discharge stormwater and are directly related to the construction process (e.g. concrete or asphalt batch plants).

CONSTRUCTION GENERAL PERMIT (CGP). The permit authorizing stormwater discharges from Construction Activities, issued and enforced by Alaska DEC. It authorizes stormwater discharges provided permit conditions and water quality standards are met.

CORPS OF ENGINEERS PERMIT (COE PERMIT). A U.S. Army Corps of Engineers Permit for construction in waters of the US. Such permit may be issued under Section 10 of the Rivers and Harbors Act of 1899, or Section 404 of the Clean Water Act.

ELECTRONIC NOTICE OF INTENT (ENOI). The electronic Notice of Intent submitted to DEC, to obtain coverage under the CGP.

ELECTRONIC NOTICE OF TERMINATION (ENOT). The electronic Notice of Termination submitted to DEC, to end coverage under the CGP.

ENVIRONMENTAL PROTECTION AGENCY (EPA). A federal agency charged to protect human health and the environment.

ERODIBLE STOCKPILE. Any material storage area or stockpile consisting of mineral aggregate, organic material, or a combination thereof, with greater than 5 percent passing the #200 sieve, and any material storage where wind or water transports sediments or other pollutants from the stockpile. Erodible Stockpile also includes any material storage area or stockpile, where the Engineer determines there is potential for wind or water transport, of sediments or other pollutants away from the stockpile.

EROSION AND SEDIMENT CONTROL PLAN (ESCP). The Department's project specific document that illustrates measures to control erosion and sediment on the project. The ESCP provides bidders with the basis for cost estimating and guidance for developing an acceptable Storm Water Pollutant Prevention Plan (SWPPP).

FINAL STABILIZATION. Is defined in this item as it is defined in the CGP, Appendix C.

HAZARDOUS MATERIAL CONTROL PLAN (HMCP). The Contractor's detailed project specific plan for prevention of pollution from storage, use, transfer, containment, cleanup, and disposal of hazardous material (including, but are not limited to, petroleum products related to construction activities and equipment). The HMCP is included as an appendix to the SWPPP.

INSPECTION. An inspection required by the CGP or the SWPPP, usually performed together by the Contractor's SWPPP Manager and Department's Stormwater Inspector.

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PERMIT. A DEC stormwater discharge permit issued to certain local governments and other public bodies, for operation of stormwater conveyances and drainage systems. See CGP for further definition.

MULTI-SECTOR GENERAL PERMIT (MSGP). The Alaska Pollutant Discharge Elimination System General Permit for stormwater discharges associated with industrial activity.

OPERATOR(S). The party or co-parties associated with a regulated activity that has responsibility to obtain permit coverage under the CGP. "Operator" for the purpose of the CGP and in the context of stormwater associated with construction activity, means any party associated with a construction project that meets either of the following two criteria:

- a. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or

- b. The party has day to day operational control of those activities at a project which are necessary to ensure compliance with a SWPPP for the site or other permit conditions (e.g. they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

POLLUTANT. Any substance or item meeting the definition of pollutant contained in 40 CFR § 122.2. A partial listing from this definition includes: dredged spoil, solid waste, sediment, sewage, garbage, sewage sludge, chemical wastes, biological materials, wrecked or discarded equipment, rock, sand, cellar dirt and industrial or municipal waste.

PROJECT ZONE. The physical area provided by the Department for Construction. The Project Zone includes the area of highway or facility under construction, project staging and equipment areas, and material and disposal sites; when those areas, routes and sites, are provided by the Contract.

Material sites, material processing sites, disposal sites, haul routes, staging and equipment storage areas; that are furnished by the Contractor or a commercial operator, are not included in the Project Zone.

QUALIFIED PERSON. A person knowledgeable in the principles and practice of erosion and sediment controls. A Qualified Person must be certified either under the Alaska Certified Erosion and Sediment Control Lead (AK-CESCL) training program. One of the following training and certification programs may substitute for AK-CESCL certification: CPESC, CESSWI, CPSWQ, or CISEC (CGP, Appendix C).

RECORDS. Any record, report, information, document or photograph required to be created or maintained pursuant to the requirements of the CGP, the CGP stormwater requirements of the Clean Water Act; and applicable local, state, and federal laws and regulations regarding document preservation.

SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN (SPCC PLAN). The Contractor's detailed plan for petroleum spill prevention and control measures that meet the requirements of 40 CFR 112.

SPILL RESPONSE FIELD REPRESENTATIVE. The Contractor's representative with authority and responsibility for managing, implementing, and executing the HMCP and SPCC Plan.

STORM EVENT. A rainfall event that produces more than 0.5-inch of precipitation in 24 hours and that is separated from the previous storm event by at least 3 days of less than 0.1-inch of rain per day.

STORM WATER POLLUTION PREVENTION PLAN (SWPPP). The Contractor's detailed project specific plan to minimize erosion and contain sediment within the Project Zone, and to prevent discharge of pollutants that exceed applicable water quality standards. The SWPPP includes, but is not limited to, amendments, records of activities, inspection schedules and reports, qualifications of key personnel, and all other documentation, required by the CGP and this specification, and other applicable local, state, and federal laws and regulations.

STORM WATER POLLUTION PREVENTION PLAN TWO (SWPPP2). The Contractor's detailed project specific plan to comply with CGP or MSGP requirements, for Contractor construction-related activities outside the Project Zone.

SUBCONTRACTOR SPILL RESPONSE COORDINATOR. The subcontractor's representative with authority and responsibility for coordinating the subcontractor's activities in compliance with the HMCP and SPCC Plan.

SUBCONTRACTOR SWPPP COORDINATOR. The subcontractor's representative with authority to direct the subcontractor's work, and who is responsible for coordination with the Superintendent and SWPPP Manager, and for the subcontractor's compliance with the SWPPP.

SUPERINTENDENT. The Contractor's duly authorized representative in responsible charge of the work. The Superintendent has responsibility and authority for the overall operation of the Project and for Contractor furnished sites and facilities directly related to the Project.

SWPPP AMENDMENT. A revision or document that adds to, deletes from, or modifies the SWPPP.

SWPPP MANAGER. The Contractor's qualified representative who conducts Inspections, updates SWPPP records, and has authority to suspend work and to implement corrective actions required for CGP compliance.

SWPPP PREPARER. The Contractor's qualified representative who is responsible for developing the initial SWPPP.

TEMPORARY STABILIZATION. Protecting soils from erosion and sediment loss by rainfall, snow melt, runoff, or wind with a temporary vegetative and/or non-vegetative protection cover. Temporary stabilization may include a combination of seeding, geotextiles, mulches, surface tackifiers, rolled erosion control products, low erodible gravel or paving, or the mentioned BMP's combined together with trackwalking.

UTILITY SPILL RESPONSE COORDINATOR. The Utility's representative with authority and responsibility for coordinating the Utility's activities in compliance with the HMCP and SPCC Plan.

UTILITY SWPPP COORDINATOR. The Utility's representative with authority to direct the Utility's work, and who is responsible for coordination with the Superintendent and SWPPP Manager, and for the Utility's compliance with the SWPPP.

641-1.3 PLAN AND PERMIT SUBMITTALS.

For plans listed in GCP Subsection 80-03.d (SWPPP, HMCP, and SPCC), use the Contractor submission and Department review deadlines identified in Subsection 641-1.3.

Partial and incomplete submittals will not be accepted for review. Any submittal that is re-submitted or revised after submission, but before the review is completed, will restart the submittal review timeline. No additional Contract time or additional compensation will be allowed due to delays caused by partial or incomplete submittals, or required re-submittals.

- a. **Storm Water Pollution Prevention Plan.** Submit an electronic copy and three hard copies of the SWPPP to the Engineer for approval. Deliver these documents to the Engineer at least 21 days before beginning Construction Activity. Organize and bind the SWPPP and related documents for submittal according to the requirements of Subsection 641-2.1.b

The Department will review the SWPPP submittals within 14 days after they are received. Submittals will be returned to the Contractor, and marked as either "rejected" with reasons listed or as "approved" by the Department. When the submittal is rejected, the Contractor must revise and resubmit the SWPPP. The 14 day review period will restart when the contractor submits an electronic copy and three hard copies of the revised SWPPP to the Engineer for approval.

After the SWPPP is approved by the Department, the Contractor must sign and certify the approved SWPPP using Form 25D-111. See Subsection 641-1.3.d for further SWPPP submittal requirements.

- b. **Hazardous Material Control Plan.** The HMCP Template can be found at the following webpage: http://www.dot.state.ak.us/stwddes/dcsconst/pop_constforms.shtml. Submit an electronic copy and three hard copies of the HMCP, as an appendix to the SWPPP, to the Engineer for approval. The HMCP submittal and review timeline, and signature requirements are the same as the SWPPP.
- c. **Spill Prevention, Control and Countermeasure Plan.** When a SPCC Plan is required under Subsection 641-2.3, submit an electronic copy and three signed hard copies of the SPCC Plan to the Engineer. Deliver these documents to the Engineer at least 21 days before beginning Construction Activity. The Department reserves the right to review the SPCC Plan and require modifications.
- d. **CGP Coverage.** The Contractor is responsible for permitting of Contractor and subcontractor Construction Activities related to the Project. Do not use the SWPPP for Construction Activities

outside the Project Zone where the Department is not an operator. Use a SWPPP2 for Construction Activities outside the Project Zone.

After Department approval of the SWPPP and prior to beginning Construction Activity, submit an eNOI with the required fee to DEC for coverage under the Construction General Permit (CGP). Submit a copy of the signed eNOI and DEC's written acknowledgement (by letter or other document), to the Engineer as soon as practicable and no later than three days after filing eNOI or receiving a written response.

Do not begin Construction Activity until the conditions listed in Subsection 641-3.1.a are completed.

The Department will submit an eNOI to DEC for Construction Activities inside the Project Zone. The Engineer will provide the Contractor with a copy of the Department's eNOI and DEC's written acknowledgment (by letter or other document), for inclusion in the SWPPP.

Before Construction Activities occur, transmit to the Engineer an electronic copy of the approved and certified SWPPP, with signed Delegations of Signature Authorities on Forms 25D-107 and 25D-108, SWPPP Certifications on Forms 25D-111 and 25D-109, both permittee's signed eNOIs and DEC's written acknowledgement.

- e. **Ending CGP Coverage.** Submit an eNOT to DEC within 30 days after the Engineer has determined the conditions listed in Subsection 641-3.1.f have been met. Submit a copy of the signed eNOT and DEC's acknowledgement letter to the Department within three days of filing the eNOT or receiving a written response.
- f. **DEC SWPPP Review.** When CGP Part 2.1.3, requires DEC SWPPP review:
 - (1) Transmit a copy of the Department-approved SWPPP to DEC using delivery receipt confirmation;
 - (2) Transmit a copy of the delivery receipt confirmation to the Engineer within seven (7) days of receiving the confirmation; and
 - (3) Retain a copy of delivery receipt confirmation in the SWPPP.
- g. **Local Government SWPPP Review.** When local government or the CGP Part 2.1.4, requires local government review:
 - (1) Transmit a copy of the Department-approved SWPPP and other information as required to local government, with the required fee. Use delivery receipt confirmation;
 - (2) Transmit a copy of the delivery receipt confirmation to the Engineer within seven days of receiving the confirmation;
 - (3) Transmit a copy of any comments by the local government to the Engineer within seven days of receipt;
 - (4) Amend the SWPPP as necessary to address local government comments and transmit SWPPP Amendments to the Engineer within seven days of receipt of the comments;
 - (5) Include a copy of local government SWPPP review letter in the SWPPP; and
 - (6) File a notification with local government that the project is ending.
- h. **Modifying Contractor's eNOI.** When required by the CGP Part 2.7, modify your eNOI to update or correct information within 30 calendar days of the change. Reasons for modification include a change in start or end dates, change in Owner/Operator address and contact information, change in

site information, any changes in number of acres to be disturbed, change in decision to use or not use treatment chemicals, or change in location of SWPPP records.

The Contractor must submit an eNOT and then submit a new eNOI instead of an eNOI modification when the operator has changed.

641-1.4 PERSONNEL QUALIFICATIONS. Provide documentation in the SWPPP that the individuals serving in these positions meet the personnel qualifications.

a. The SWPPP Preparer:

(1) Total disturbed acreage 20 acres or less, must meet at least one of the following qualifications:

- (a) Current certification as a Certified Professional in Erosion and Sediment Control (CPESC);
- (b) Current certification as AK-CESCL, and at least two years' experience in erosion and sediment control, as a SWPPP Manager or SWPPP writer, or equivalent. Provide documentation including project names, project timelines, and work responsibilities demonstrating the experience requirement; or
- (c) Professional Engineer registered in the State of Alaska with current certification as AK-CESCL.

(2) Total disturbed acreage greater than 20 acres, meet 641-1.4.a(1) above, and complete a SWPPP Preparation course.

b. The Superintendent must meet the following qualifications:

- (1) Current certification as AK-CESCL; and
- (2) Duly authorized representative, as defined in the CGP, Appendix A, Part 1.12.3.

c. The SWPPP Manager must have current certification as AK-CESCL. The SWPPP Manager must meet the experience, and authority requirements identified in the CGP for the Stormwater Lead and Stormwater Inspector positions.

d. The Active Treatment System (ATS) operator must have current certification as AK-CESCL, and be knowledgeable in the principles and practices of treatment systems in general, and the operation of the project-specific ATS. The ATS operator must have at least three months field experience with ATS, or completion of an ATS manufacturer's training course, or completion of system operator certification course.

e. The Department accepts people having any of the following certificates as equivalent to AK-CESCL, if the certificates are current according to the sponsoring organization's policies:

- (1) CPESC, Certified Professional in Erosion and Sediment Control; or
- (2) CISEC, Certified Inspector in Sediment and Erosion Control.

641-1.5 SIGNATURE/CERTIFICATION REQUIREMENTS AND DELEGATIONS.

a. **eNOI and eNOT.** The eNOI and eNOT must be signed and certified by a responsible corporate officer according to CGP Appendix A, Part 1.12. Signature and certification authority for the eNOI and eNOT cannot be delegated.

b. **Delegation of Signature Authority for Other SWPPP Documents and Reports.** Use Form 25D-108 to delegate signature authority and certification authority to the Superintendent position, according to CGP Appendix A, Part 1.12.3, for the SWPPP, Inspection Reports and other reports

required by the CGP. The Superintendent position is responsible for signing and certifying the SWPPP, Inspection Reports, and other reports required by the CGP, except the eNOI and eNOT.

The Engineer will provide the Department's delegation on Form 25D-107, which the Contractor must include in the SWPPP.

- c. **Subcontractor Certification.** Subcontractors must certify on Form 25D-105, that they have read and will abide by the CGP and the conditions of the project SWPPP.
- d. **Signatures and Initials.** Handwrite signatures or initials on CGP documents and SWPPP forms, wherever a signature or initial is required.

641-1.6 RESPONSIBILITY FOR STORM WATER PERMIT COVERAGE.

- a. The Department and the Contractor are jointly responsible for permitting and permit compliance within the Project Zone.
- b. The Contractor is responsible for permitting and permit compliance outside the Project Zone. The Contractor has sole responsibility for compliance with DEC, COE and other applicable federal, state, and local requirements, and for securing all necessary clearances, rights, and permits. GCP Subsection 70-02 describes the requirement to obtain permits, and to provide permit documents to the Engineer.
- c. An entity that owns or operates, a commercial plant (as defined in GCP Subsection 80-01.d. or material source or disposal site outside the Project Zone, is responsible for permitting and permit compliance. The Contractor has sole responsibility to verify that the entity has appropriate permit coverage. GCP Subsection 70-02 describes the requirement to obtain permits, and to provide permit documents to the Engineer.
- d. The Department is not responsible for permitting or permit compliance, and is not liable for fines resulting from noncompliance with permit conditions:
 - (1) For areas outside the Project Zone;
 - (2) For Construction Activity and Support Activities outside the Project Zone; and
 - (3) For commercial plants, commercial material sources, and commercial disposal sites.

641-1.7 UTILITY. (RESERVED FOR REGIONS)

641-2.1 STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS.

- a. **SWPPP Preparer and Pre-Construction Site Visit.**

Use a SWPPP Preparer to develop the SWPPP and associated documents, according to the requirements of the CGP and COE permit. The SWPPP Preparer must put their name, qualifications (including the expiration date of any certifications), title and company name in the SWPPP.

The SWPPP Preparer must conduct a pre-construction inspection at the Project site before construction activity begins. If the SWPPP Preparer is not a Contractor employee, the SWPPP Preparer must visit the site accompanied by the Contractor. Give the Department at least seven days advance notice of the site visit, so that the Department may participate.

During the pre-construction inspection, the SWPPP Preparer must identify, or if a draft of the SWPPP has already been prepared verify that the SWPPP fully addresses and describes:

- (1) Opportunities to phase construction activities;

- (2) Appropriate BMPs and their sequencing; and
- (3) Sediment controls that must be installed prior to beginning Construction Activities.

Document the SWPPP Preparer's pre-construction inspection in the SWPPP on Form 25D-106, SWPPP Pre-Construction Site Visit, including the names of attendees and the date.

b. Developing the SWPPP.

Use the Department's ESCP, Environmental commitments, and other Contract documents as a starting point for developing the SWPPP. The approved SWPPP replaces the ESCP.

Develop the SWPPP with sections and appendices, according to the current DOT&PF SWPPP template. Include information required by the Contract and described in the CGP Part 5.0.

- (1) Obtain the following forms after they have been completed by the Department and include them in the SWPPP:
 - (a) SWPPP Delegation of Signature Authority – DOT&PF (25D-107)
 - (b) SWPPP Certification for DOT&PF (25D-109)
 - (c) SWPPP Delayed Action Item Report (25D-113), if needed
- (2) Use the following Department forms for recording information in the SWPPP:
 - (a) SWPPP Amendment Log (25D-114)
 - (b) SWPPP Certification for Contractor (25D-111)
 - (c) SWPPP Construction Site Inspection Report (25D-100)
 - (d) SWPPP Corrective Action Log (25D-112)
 - (e) SWPPP Daily Record of Rainfall (25D-115)
 - (f) SWPPP Delegation of Signature Authority – Contractor (25D-108)
 - (g) SWPPP Grading and Stabilization Activities Log (25D-110)
 - (h) SWPPP Pre-Construction Site Visit (25D-106)
 - (i) SWPPP Project Staff Tracking (25D-127)
 - (j) SWPPP Subcontractor Certification (25D-105)
 - (k) SWPPP Training Log (25D-125)
 - (l) SWPPP Noncompliance (25D-143)

SWPPP Template, forms, and instructions are available online at:

http://www.dot.state.ak.us/stwddes/dcsconst/pop_constforms.shtml

Compile the SWPPP in three ring binders with tabbed and labeled dividers for each section and appendix.

c. SWPPP Considerations and Contents.

- (1)** The SWPPP must provide erosion and sediment control measures for all Construction Activity within the Project Zone. Construction activity outside the Project Zone must have permit coverage, using a separate SWPPP2, and separate Contractor Inspections.
- (2)** The SWPPP must consider the activities of the Contractor and all subcontractors and utility companies performing work in the Project Zone. The SWPPP must describe the roles and responsibilities of the Contractor, subcontractors, utility companies, and the Department with regard to implementation of the SWPPP. The SWPPP must identify all operators for the Project, including utility companies performing Construction Activity, and identify the areas:
 - (a)** Over which each operator has operational control; and
 - (b)** Where the Department and Contractor are co-operators.
- (3)** For work outside the Project Zone the SWPPP must identify the entity that has stormwater permit coverage, the operator, and the areas that are:
 - (a)** Dedicated to the Project and where the Department is not an operator; and
 - (b)** Not dedicated to the project, but used for the project.
- (4)** Account for the Contractor's construction methods and phasing. Identify the amount of mean annual precipitation.
- (5)** Comply with the CGP Part 1.4.3 Authorized Non-Storm Water Discharges. List locations where authorized non-stormwater will be used, including the types of water that will be used on-site.
- (6)** Include the Department's Antidegradation Analysis in the SWPPP if stormwater from the Project Zone discharges into receiving water that is considered a high quality water and that constitutes an outstanding national resource, according to CGP Part 2.1.6.
- (7)** Where the project intersects a Public Water System (PWS), the Engineer will notify the PWS contact for the Department and Contractor according to the CGP Part 4.10. Contractor Amend a copy of the communications in Appendix Q.
- (8)** There are special requirements in the CGP Part 3.2, for stormwater discharges into an impaired water body, and they may include monitoring of stormwater discharges. For Projects meeting the permit criteria, the Contractor shall implement a monitoring plan approved by the Department for the stormwater within the Project Zone, and shall provide the required information and reports for inclusion in the SWPPP. The Contractor is responsible for monitoring and reporting outside the Project Zone.
- (9)** Preserve natural topsoil unless infeasible. Delineate the site according to CGP Part 4.2.1. Use stakes, flags, or silt fence, etc. to identify areas where land disturbing activities will occur and areas that will be left undisturbed. Minimize the amount of soil exposed during Construction activity according to CGP Part 4.2.2.
- (10)** Comply with CGP Part 4.4, and the DEC General Permit for Excavation Dewatering (AKG002000), requirements for dewatering for trenches and excavations.
- (11)** The SWPPP must identify specific areas where potential erosion, sedimentation, or pollution may occur. The potential for wind erosion must be addressed. The potential for erosion at drainage structures must be addressed.
- (12)** Describe methods and time limits, to initiate temporary or final soil stabilization, CGP Part 4.5.1.1. Begin stabilization no later than the end of the next work day, following the day when the earth-disturbing activities have permanently ceased on any portion of the site or temporarily ceased on any portion of the site and will not resume for a period exceeding:

- (a) Seven days for areas with mean annual precipitation 40 inches or greater; or
 - (b) Fourteen days for areas with mean annual precipitation less than 40 inches.
 - (c) Time allotted to complete temporary and final stabilization, Subsection 641-2.1(c)(13)
- (13) Within seven days of initiating final stabilization, CGP Part 4.5.1.4, either complete final stabilization or continue maintenance of work until final stabilization is complete. Complete temporary stabilization within fourteen days of initiating stabilization, CGP Part 4.5.1.2.
- (14) Include in the "Stabilize Soils" section of the SWPPP, a description of how you will minimize the amount of disturbed and unstabilized ground in the fall season. Identify anticipated dates of fall freeze-up and spring thaw. Describe how you will stabilize areas when it is close to or past the seasonal time of snow cover or frozen conditions, and before the first seasonal thaw. Include a plan for final stabilization.
- (15) Plans for Active Treatment Systems must be submitted to DEC for review at least 14 days prior to use of the system and the Operator of the ATS identified in the SWPPP. Any use of treatment chemicals must be identified on the NOI, documented in the SWPPP, and meet with the requirements in the CGP Part 4.6.
- (16) The SWPPP must provide designated areas for equipment and wheel washing, equipment fueling and maintenance, chemical storage, staging or material storage, waste or disposal sites, concrete washouts, paint and stucco washouts, and sanitary toilets. These activities must be done in designated areas that are located, to the extent practicable, away from drain inlets, conveyance channels, and waters of the US. No discharges are allowed from concrete washout, paint and stucco washout; or from release oils, curing compounds, fuels, oils, soaps, and solvents. Equipment and wheel washing water that doesn't contain detergent may be discharged on-site if it is treated before discharge.
- (17) Design temporary BMPs for a 2 year 24 hour precipitation amount. Describe BMPs in the SWPPP and in SWPPP Amendments, including source controls, sediment controls, discharge points, and temporary and final stabilization measures. Describe the design, placement, installation, and maintenance of each BMP, using words and drawings as appropriate. Describe the design capacity of sediment basins (including sediment ponds and traps). Provide a citation to the BMP Manual or publication used as a source for the BMP, including the manufacturer's or BMP manual specifications for installation (CGP Part 5.3.6.2). If no published source was used to select or design a BMP, then the SWPPP or SWPPP amendment must state that "No BMP manual or publication was used for this design."
- (18) Describe the sequence and timing of activities that disturb soils and of BMP implementation and removal. Phase earth disturbing activities to minimize unstabilized areas, and to achieve temporary or final stabilization quickly. Whenever practicable incorporate final stabilization work into excavation, embankment and grading activities. Include drawings showing each phase of the project with the BMPs implemented in the phase.
- (19) Provide a legible site map or set of maps in the SWPPP, showing the entire site and identifying boundaries of the property where construction and earth-disturbing activities will occur, as described in the CGP Part 5.3.5. Include all BMPs on the site map.
- (20) Identify the inspection frequency in the SWPPP.
 - (a) For areas of the state where the mean annual precipitation is less than 40 inches:
 - (1) Inspect at least once every seven calendar days; or
 - (2) Inspect at least once every 14 calendar days and within 24 hours of the end of a storm event that resulted in a discharge from the site.

(b) For areas of the state where the mean annual precipitation is 40 inches or greater:

(1) Inspect at least once every seven calendar days.

(21) Linear Project Inspections, described in CGP Part 6.5, are not applicable to this contract.

(22) The SWPPP must cite and incorporate applicable requirements of the Project permits, environmental commitments, COE permit, and commitments related to historic preservation. Make additional consultations or obtain permits as necessary for Contractor specific activities that were not included in the Department's permitting and consultation.

(23) The SWPPP is a dynamic document. Keep the SWPPP current by noting installation, modification, and removal of BMPs, and by using amendments, SWPPP amendment logs, Inspection Reports, corrective action logs, records of land disturbance and stabilization, and any other records necessary to document stormwater pollution prevention activities and to satisfy the requirements of the CGP and this specification. See Subsection 641-3.3 for more information.

d. Recording Personnel and Contact Information in the SWPPP.

Identify the SWPPP Manager as the Stormwater Lead and Stormwater Inspector positions in the SWPPP. Document the SWPPP Manager's responsibilities in Section 2.0 Stormwater Contacts, of the SWPPP template and:

(1) Identify that the SWPPP Manager does not have authority to sign inspection reports (unless the SWPPP Manager is also the designated project Superintendent).

(2) Identify that the SWPPP Manager cannot prepare the SWPPP unless the SWPPP Manager meets the Contract requirements for the SWPPP Preparer.

Include in the SWPPP proof of AK-CESCL or equivalent certifications for the Superintendent and SWPPP Manager, and for any acting Superintendent and acting SWPPP Managers. If the Superintendent or SWPPP Manager is replaced permanently or temporarily, by an acting Superintendent or acting SWPPP Manager; record in the SWPPP (use Form 25D-127) the names of the replacement personnel, the date of the replacement. For temporary personnel record their beginning and ending dates.

Provide 24 hour contact information for the Superintendent and SWPPP Manager. The Superintendent and SWPPP Manager must have 24 hour contact information for all Subcontractor SWPPP Coordinators and Utility SWPPP Coordinators.

Include in the SWPPP proof of AK-CESCL or equivalent certifications of ATS operators. Record names of ATS operators and their beginning and ending dates, on Form 25D-127.

The Department will provide proof of AK-CESCL, or equivalent certifications for the Department's Project Engineer, Stormwater Inspectors, and Monitoring Person (if applicable), and names and dates they are acting in that position. Include the Department's staff certifications in Appendix E. Include Department's staff names, dates acting, and assignments, in Section 2.0 of the SWPPP.

641-2.2 HAZARDOUS MATERIAL CONTROL PLAN (HMCP) REQUIREMENTS.

a. Prepare the HMCP using the DOT&PF template located at the following DOT&PF link; (http://www.dot.state.ak.us/stwddes/dcsconst/pop_constforms.shtml) for prevention of pollution from storage, use, containment, cleanup, and disposal of all hazardous material, including petroleum products related to construction activities and equipment. Include the HMCP as an appendix to the SWPPP. Compile Material Safety Data Sheets in one location and reference that location in the HMCP.

- b. Designate a Contractor's Spill Response Field Representative with 24-hour contact information. Designate a Subcontractor Spill Response Coordinator for each subcontractor. The Superintendent and Contractor's Spill Response Field Representative must have 24-hour contact information for each Subcontractor Spill Response Coordinator and the Utility Spill Response Coordinator.
- c. List and give the location and estimated quantities of hazardous materials (including materials or substances listed in 40 CFR 117 and 302, and petroleum products) to be used or stored on the Project. Hazardous materials must be stored in covered storage areas. Include secondary containment for all hazardous material storage areas.
- d. Identify the locations where fueling and maintenance activities will take place, describe the activities, and list controls to prevent the accidental spillage of petroleum products and other hazardous materials. Controls include placing absorbent pads or other suitable containment under fill ports while fueling, under equipment during maintenance or repairs, and under leaky equipment.
- e. List the types and approximate quantities of response equipment and cleanup materials available on the Project. Include a list and location map of cleanup materials, at each different work site and readily available off site (materials sources, material processing sites, disposal sites, staging areas, etc.). Spill response materials must be stored in sufficient quantity at each work location, appropriate to the hazards associated with that site.
- f. Describe procedures for containment and cleanup of hazardous materials. Describe a plan for the prevention, containment, cleanup, and disposal of soil and water contaminated by spills. Describe a plan for dealing with contaminated soil and water encountered during construction. Clean up spills or contaminated surfaces immediately.
- g. Describe methods of disposing of waste petroleum products and other hazardous materials generated by the Project, including routine maintenance. Identify haul methods and final disposal areas. Assure final disposal areas are permitted for hazardous material disposal.
- h. Describe methods of complying with the requirements of AS 46.04.010-900, Oil and Hazardous Substances Pollution Control, and 18 AAC 75. Include contact information for reporting hazardous materials and petroleum product spills to the Project Engineer and reporting to federal, state, and local agencies.

641-2.3 SPILL PREVENTION, CONTROL AND COUNTERMEASURE PLAN (SPCC PLAN) REQUIREMENTS.

Prepare and implement an SPCC Plan when required by 40 CFR 112 when both of the following conditions are present on the Project:

- a. Oil or petroleum products from a spill may reach navigable waters (as defined in 40 CFR 112); and
- b. Total above ground storage capacity for oil and any petroleum products is greater than 1,320 gallons (not including onboard tanks for fuel or hydraulic fluid used primarily to power the movement of a motor vehicle or ancillary onboard oil-filled operational equipment, and not including containers with a storage capacity of less than 55 gallons)

Reference the SPCC Plan in the HMCP and SWPPP.

641-2.4 RESPONSIBILITY AND AUTHORITY OF THE SUPERINTENDENT AND SWPPP MANAGER.

The Superintendent is responsible for the overall operation of the Project and all Contractor furnished sites and facilities directly related to the Project. The Superintendent shall sign and certify the SWPPP, Inspection Reports, and other reports required by the CGP, except the NOI and NOT. The Superintendent may not delegate the task or responsibility of signing and certifying the SWPPP submitted under Subsection 641-1.3.a, Inspection Reports, and other reports required by the CGP.

The Superintendent may assign certain duties to the SWPPP Manager.

- a. Ensuring Contractor's and subcontractor's compliance with the SWPPP and CGP;
- b. Ensuring the control of erosion, sedimentation, or discharge of pollutants;
- c. Directing and overseeing installation, maintenance, and removal of BMPs;
- d. Performing Inspections; and
- e. Updating the SWPPP including adding amendments and forms.

When Bid Item P641.070.0000 is part of the Contract, the SWPPP Manager must be available at all times to administer SWPPP requirements, and be physically present within the Project Zone or the project office, for at least eight hours per day when construction activities are occurring.

The Superintendent and SWPPP Manager shall be knowledgeable in the requirements of this Item P-641, the SWPPP, CGP, BMPs, HMCP, SPCC Plan, environmental permits, environmental commitments, and historic preservation commitments.

The Superintendent and SWPPP Manager shall have the Contractor's complete authority and be responsible for suspending construction activities that do not conform to the SWPPP or CGP.

641-2.5 MATERIALS.

Use materials suitable to withstand hydraulic, wind, and soil forces, and to control erosion and trap sediments according to the requirements of the CGP and the Specifications.

Use the temporary seed mixture specified in the contract or as directed by the Engineer.

Use soil stabilization material as specified in Item P-682 and T-908.

Use silt fences as specified in Item P-680.

Use straw and straw products certified weed free of prohibited and restricted noxious weed seed and quarantined pests, according to Alaska Administrative Code, Title 11, Chapter 34 (11 AAC 34). When straw or straw products certified according to 11 AAC 34 are not available, use non-certified products manufactured within Alaska before products manufactured in another state, country or territory. Grass, legumes, or any other herbaceous plants produced as hay, shall not be substituted for straw or straw products.

Use Oregon Scientific RGR126 wireless rain gauge with temperature, or Taylor 2751 Digital Wireless Rain Gauge with Thermometer, or approved equivalent

641-3.1 CONSTRUCTION REQUIREMENTS.

Comply with the SWPPP and the requirements of the CGP Part 5.0.

a. Before Construction Activity may Begin.

The following actions must be completed before Construction Activity begins:

- (1) The SWPPP Preparer must visit the Project, the visit must be documented in the SWPPP Form (25D-106), and the SWPPP must be developed (or amended) with findings from the visit;
- (2) The SWPPP must be approved by the Engineer on Form 25D-109;
- (3) The Contractor must be authorized to begin by the Engineer;

- (4) The Project eNOIs for the Department and for the Contractor, as well as any other eNOIs if there are additional operators, must be listed as Active Status on the DEC website;
- (5) The Department approved SWPPP must be submitted to DEC and Local Government (when required); and
- (6) The Contractor has transmitted to the Engineer an electronic copy and at least one hardcopy of the approved SWPPP.
- (7) The Delegation of Authority (Forms 25D-108 and 25D-107) for both the Contractor and DOT&PF Engineer are signed.
- (8) Begin winter construction activity according to CGP Part 4.12.2, provided actions (1), (3), and (7) are completed. If winter construction activities may extend beyond spring thaw, the following actions must be completed before spring thaw:
 - (a) Actions (1) through (7), listed above, and
 - (b) Appropriate control measures to minimize erosion and sediment runoff during spring thaw and summer rainfall are installed.
- (9) Post notices. Include the following information:
 - (a) Copy of all eNOIs related to this project;
 - (b) Location of the SWPPP.

Post notices on the outside wall of the Contractor's project office, and near the main entrances of the construction project. Protect postings from the weather. Locate postings so the public can safely read them without obstructing construction activities or the traveling public (for example, at an existing pullout). Do not use retroreflective signs for the SWPPP posting. Do not locate SWPPP signs in locations where the signs may be confused with traffic control signs or devices. Update the notices if the listed information changes.
- (10) Install an outdoor rain gauge per manufacturer's guidance in a readily accessible location on the Project. Projects may utilize the nearest National Weather Service (NWS) precipitation gauge station, if within 20 miles of the project, to determine rainfall amounts during storm events.
- (11) Delineate the site for both land disturbing activities and areas that will be left undisturbed.
- (12) Install sediment controls and other BMPs that must be placed prior to the initiation of Construction Activity.

b. During Construction.

Before subcontractors or utility companies begin soil disturbing activities, provide to them copies of applicable portions of the SWPPP, and require them to sign a SWPPP Subcontractor Certification, Form 25D-105. Include SWPPP Subcontractor Certifications as an appendix to the SWPPP. Ensure subcontractors and utility companies understand and comply with the SWPPP and the CGP. Inform subcontractors and utility companies of SWPPP amendments that affect them in a timely manner. Coordinate with subcontractors and utility companies doing work in the Project Zone so BMPs, including temporary and final stabilization are installed, maintained, and protected from damage.

Provide on-going training to employees and subcontractors, on control measures at the site and applicable stormwater pollution prevention procedures. Training must be specific to the installation, maintenance, protection, and removal of control measures CGP 4.14. Training must be given at a frequency that will be adequate to ensure proper implementation and protection of control measures, and no less frequently than once a month during construction activity. Document on the SWPPP

Training Log, Form 25D-125, the dates and attendees to these trainings. Include the SWPPP Training Log as an appendix to the SWPPP.

Notify the Engineer immediately if the actions of any utility company or subcontractor do not comply with the SWPPP and the CGP.

Comply with GCP Subsection 70-11 Protection and Restoration of Property and Landscape. Concrete washout must be fully contained.

Comply with CGP Part 4.8.2 for fueling and maintenance activities. Place absorbent pads or other suitable containment under fill ports while fueling, under equipment during maintenance or repairs, and under leaky equipment.

Comply with requirements of the HMCP and SPCC Plan, and all local, state and federal regulations that pertain to the handling, storage, containment, cleanup, and disposal of petroleum products or other hazardous materials.

Keep the SWPPP and HMCP current (refer to Subsection 641-2.1.c, SWPPP Considerations and Contents).

c. Pollutant Reporting Requirements.

If an incident of non-compliance occurs that may endanger health or the environment a report must be made, CGP, Appendix A, Part 3.4:

- (1) Verbally, immediately report the incident to the Engineer,
- (2) Verbally report to DEC within 24 hours after the permittee becomes aware of the incident, and
- (3) In writing, report to DEC within five days after the permittee becomes aware of the circumstances. To report in writing, complete the written noncompliance report on Form 25D-143, and file the written report with DEC. Coordinate the report with the Engineer. Include in the report:
 - (a) A description of the noncompliance and its causes;
 - (b) The exact dates and times of noncompliance;
 - (c) If not yet corrected the anticipated time the project will be brought back into compliance; and
 - (d) The corrective action taken or planned to reduce, eliminate and prevent reoccurrence.
 - (e) Notify the Engineer and COE Regulatory Program immediately if there is incident of noncompliance with COE Permits.

d. Hazardous Materials Reporting Requirements.

Any release of a hazardous substance must be reported immediately, to the Engineer as soon as the person has knowledge of the discharge.

Report spills of petroleum products or other hazardous materials to the Engineer and other agencies as required by law, and according to CGP Part 9.3.

- (1) To water:
 - (a) Any amount released must be reported immediately to the Engineer, DEC, and the Coast Guard.
- (2) To land:

- (a) Any release of a petroleum product in excess of 55 gallons must be reported as soon as the person has knowledge of the discharge CGP Part 9.3.2.
 - (b) Any release of a petroleum product in excess of 10 gallons but less than 55 gallons must be reported to the Engineer and must be reported to DEC within 48 hours after the person has knowledge of the discharge CGP Part 9.3.2.
 - (c) Any release of a petroleum product in excess of 1 gallon to 10 gallons must be recorded and logged and provided to DEC on a monthly basis.
- (3) Use the HMCP and SPCC Plan (if available) for contact information to report spills to regulatory agencies.
 - (4) Within seven calendar days of knowledge of the release, provide a description of the release, the circumstances leading to the release, and the date of the release to the nearest DEC Area Response Team Office listed CGP Part 9.3.2.
 - (5) Implement measures to prevent the reoccurrence of and to respond to such releases.

e. Corrective Action and Maintenance of BMPs.

Implement maintenance as required by the CGP, SWPPP, and manufacturer's specifications, whichever is more restrictive.

(1) Implement corrective action:

- (a) If an incident of noncompliance with the SWPPP, or CGP is identified;
- (b) If an Inspection or the Engineer identifies the SWPPP or any part of the SWPPP is ineffective in preventing erosion, sedimentation or the discharge of pollutants;
- (c) If a required BMP was not installed according to the SWPPP schedule or phasing, or was installed incorrectly, or was not installed according to the CGP Part 4.0;
- (d) If a BMP is not operating as intended, has not been maintained in an effective operation condition, or is unable to effectively perform the intended function;
- (e) If sediment accumulates more than one-third of the distance of the above-ground height of the silt fence;
- (f) If sediment accumulates to more than one-half retention height for an inlet BMP, check dam, berm, wattle, or other control measures;
- (g) If a prohibited discharge of pollutants, as specified in CGP Part 4.7, is occurring or will occur;
or
- (h) If there is accumulation of sediment or other pollutants, that is in or near any stormwater conveyance channels, or that may enter a discharge point or storm sewer system. If there is accumulation of sediment or other pollutants that is being tracked outside the project zone.

(2) Implement corrective actions so that they comply with the following time requirements:

- (a) For conditions that are easily remedied (i.e. removal of tracked sediment, maintenance of control measure, or spill clean-up), initiate corrective action within 24 hours and complete as soon as possible;
- (b) If a discharge occurs during a local 2-year, 24-hour storm event, initiate a corrective action the day after the storm event ends;

- (c) If installation of a new control measure is needed or an existing control measure requires redesign and reconstruction or replacement to make it operational, the corrective action must be completed within seven calendar days from the time discovered.
- (d) For all other conditions initiate corrective actions so both of the following requirements are met:
 - (1) Corrective action is completed in time to protect water quality; and
 - (2) Corrective action is completed no later than the Complete-by-Date that was entered in an Inspection Report (see Subsection 641-3.3.b for more information).

If a corrective action is not implemented within the time requirements of this section, document the situation in the SWPPP, notify the Engineer and implement corrective action as soon as possible.

If a corrective action could affect a subcontractor, notify the subcontractor within three days of taking the corrective action. Require in your written subcontract, that subcontractors must notify the Contractor within 24 hours of becoming aware of a condition that requires a corrective action.

f. Stabilization.

- (1) Stabilization may be accomplished using temporary or permanent measures. Initiate stabilization of disturbed soils, erodible stockpiles, disposal sites, and of erodible aggregate layers so that all of the following conditions are satisfied:
 - (a) Not later than the end of the next work day, following the day when the earth-disturbing activities have temporarily or permanently ceased (CGP 4.5.1.1).
 - (b) As soon as necessary to avoid erosion, sedimentation, or the discharge of pollutants; and
 - (c) As identified in the SWPPP.
- (2) Land may be disturbed and stabilized multiple times during a project. Coordinate work to minimize the amount of disturbed soil at any one time. Do not disturb more soil than you can stabilize with the resources available.
- (3) Temporarily stabilize from wind and water erosion portions of disturbed soils, portions of stockpiles, and portions of disposal sites, that are not in active construction. Temporary stabilization measures may require a combination of measures including but not limited to vegetative cover, mulch, stabilizing emulsions, blankets, mats, soil binders, low-erodible cover, dust palliatives, or other approved methods.
- (4) When temporary or permanent seeding is required, provide a working hydro seeding equipment located within 100 miles of the project by road; with 1,000 gallon or more tank capacity, paddle agitation of tank, and the capability to reach the seed areas with an uniform mixture of water, seed, mulch and tackifier. If the project is located in an isolated community the hydro-seeder must be located at the project.
- (5) Before applying temporary or permanent seeding, prepare the surface to be seeded to reduce erosion potential and to facilitate germination and growth of vegetative cover. Apply seed and maintain seeded areas. Reseed areas where growth of temporary vegetative cover is inadequate to stabilize disturbed ground.
- (6) Apply permanent seed according to Item T-901, within the time periods allowed by the CGP and the contract, at locations where seeding is indicated on the plans and after land-disturbing activity is permanently ceased.

- (7) When installing a culvert or other drainage structure where stream bypass is not used, install temporary or final stabilization concurrently or immediately after placing the culvert or drainage structure in a manner that complies with the SWPPP, applicable project permits and prevents discharge of pollutants. Install temporary or final stabilization:
- (a) At the culvert or drainage structure inlet and outlet; and
 - (b) In the areas upstream and downstream that may be disturbed by the process of installing the culvert, culvert end walls, culvert end sections, or drainage structure.
- (8) Before deactivating a stream bypass or stream diversion used for construction of a bridge, culvert, or drainage structure, install final or temporary stabilization when approved by the Engineer:
- (a) At the inlet and outlet of the culvert, drainage structure, or bridge;
 - (b) In the area upstream and downstream of the culvert, drainage structure, or bridge, that is disturbed during installation or construction of the culvert, drainage structure, or bridge; and
 - (c) Under the bridge.

Within seven days of initiating final stabilization, either complete final stabilization or continue maintenance of work until final stabilization is complete, CGP Part 4.5.1.5.

Complete temporary stabilization within 14 day of initiating stabilization, CGP Part 4.5.1.2.

g. Ending CGP Coverage and BMP Maintenance in the Project Zone.

- (1) The Engineer will determine the date that all the following conditions for ending CGP coverage have been met within the Project Zone:
- (a) Land disturbing activities have ceased;
 - (b) Final Stabilization has been achieved on all portions of the Project Zone, according to the CGP PART 4.5.2 (including at Department furnished material sources, disposal sites, staging areas, equipment areas, etc.); and
 - (c) Temporary BMPs have been removed.
- (2) After the Engineer has determined the conditions for ending CGP coverage have been met, the Department will:
- (a) Send written notice to the Contractor with the date that the conditions were met;
 - (b) Submit an eNOT to DEC; and
 - (c) Provide a copy of the eNOT and DEC's acknowledgement letter to the Contractor.

The Contractor is responsible for ending permit coverage within the Project Zone, by submitting an eNOT to DEC within 30 days of meeting the conditions for ending CGP coverage. The Contractor is responsible for BMP maintenance and SWPPP updates until permit coverage is ended.

If the Contractor's CGP eNOI acreage includes Support Activities and any other areas where the Department is not an Operator, the Contractor may not be able to file an eNOT at the same time as the Department. In this case, the Contractor must amend the SWPPP and separate SWPPP2(s), to indicate the Department's CGP coverage has ended, and the Department is no longer an Operator within the Project Zone.

The Contractor must indicate in the SWPPP the areas that have reached Final Stabilization, and the dates land disturbing activities ended and Final Stabilization was achieved. The Contractor must submit an eNOT to DEC, and insert copies of the Department's and the Contractor's eNOTs with DEC's acknowledgement letters in the appendix of the SWPPP.

The Contractor must submit a copy of each signed eNOT and DEC's acknowledgement letter to the Department within three days of filing the eNOT or receiving a written response.

The Contractor is responsible for coordinating local government inspections of work and ending permit coverage with local government. See Subsection 641-1.3.e for more information.

h. Transmit final SWPPP.

Transmit one copy of the final SWPPP, including all amendments, appendices and maps, to the Engineer; when the project eNOTs are filed, or within 30 days of the Department's eNOT being filed, whichever is sooner. Transmittal must be by both electronic and at least one hard copy.

641-3.2 SWPPP DOCUMENTS, LOCATION ON-SITE, AVAILABILITY, AND RECORD RETENTION.

The SWPPP and related documents maintained by the Contractor are the Record for demonstrating compliance with the CGP. Copies of SWPPP documents transmitted to the Engineer under the requirements of this specification are informational and do not relieve the Contractor's responsibility to maintain complete records as required by the CGP and this specification.

Keep the SWPPP, HMCP and SPCC Plan at the on-site project office. If there is not an on-site project office, keep the documents at a locally available location that meets CGP requirements and is approved by the Engineer. Records may be moved to another office for record retention after the eNOTs are filed. Records may be moved to another office during winter shutdown. Update on-site postings if records are relocated during winter shutdown. Provide the Department with copies of all Records.

Retain Records and a copy of the SWPPP, for at least three years after the date of eNOT. If EPA or DEC inspects the project, issues a Notice of Violation (NOV), or begins investigation for a potential NOV before the retention period expires, retain the SWPPP and all Records related to the SWPPP and CGP until at least three years after EPA and/or DEC has determined all issues related to the investigation are settled.

The SWPPP and related documents must be made available for review and copy, to the Department and other regulatory agencies that request them. See CGP Parts 5.10, 6.6 and 9.5.

641-3.3 SWPPP INSPECTIONS, AMENDMENTS, REPORTS, AND LOGS.

Perform Inspections, prepare Inspection Reports, and prepare SWPPP Amendments in compliance with the SWPPP and the CGP. Update SWPPP Corrective Action Log Form 25D-112, SWPPP Amendment Log Form 25D-114, SWPPP Grading and Stabilization Activities Log Form 25D-110, SWPPP Project Staff Tracking Form 25D-127, and SWPPP Daily Record of Rainfall Form 25D-115. For active projects update the Records daily.

a. Inspection during Construction.

Conduct Inspections according to the schedule and requirements of the SWPPP and CGP.

Inspections required by the CGP and SWPPP must be performed by the Contractor's SWPPP Manager and the Department's Stormwater Inspector jointly, unless approved by the Engineer, when:

- (1) One of the inspectors is not on site, access is only by air, and weather delayed or canceled flights;
- (2) One of the inspectors is sick;

- (3) The project is on a reduced frequency inspection schedule with no staff on site, the only access to the site is by air, and it is economical to send only one inspector; or
- (4) When the Engineer determines a safety concern that makes joint inspection impracticable.

When this is the case, the Operator who conducts the Inspection must provide a copy of the Inspection Report to the other Operator within three days of the Inspection date and document the date of the report transmittal.

b. Inspection Reports.

Use only the DOT&PF SWPPP Construction Site Inspection Report, Form 25D-100 to record Inspections. Changes or revisions to Form 25D-100 are not permitted; except for adding or deleting data fields that list: Location of Discharge Points, and Site Specific BMPs. Complete all fields included on the Inspection Report form; do not leave any field blank.

Insert a Complete-by-Date for each corrective action listed that complies with:

- (1) Section 641-3.1.d, and
- (2) The CGP.

Provide a copy of the completed, unsigned Inspection Report to the Engineer by the end of the next business day following the inspection.

The Superintendent must review, correct errors, and sign and certify the Inspection Report, within three days of the date of Inspection. The Engineer may coordinate with the Superintendent to review and correct any errors or omissions before the Superintendent signs the report. Corrections are limited to adding missing information or correcting entries to match field notes and conditions present at the time the Inspection was performed. Deliver the signed and certified Inspection Report to the Engineer on the same day the Superintendent signs it.

The Engineer will sign and certify the Inspection Report and will return the original to the Contractor within three working days.

The Engineer may make corrections after the Superintendent has signed and certified the Inspection Report. The Engineer will initial and date each correction. If the Engineer makes corrections, the Superintendent must recertify the Inspection Report by entering a new signature and date in the white space below the original signature and date lines. Send a copy of the recertified Inspection Report to the Engineer on the day it is recertified.

If subsequent corrections to the certified Inspection Report are needed, document the corrections in an amendment memo that addresses only the omitted or erroneous portions of the original Inspection Report. The Superintendent and the Engineer must both sign and certify the amendment memo. The issuance of an amendment memo does not relieve the Contractor of liquidated damages that may have been incurred as a result of the error on the original certified inspection report.

c. Inspection before Seasonal Suspension of Work.

Conduct an Inspection before seasonal suspension of work to confirm BMPs are installed and functioning according to the requirements of the SWPPP and CGP.

d. Reduced Inspection Frequencies.

Conduct Inspections according to the inspection schedule indicated in the approved SWPPP. Any change in inspection frequency must be approved by the Engineer, and beginning and ending dates documented as an amendment to the SWPPP.

If the Engineer approves and the entire site is stabilized, the frequency of inspections may be reduced to at least one inspection every 30 days. At actively staffed sites, inspect within two business days of the end of a storm event that results in a discharge from the site.

When work is suspended due to fall freeze-up, the Engineer may suspend inspection requirements after fourteen days of freezing conditions if:

- (1) Soil disturbing activities are suspended; and
- (2) Soil stabilizing activities are suspended.

Inspections must resume according to the normal inspection schedule identified in the SWPPP, at least 21 days before anticipated spring thaw. See CGP Part 6.2.3.

The Engineer may waive requirements for updating the Grading and Stabilization Activities Log and Daily Record of Rainfall during seasonal suspension of work. If so, resume collecting and recording weather data on the Daily Record of Rainfall form one month before thawing conditions are expected to result in runoff. Resume recording land disturbance and stabilization activities on the Grading and Stabilization Activities Log when Construction Activity resumes.

e. Stabilization before Fall Freeze up and Spring Thaw.

Stabilize Construction Activities within the Project Zone with appropriate BMPs prior to the anticipated date of fall freeze up, in accordance with the CGP, Part 4.12.

Exceptions to stabilization prior to anticipated date of fall freeze up include:

- (1) When stabilization activities are precluded by snow cover or frozen ground conditions prior to the anticipated date of fall freeze up, or
- (2) When winter construction activity is authorized by the Engineer and conducted according to the contract.

Stabilize Construction Activities within the Project Zone with appropriate BMPs prior to spring thaw, as defined in the CGP.

f. Inspection before Project Completion.

Conduct Inspection to ensure Final Stabilization is complete throughout the Project, and temporary BMPs that are required to be removed are removed. Temporary BMPs that are biodegradable and are specifically designed and installed with the intent of remaining in place until they degrade, may remain in place after project completion.

g. Items and Areas to Inspect.

Conduct Inspections of the areas required by the CGP and SWPPP.

h. SWPPP Amendments and SWPPP Amendment Log.

The Superintendent and the SWPPP Manager are the only persons authorized to amend the SWPPP and update the SWPPP Amendment Log, Form 25D-114. The Superintendent or the

SWPPP Manager must sign and date amendments to the SWPPP and updates to the SWPPP Amendment Log.

SWPPP Amendments must be approved by the Engineer.

Amendments must occur:

- (1) Whenever there is a change in design, construction operation, or maintenance at the construction site that has or could cause erosion, sedimentation or the discharge of pollutants that has not been previously addressed in the SWPPP;
- (2) If an Inspection identifies that any portion of the SWPPP is ineffective in preventing erosion, sedimentation, or the discharge of pollutants;
- (3) Whenever an Inspection identifies a problem that requires additional or modified BMPs
- (4) Whenever a BMP is modified during construction, or a BMP not shown in the original SWPPP is added;
- (5) If the Inspection frequency is modified (note beginning and ending dates); or
- (6) When there is a change in personnel who are named in the SWPPP, according to Subsection 641-2.1.d.

Amend the SWPPP narrative as soon as practicable after any change or modification, but in no case, later than seven days following identification of the need for an amendment. Every SWPPP Amendment must be signed and dated. Cross-reference the amendment number with the Corrective Action Log or SWPPP page number, as applicable. When a BMP is modified or added, describe the BMP according to Subsection 641-2.1.c.

Keep the SWPPP Amendment Log current. Prior to performing each scheduled Inspection, submit to the Engineer a copy of the pages of the Amendment Log that contain new entries since the last submittal. Include copies of any documents amending the SWPPP.

Keep the SWPPP Amendment Log as an appendix to the SWPPP.

i. Site Maps.

Document installation, routine maintenance, and removal of BMPs by making notes on the SWPPP Site Maps. Include the date and the recording person's initials by these notes. Identify areas where Construction Activities begin, areas where Construction Activities temporarily or permanently cease, and areas that are temporarily or permanently stabilized.

j. Corrective Action Log.

The Superintendent and SWPPP Manager are the only persons authorized to make entries on the SWPPP Corrective Action Log, Form 25D-112. Document the need for corrective action within 24 hours of either:

- (1) Identification during an inspection; or
- (2) Discovery by the Department's or Contractor's staff, a subcontractor, or a regulatory agency inspector.

Modification or replacement of a BMP, installation of a new BMP not shown in the original SWPPP, overdue BMP maintenance, or other reasons listed as corrective actions in 641-3.1.d must be documented on the Corrective Action Log.

Within 24 hours of discovery, update the Corrective Action Log, Form 25D-112, with the date of discovery and proposed corrective action. If discovered during an inspection, update log with inspection date and proposed corrective actions noted on the Inspection Report. If discovered outside of an inspection, update the log with the date of discovery, the proposed corrective action, and the date the corrective action was completed.

After the corrective action has been accomplished, note in the Corrective Action Log the action taken and if a SWPPP amendment was needed. Date and initial the entry.

Keep the Corrective Action Log current and submit a copy to the Engineer prior to performing each scheduled SWPPP Inspection.

Keep the Corrective Action Log as an appendix to the SWPPP.

k. Grading and Stabilization Activities Log.

The Superintendent and SWPPP Manager are the only persons authorized to date and initial entries on the SWPPP Grading and Stabilization Activities Log, Form 25D-110. Use the SWPPP Grading and Stabilization Activities Log, to record land disturbance and stabilization activities.

Keep the Grading and Stabilization Activities Log current and submit a copy to the Engineer prior to performing each scheduled SWPPP Inspection. Keep the Grading and Stabilization Activities Log organized and completed to demonstrate compliance with the CGP Part 4.5.

Keep the Grading and Stabilization Activities Log as an appendix to the SWPPP.

l. Daily Record of Rainfall.

Use SWPPP Daily Record of Rainfall, Form 25D-115, to record weather conditions at the Project. Update the form daily and include the initials of the person recording each day's entry. Submit a copy to the Engineer prior to performing each scheduled Inspection. Keep the Daily Record of Rainfall as an appendix to the SWPPP.

m. Staff Tracking Log.

Use the SWPPP Project Staff Tracking Form 25D-127, to keep staff records current. Include Records of the AK-CESCL or equivalent qualifications for the Superintendent, SWPPP Manager, ATS operator, any acting Superintendent and acting SWPPP Managers, and beginning and end dates for temporary personnel assignments related to administration of the CGP or Item P-641. Update the SWPPP Staff Tracking Log within 24 hours of any changes in personnel, qualifications, or other staffing items related to administration of the CGP or Item P-641.

641-3.4 FAILURE TO PERFORM WORK.

The Engineer has authority to suspend work and withhold monies according to GCP Subsections 50-01 and 80-06 for the reasons listed under GCP Subsection 80-06 and for an incident of noncompliance with the CGP or SWPPP, that may endanger health or the environment or for failure to perform work related to Item 641.

An incident of noncompliance includes, but is not limited to, the Contractor's failure to:

- (a) Obtain appropriate permits before Construction Activities occur;
- (b) Perform SWPPP Administration;
- (c) Perform timely Inspections;
- (d) Update the SWPPP;

- (e) Transmit updated SWPPP, Inspection Reports, and other updated SWPPP forms to the Engineer;
- (f) Maintain effective BMPs to control erosion, sedimentation, and pollution in accordance with the SWPPP, the CGP, and applicable local, state, and federal requirements;
- (g) Perform duties according to the requirements of Item P-641; or
- (h) Meet requirements of the CGP, SWPPP, or other permits, laws, and regulations related to erosion, sediment, or pollution control.
- (i) Any other requirements established or included in the contract.

No additional Contract time or additional compensation will be allowed due to delays caused by the Engineer's suspension of work.

641-3.5 ACCESS TO WORK.

The Project, including any related off-site areas or support activities, must be made available for inspection, or sampling and monitoring, by the Department and other regulatory agencies. See CGP Part 6.6.

METHOD OF MEASUREMENT

641-4.1 See Section 90 and as follows:

Item P641.010.0000, P641.030.0000, P641.070.0000 and P641.090.0000, are lump sum.

Items P641.020.0000, P641.040.0000, P641.050.0000, P641.080.0000 and P641.100.0000 will be measured on a contingent sum basis as specified by the Directive authorizing the work.

Item P641.060.0000 will be measured on a contingent sum basis with withholding determined by the Department.

TABLE 641-1 BMP VALUES – RESERVED

Liquidated Damages assessed according to Table 641-2 are not an adjustment to the Contract amount. These damages charges are related to Contract performance but are billed by the Department to the Contractor, independent of the Contract amount. An amount equal to the Liquidated Damages may be withheld for unsatisfactory performance, from payment due under the Contract, until the Contractor remits payment for billed Liquidated Damages.

**TABLE 641-2 - Version C
EROSION, SEDIMENT AND POLLUTION CONTROL – LIQUIDATED DAMAGES**

Code	Specification Section Number and Description	Deductible Amount in Dollars	Cumulative Deductible Amounts in Dollars
a	641-1.4 Failure to have a qualified (AK-CESCL or equivalent) SWPPP Manager	Calculated in Code b or f	
b	Failure to meet SWPPP requirements of: (1) 641-2.1.a Name of SWPPP Preparer (2) Not Applicable (3) 641-3.3.h Sign and Date SWPPP amendments by qualified person (4) 641-3.2 Records maintained at project and made available for review	\$750 per omission	
c	Not Applicable		

Code	Specification Section Number and Description	Deductible Amount in Dollars	Cumulative Deductible Amounts in Dollars
d	641-3.3.e Failure to stabilize a Project prior to fall freeze up.	\$5,000 per Project per year	
e	641-2.1.a Failure to conduct pre-construction inspections before Construction Activities on all projects greater than 1 acre.	\$2,000 per Project	
f*	641-3.3. Failure to conduct and record CGP Inspections 641-3.3.a Personnel conducting Inspections and Frequency 641-3.3.b Inspection Reports, use Form 25D-100, completed with all required information	\$750 per Inspection	Additional \$750 for every additional 7 day period without completing the required inspection.
g	641-3.1.d Corrective action, failure to timely accomplish BMP maintenance and/or repairs. In effect until BMP maintenance and/or repairs is completed.	\$500 per Project per day	
h	641-3.1.c Failure to provide to the Engineer and DEC a timely oral noncompliance report of violations or for a deficient oral noncompliance report	\$750 for the first day the report is late or deficient	Additional \$750 for every 14 day period with- out the required information
i	641-3.1.c Failure to provide to the Engineer and DEC a timely written noncompliance report, use Form 25D-143, of violations or for a deficient written noncompliance report	\$750 for the first day the report is late or deficient	Additional \$750 for every 14 day period without the required information
j	641.3.4 Failure to comply with the requirements of the CGP, approved SWPPP, and Item P-641, except as listed above	\$750 per occurrence for the first day of noncompliance	Additional \$750 for every day the deficiency remains uncorrected

Code f* Liquidated Damages according to Code f will not be billed for typographic errors and minor data entry errors, except the liquidated damages will be assessed for these errors when:

- (1) the contractor has previously been notified and subsequent inspection reports repeat the same or similar error,
- (2) multiple inspection reports are submitted after the submission due date and the same or similar errors are repeated on multiple overdue reports,
- (3) an error in recording the inspector's AK-CESCL certification date results in an inspector performing the inspection during a period when their certification was lapsed or was otherwise invalid.

BASIS OF PAYMENT

641-5.1 See Subsection 641-3.4 Failure to Perform Work, for additional work and payment requirements.

Item P641.010.0000 Erosion, Sediment and Pollution Control Administration. At the Contract lump sum price for administration of all work under this Section. Includes, but is not limited to, SWPPP and HMCP and SPCC Plan preparation, agency fees for SWPPP reviews, SWPPP amendments, pre-construction Inspections, Inspections, monitoring, reporting, and Record keeping or copying Records related to the SWPPP and required by the CGP, and Record retention.

Item P641.020.0000 Temporary Erosion, Sediment and Pollution Control. At the contingent sum prices specified for all labor, supervision, material, equipment, and incidentals to install, maintain, remove and dispose of approved temporary erosion, sedimentation, and pollution control BMPs required to implement the SWPPP and SPCC Plan.

Item P641.030.0000 Temporary Erosion, Sediment and Pollution Control. At the Contract lump sum price for all labor, supervision, material, equipment, and incidentals to install, maintain, remove and dispose of temporary erosion, sedimentation, and pollution control BMPs identified in the SWPPP and SPCC Plan.

Item P641.040.0000 Temporary Erosion, Sediment and Pollution Control Additives. At the contingent sum prices specified in the Directive to authorize the work, for all labor, supervision, materials, equipment, and incidentals for extra, additional, or unanticipated work, to install, maintain, remove and dispose of temporary erosion, sedimentation, and pollution control BMPs not covered by Item P641.030.0000. All additional Erosion, Sediment, and Pollution Control Administration necessary due to this item will not be paid for separately but will be subsidiary to other bid items.

Item P641.050.0000 Temporary Erosion, Sediment and Pollution Control by Directive. At the contingent sum prices specified in the Directive using time and materials to authorize the work, for all labor, supervision, materials, equipment, and incidentals to install, maintain, remove and dispose of temporary erosion, sedimentation, and pollution control BMPs. Prices for this item will be by time and materials according to GCP Subsection 90-05, or by mutual agreement between the Engineer and Contractor. All additional Erosion, Sediment, and Pollution Control Administration necessary due to this item will not be paid for separately but will be subsidiary to other bid items.

Item P641.060.0000 Withholding. The Engineer may withhold an amount equal to Liquidated Damages, assessed according to Item P-641, from payment due the Contractor. Liquidated Damages for violations of the Contract, CWA, CGP, are determined by the Engineer according to Table 641-2. The Engineer may withhold payment due the Contractors until the Contractor pays the Liquidated Damages to the Department.

The Department will not release performance bonds until Liquidated Damages assessed according to Item P-641 are paid to the Department, and all requirements according to GCP Subsection 30-05 are satisfied.

Item P641.070.0000 SWPPP Manager. At the Contract lump sum price for a SWPPP Manager that conforms to this specification. When Item P641.070.0000 appears in the Bid Schedule, the SWPPP Manager must be a different person than the superintendent, and must be physically present during construction activity with duties and authority as described in Subsection 641-2.4. When Item P641.070.0000 does not appear in the Bid Schedule, the SWPPP Manager is subsidiary to Item P641.010.0000.

Subsidiary Items. Temporary erosion, sediment and pollution control measures that are required outside the Project Zone are subsidiary. Work required by the HMCP and SPCC Plan including hazardous material storage, containment, removal, cleanup and disposal, are subsidiary to Item P641.010.0000 Erosion, Sediment and Pollution Control Administration.

Work under other pay items. Work that is paid for directly or indirectly under other pay items will not be measured and paid for under Item P-641. This work includes but is not limited to:

- a. Dewatering;
- b. Shoring;
- c. Bailing;
- d. Permanent seeding;
- e. Installation and removal of temporary work pads;
- f. Temporary accesses;
- g. Temporary drainage pipes and structures;
- h. Diversion channels;
- i. Settling impoundment; and

j. Filtration.

Permanent erosion, sediment and pollution control measures will be measured and paid for under other Contract items when shown on the bid schedule.

Work at the Contractor's Expense. Temporary erosion, sediment and pollution control measures that are required due to carelessness, negligence, or failure to install temporary or permanent controls as scheduled or ordered by the Engineer, or for the Contractor's convenience, are at the Contractor's expense.

Payment will be made under:

Item P641.010.0000	Erosion, Sediment, and Pollution Control Administration – per lump sum
Item P641.020.0000	Temporary Erosion, Sediment, and Pollution Control – per contingent sum
Item P641.030.0000	Temporary Erosion, Sediment, and Pollution Control – per lump sum
Item P641.040.0000	Temporary Erosion, Sediment, and Pollution Control Additives – per contingent sum

ITEM P-650 AIRCRAFT TIE-DOWN

DESCRIPTION

650-1.1 This item consists of furnishing and installing aircraft tie-down anchors according to these specifications and the details on the Plans, or as directed by the Engineer.

MATERIALS

650-2.1 GENERAL.

Meet the strength and/or capacity requirements of this section for the type of anchor specified.

Substitution of products as approved equals will be determined by comparing ratings for tensile breaking strength and pull-out capacity that exceed the specified minimums when installed under prevailing soil or rock conditions. The practicality of installing proposed anchors at the plan locations and corrosion resistance will also be considered.

Locate existing tiedowns and record their locations such that new tie-downs may be placed in a similar layout.

Cut existing tie-downs off at the lowest point available after excavation in the area is complete.

Install tie-downs such that the new tie-down is offset 18 inches or as directed by the Engineer to avoid hitting the existing anchor with the new installation.

650-2.2 SOIL ANCHOR TIE-DOWNS.

- a. **Driven Toggle.** Provide an anchor assembly with a minimum tensile breaking strength of 9,000 pounds, a minimum working load capacity of 3,500 pounds and a minimum field pull-out capacity of 5,000 pounds. Provide anchors equipped with stainless steel cable, swaged eyes at cable ends, and no intermediate connections.
- b. **Buried Plate.** Provide an anchor assembly meeting the details shown on the plans.
- c. **Helical "Screw" Anchor.** Provide an anchor assembly with minimum tensile breaking strength of 9,000 pounds, a minimum working load capacity of 3,500 pounds, and a minimum field pull-out capacity of 5,000 pounds.

For each anchor assembly, provide a chain extension to the anchor cable so that the cable eye is buried 12 inches minimum below finish grade and the chain extends several links above finish grade after locking the anchor. Use 3/8-inch grade 43 high test hot galvanized steel chain with two 3/8-inch removable coupling links, one at each end of the chain.

650-2.3 ROCK ANCHOR TIE-DOWNS. Rock anchors shall be 1/2-inch diameter Williams Solid Bar "Spin Lock" Rock Bolts, Williams Titan Injection Anchor 30/16, or an approved equal. Provide anchor assembly with a minimum tensile breaking strength of 9,000 pounds and minimum field pull-out capacity of 5,000 pounds. Provide chain and chain coupling links meeting the same requirements as specified for soil anchor tie downs.

650-2.4 TEMPORARY TIE-DOWNS. Temporary tie-down anchors shall provide a minimum 500 pounds of resistance to uplift per anchor. Temporary anchors shall be laid out as shown on the plans or as approved by the Engineer. Each anchor shall be provided with a 2-inch link or eye to which aircraft can be tethered. If above ground weights are used they shall be painted with reflective paint to be visible from any horizontal angle.

CONSTRUCTION METHODS

650-3.1 GENERAL. Soil and Rock Anchor tie-downs shall be installed as shown on the Plans.

Install anchor eye to the end of the anchor shaft by either bolting or as recommended by the manufacturer and approved by the Engineer. Eye must be able to pass a 1-inch rope or pin.

650-3.2 SOIL ANCHOR TIE-DOWNS.

- a. **Driven Toggle.** Drive to sufficient depth to develop the minimum pull-out strength according to the manufacturer's installation instructions. Predrilling may be required depending on soil class. Anchor placement shall be achieved by methods recommended in the manufacturer's installation instructions. Backfill material, when required, shall be aggregate compacted to the satisfaction of the Engineer. If the anchor is set in pavement, backfill to a level 2-inches below finish grade. Two-component sealant shall be used to fill the remainder of the hole to a level 1-inch below finish grade.
- b. **Buried Plate.** Install each plate on a level and compacted surface at 5 feet minimum below finish grade. Place backfill with the chain plumb and under tension. Meet the material and compaction requirements for the applicable lift of material involved.
- c. **Helical "Screw" Anchor.** Helical anchors shall be handled, stored, and installed in accordance with the manufacturer's recommendations. The helix of the helical anchors shall be installed a minimum of 6 feet below finish grade. Under no circumstances shall the manufacturer's recommended maximum allowable torque be exceeded at any time during installation.

The helix must be advanced in a continuous manner that allows the helix to "screw" into the soil matrix rather than "auger" through the soil matrix, resulting in disturbed soils around the helices. The rate of advance should provide a rotation of 5 to 15 rotations per minute. Apply uniform down pressure to maintain a penetration rate commensurate with the helix pitch. The rate of rotation and magnitude of down pressure may require adjustments during installation.

Prior to installing helical anchors in paved areas, core through the asphalt using a circular coring machine approved by the engineer. Install as shown on the Plans and compact to the satisfaction of the Engineer.

The helical anchors installed shall be field tension tested to the design pull-out load under the supervision of the Engineer to confirm tension load performance.

650-3.3 ROCK ANCHOR TIE-DOWNS. Rock anchors shall be anchored in sound bedrock at sufficient penetration to develop the minimum pull-out strength according to the manufacturer's instructions.

650-3.4 TEMPORARY TIE-DOWNS. Temporary tie-downs shall be produced that can be located to provide tie downs for aircraft displaced by the Contractor's operations. Tie-downs shall not require any permanent modifications to existing facilities or pavements and shall be re-locatable using readily available equipment. Initial placement and subsequent relocations of tie-downs shall be accomplished at the direction of the Engineer at no additional cost to the State.

650-3.5 MANUFACTURER'S CERTIFICATION AND ACCEPTANCE TESTING. For anchors where minimum tensile breaking strength or working load capacity is specified, provide manufacturer's certification that requirements are met. For anchors where minimum field pull-out capacities are specified, provide an Engineer approved testing apparatus that can apply and measure the required minimum field pull-out capacity. Field test each anchor and certify each test by recording the date of the test, the force applied, and the person completing the test. Tabulate this data and deliver to the Engineer within 24 hours of completing the tests.

METHOD OF MEASUREMENT

650-4.1 By each set, consisting of 3 anchors, completed and accepted in final position.

BASIS OF PAYMENT

650-5.1 At the contract price, per set, for each of the pay items shown in the bid schedule.

Payment will be made under:

Item P650.010.0000	Aircraft Tie-down – per each
Item P650.020.0000	Soil Anchor Tie-down – per set
Item P650.030.0000	Rock Anchor Tie-down – per set
Item P650.040.0000	Temporary Tie-down – per each

ITEM P-655 AIRCRAFT RELOCATION

DESCRIPTION

655-1.1 Move parked aircraft from the work area to a temporary parking area while work is in progress. Move the aircraft back to the parking apron following construction. Notify aircraft owners before moving aircraft to give them the opportunity to relocate their aircraft. If there is no response, accomplish the relocation.

REQUIREMENTS

655-2.1 NOTIFICATION. Notify the Engineer and Airport Manager a minimum of 14 calendar days prior to the requirement to remove aircraft from the area of apron to be reconstructed. You will be provided with each aircraft owners name, most current address, and telephone number. Make a minimum of three attempts on different days beginning a minimum of 10 days prior to the planned apron reconstruction start date. Document by phone log or other approved method your attempts to contact the owner. Repeat this process when work in an area is complete and ready to be reoccupied by aircraft.

Allow a minimum of 7 calendar days for aircraft owners to relocate their aircraft.

At the direction of the Engineer, relocate any aircraft that remain following the 7 day period allowed for owners to move their aircraft.

655-2.2 QUALIFIED PERSONNEL. Accomplish relocation of aircraft under the direct supervision of an aircraft maintenance technician in possession of a current A&P or AI license issued by the FAA.

655-2.3 TIE-DOWN MATERIAL. Tie aircraft down either in the temporary tie-down area or in a vacant tie-down space as directed by the Engineer. Secure each aircraft at 3 points; at each wing and the tail using 3 lengths of suitable 1/2-inch nylon rope. Tie-down rope used to tie down the aircraft at its original position may be used if, in the aircraft technician's opinion, it is suitable for the purpose. If the existing tie-down ropes are not used, return these ropes to the owner and tie aircraft down with the new rope.

METHOD OF MEASUREMENT

655-4.1 For each aircraft relocated measured one way from permanently assigned tie-down to temporary tie-down or from temporary tie-down to permanently assigned tie-down.

BASIS OF PAYMENT

655-5.1 Payment for Aircraft Relocation will be full compensation for moving the aircraft to or from the temporary parking area including new tie-down ropes and for all labor, material and equipment needed to complete the item.

Payment will be made under:

Item P655.010.0000 Aircraft Relocation – per each

ITEM P-660 RETROREFLECTIVE MARKERS AND CONES

DESCRIPTION

660-1.1 Furnish and install airport retroreflective markers and traffic cones in accordance with the plans, the safety plan, and the specifications at the locations indicated on the plans or as directed by the Engineer. Assemble and install markers using all materials and incidentals necessary to place completed markers into operation to the satisfaction of the Engineer. Remove existing reflective marker cones and threshold markers for salvage and offer to the owner for possession.

MATERIALS

660-2.1 MARKERS.

- a. **Type I Marker.** Semi-flush centerline marker conforming to FAA AC 150/5345-39x, "Specification for L-853. Runway and Taxiway Lighting Retroreflective Markers" and certified under AC 150/5345-53 *Airport Lighting Equipment Certification Program*.
- b. **Type II Marker.** Elevated marker for edge marking conforming to FAA AC 150/5345-39x, "Specification for L-853. Runway and Taxiway Lighting Retroreflective Markers" and certified under AC 150/5345-53 *Airport Lighting Equipment Certification Program*. Provide flexible or frangible markers in accordance with the height, marker colors, and retro-reflective colors shown on the plans. If not called on the plans, provide a finished marker height that is 30 inches above finish grade, marker color orange, and retroreflective colors as required by AC 150/5345-39x. If frangible markers are supplied, ensure that the mounting system and tether are certified. When retro-reflective sheeting is used, provide manufacturer applied sheeting.
- c. **Cone, 18-Inch.** Reflective traffic cone, 18 inches in height, orange color. Fit each cone with retro-reflective sheeting to the height specified on the plans. When no height dimension is specified, fit with a 7-inch wide band of retro-reflective sheeting centered on the cone. Use pressure sensitive, flexible, high intensity retroreflective sheeting, conforming to ASTM D4956, Type III. Provide the appropriate sheeting color(s) as indicated on the plans or if none is indicated supply with white colored band. Provide each cone with an anchoring tether of weather and corrosion resistant material capable of securing the assembly to prevent foreign object debris (FOD) hazard to aircraft similar to the tether required for Type II Markers that are frangible.

CONSTRUCTION REQUIREMENTS

660-3.1 Install markers and/or cones at the locations shown on the plans, called for in the specifications or as directed by the Engineer. Stabilize Type II Markers by using the manufacturer's recommended methods of driving the supporting posts into the ground or providing a certified mounting system. If frangible Type II Markers or cones are provided, secure the tether to a hard point in accordance with AC 150/5345-39x per the manufacturer's recommendations.

Remove existing reflective markers and threshold marking panels as shown on the plans or as directed for salvage and offer to the owner for possession. Markers not claimed by the owner become the property of the Contractor to be disposed of in a manner approved by the Engineer.

METHOD OF MEASUREMENT

660-4.1 The method of measurement will be by the number of markers or cones furnished and installed of the specified type, at locations approved by the Engineer.

Removal and salvaging of existing markers and panels will be subsidiary to the installation of reflective markers and/or cones and will not be measured for payment.

BASIS OF PAYMENT

660-5.1 Payment will be made at the contract unit price for each furnished and accepted item. This price will be full compensation for furnishing all materials, for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item P660.010.0000	Reflective Marker, Type I – per each
Item P660.020.0000	Reflective Marker, Type I – per lump sum
Item P660.030.0000	Reflective Marker, Type II – per each
Item P660.040.0000	Reflective Marker, Type II – per lump sum

ITEM P-661 STANDARD SIGNS

DESCRIPTION

661-1.1 Furnish and install standard signs. The location and type of installation will be as shown on the plans or as designated.

MATERIALS

661-2.1 Use materials that conform to the following:

- a. **Sheet Aluminum.** Use alloy 6061-T6, 5052-H36, 5052-H38, or recycled aluminum meeting alloy 3105, as specified in ASTM B 209. Meet the thickness of aluminum sheet designated on the plans. Verify alloy and temper designations by mill certification.

Treat the aluminum base metal sheets with coating for aluminum to meet ASTM B921, Class 2. Handle the cleaned and coated base metal only by a mechanical device or by operators wearing clean cotton or rubber gloves. After cleaning and coating operations, protect the panels at all times from contact or exposure to greases, oils, dust or other contaminants.

Make each sign panel a continuous sheet for all lengths 72 inches or less in the horizontal direction. Use no more than one vertical splice for signs up to 144 inches in length and 48 inches or less in height.

Meet the panel dimensions specified with a tolerance of 1/16-inch. Furnish metal panels that are cut to size and shape and free of buckles, warp, dents, cockles, burrs and any other defects resulting from fabrication. Complete all possible fabrication, including shearing, cutting and punching of holes prior to the base metal preparation.

- b. **Reflective Sheeting.** Meet ASTM D4956, for the type specified.
- c. **Sign Posts.** Use the type and size of posts designated on the plans.

(1) Perforated Steel Posts.

Fabricate posts from 0.105-inch thick cold-rolled carbon steel sheets, commercial quality, to meet ASTM A 653 and ASTM A 924. Zinc coat, both sides, to meet coating designation G90. Form posts into a steel tube, roll to size, and weld in the corner.

Perforate all members for their entire length with 7/16-inch diameter holes on 1-inch centers.

Furnish members that are straight and with a smooth, uniform finish, with no splices.

Ensure that all perforations and cut off ends are free from burrs.

Ensure that consecutive sizes will telescope freely with a minimum of play.

- d. **Sign Fabrication.** Use Type IV reflective sheeting (for lettering, symbols, borders, and background) on sheet aluminum panels.
- e. **Sign Posts and Bases.** Use sign posts and bases of the types specified. The structural aspects of design and materials for sign supports must comply with the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*. Do not splice sign posts.

Use commercial grade concrete for sign foundations with a minimum 28-day compressive strength of 2,500 psi or an approved, pre-mixed, sacked concrete.

CONSTRUCTION REQUIREMENTS

661-3.1 Attach sign panels to posts using the types and sizes of fastening hardware shown on the plans.

All materials and finished signs are subject to inspection and acceptance in place.

- a. Surfaces exposed to weathering must be free of defects in the coating that impair serviceability or detract from general appearance or color match.
- b. Finished signs must be clean and have no chatter marks, burrs, sharp edges, loose rivets, delaminated reflective sheeting, or aluminum marks. Do not make repairs to the face sheet.

Install breakaway assemblies according to the manufacturer's written instructions.

Remove and replace all foundations requiring more than three shims to plumb a post without extra compensation.

Construct the top of any foundation located on a slope so that the finished slope passes through the top center of the foundation. Grade the area 24 inches up and down slope of the foundation edge so that no portion of the foundation projects above the surrounding slope and water will drain away from the foundation.

Attach a label to the back of all standard signs in the lower right corner. Make the label at least 15 square inches and show the year the sign was purchased from the manufacturer. Show the last two digits of the year in clear and bold numbers. Make the label from Type I or brighter reflective sheeting. Use background and legend colors meeting Table 661-1.

Table 661-1

DECAL COLORS

YEAR	BACKGROUND COLOR	LEGEND COLOR
XXX1	Yellow	Black
XXX2	Red	White
XXX3	Blue	White
XXX4	Green	White
XXX5	Brown	White
XXX6	Orange	Black
XXX7	Black	White
XXX8	White	Black
XXX9	Purple	White
XXX0	Strong Yellow-Green	Black

Central values and tolerance limits for each color, as referenced in the MUTCD, are available from the Federal Highway Administration, (HHS-30), 400 7th St. SW, Washington, D.C. 20590

661-3.2 SIGN PLACEMENT AND INSTALLATION. Sign locations are approximate and subject to field adjustment by the Engineer.

Do not allow the top of the embedded steel tube to extend more than 2 inches above the surrounding ground and concrete foundation.

On all signs, install 2-inch diameter wind washers, colored to match the sign face, between the fastener head and the sign. Use rust-resistant washers fabricated from a material equal in strength to the sign blank.

METHOD OF MEASUREMENT

661-4.1 By the total area of legend-bearing sign panel erected in place. No deductions in quantity for corner rounding will be made. Nominal dimensions for sign sizes indicated on the plans will be used to calculate sign pay quantities. Octagons and round signs will be measured as rectangles.

BASIS OF PAYMENT

661-5.1 Payment will be made at the contract price per unit of measurement. Sign posts, bases, mounting hardware, and concrete used for sign bases are subsidiary.

Payment will be made under:

Item P661.010.0000	Standard Sign – per square foot
Item P661.020.0000	Standard Sign – per each
Item P661.030.0000	Standard Signs – per lump sum
Item P661.040.0000	Relocate Standard Sign – per each

ITEM P-670 HAZARDOUS AREA BARRIERS

DESCRIPTION

670-1.1 Provide barriers for use on the project under subsection 70-09, Barricades, Warning Signs and Hazard Markings. Provide each barrier complete with flasher unit and flag in accordance with the dimensions, design, and details shown on the Plans. Haul and place barriers as shown on the Plans or as directed by the Engineer. Relocate barriers as conditions warrant.

When used during periods of darkness, such barricades, warning signs and hazard markings shall be suitably illuminated. Barricades shall be spaced not more than 25 feet apart.

Provide additional flasher units and flags, when specified, for use on Department-supplied barriers.

MATERIALS

670-2.1 Use materials that conform to the following:

- a. **Hazard Marker Barrier, Timber.** Provide construction-grade Douglas Fir-Larch with nominal dimensions of 12 inches by 12 inches and a length of 8 feet. All timber that is exposed to weather, water, or soil shall be pressure treated to the current edition of the AWPA Standards, or AASHTO M 133, using preservatives registered with the US Environmental Protection Agency. Products shall be treated according AWPA Standard U1, Use Category System. Use either oil base or latex exterior paint in colors international orange and white.
- b. **Hazard Marker Barrier, Plastic.** Provide 10-inch by 10-inch by 8-foot nominal dimension portable water-ballast barriers made from high impact, safety orange and white, UV-resistant, high density polyethylene (HDPE) plastic. Provide barriers with pre-molded flag staff and flasher bracket attachment holes. Provide barriers that are designed as a modular system to allow assembly/disassembly and nesting for compact storage, and to permit the option of physically bolting multiple barriers together to provide a continuous barrier wall. Provide 6-inch by 72-inch reflective striping panel for attachment to one side of each barrier.

670-2.2 FLAG. Provide heavy vinyl coated nylon, 18-inch by 18-inch flag with an integral diagonal metal or plastic stay to make the flag self-supporting. Provide flag in color fluorescent orange and mounted on a 3/4-inch by 30-inch staff.

670-2.3 FLASHER UNIT. Provide battery-operated omnidirectional flashing red light. Provide flasher unit with mounting bracket designed for the appropriate barrier type.

- a. **Flasher Unit for Timber Barrier.** Meet Manual on Uniform Traffic Control Devices (MUTCD) requirements for Type A Warning Lights. Supply one set of non-standard tools, such as the on/off switch or battery access tool, for each 5 flasher units furnished.
- b. **Flasher Unit for Plastic Barrier.**

Composition	High impact, polycarbonate plastic lens and base
Flashing Rate	60 flashes per minute
Brightness	6000 mcd
LED	Total of 3 red
Photo Cell	Allows for solar light to automatically shut off in higher level light conditions and turn on in lower light conditions

CONSTRUCTION REQUIREMENTS

670-3.1 GENERAL. On the top side and at opposite ends of each barrier, mount one flag and one flasher unit per manufacturer's instructions. Tether flag to the barrier.

a. Hazard Marker Barrier, Timber.

- (1) Preparation.** Prior to painting, notch the underside of each timber to allow for the use of a forklift. Cut two 4-inch high by 12-inch wide notches spaced 36 inches center to center, centered on the long axis of the timber.
- (2) Painting.** Apply one coat of primer and one coat of finish white color paint on all sides and the ends followed by two coats of orange finish paint to form the stripes on the sides. Paint orange stripes 24 inches wide and offset by 6 inches from one side to the next giving a "barber pole" effect.
- (3) Flag and Flasher Unit.** Mount the flag 24 inches from one end of the timber by drilling a hole 1/8-inch larger than the diameter of the staff by 8 inches deep. Mount the flasher unit 24 inches from the opposite end of the timber.

b. Hazard Marker Barrier, Plastic. Fill barriers with water for ballast in accordance with manufacturer's recommendations. When shown on the plans or directed by the Engineer, interlock barrier units using manufacturer recommended connectors to form a continuous wall separating the hazardous work area from aircraft movement areas. Adhere reflective striping panels to one side of each barrier.

670-3.2 DELIVERY. Deliver hazard marker barriers, flasher units, and flags to the project site prior to commencing work within the Air Operations Area.

METHOD OF MEASUREMENT

670-4.1 Hazard marker barriers, complete with flag and flasher unit will be measured by the number of units furnished and accepted.

Flasher units and flags to be used on Department-supplied barriers will be measured by the number of units furnished and accepted.

BASIS OF PAYMENT

670-5.1 Payment covers all costs associated with furnishing and storing hazard marker barriers, flasher units, and flags, including tools, batteries, and incidentals.

Work required for placing, erecting, moving, and maintaining barriers is subsidiary.

Payment will be made under:

Item P670.010.0000	Hazard Marker Barrier, Plastic – per each
Item P670.020.0000	Hazard Marker Barrier, Timber – per each
Item P670.030.0000	Flasher Unit for Plastic Barrier – per each
Item P670.040.0000	Flasher Unit for Timber Barrier – per each

ITEM P-671 RUNWAY AND TAXIWAY CLOSURE MARKERS

DESCRIPTION

671-1.1 Furnish, install, and maintain runway and/or taxiway closure markers at the locations shown on the Plans or as directed by the Engineer. Where a new runway is built to replace an existing runway, install runway closure markers on the old runway immediately after the new runway has been opened for operations. Place markers as shown on the Plans or as directed by the Engineer. Relocate markers as required. Materials supplied under this item may be used as temporary closure markers as required in GCP Subsection 80-04.

MATERIALS

671-2.1 Use materials that conform to the following.

a. Vinyl Mesh Panel.

- (1) Panel Material.** High tenacity vinyl coated polyester mesh fabric, 9 ounces per square yard (oz/yd²), 70% closed mesh allowing water to flow through. Use 3.0 oz/yd² woven polyester fabric, coated after weaving with 6.0 oz/yd² coating of poly vinyl chloride, color traffic yellow. Minimum tensile strength 230 by 200 pounds (lbs) grab method and 200 by 140 lbs strip method. Meet ASTM D 471 for water absorption, 7 days @160°F, 5.0% maximum weight gain and ASTM D 750 for weathering, 2,500 hours, no appreciable change in color, no cracking, minimum crazing.
- (2) Seams, Perimeter Hem, and Thread.** Double flat felled seams, double stitched, and 3-ply perimeter hem sewn with UV resistant #92 bonded polyester thread.
- (3) Grommets.** No. 2 brass rolled-rim spur grommets installed through hem at 30-inch intervals along marker perimeter.
- (4) Anchors.** 3/8-inch diameter deformed reinforcing steel at least 18 inches long, including a hook formed as a 4-inch segment bent perpendicular to the anchor stem.

b. Snow Fence Panel.

- (1) Panel Material.** Wire-supported wood lathe snow fence, pre-treated with a suitable wood stain.
- (2) Paint Type:** (select one)
 - (a)** AASHTO M248, Type F (Alkyd resin)
 - (b)** FSS TT-P-19D(1) Paint Latex (Acrylic emulsion, Exterior).
- (3) Paint Color:** Traffic Yellow, #33538
- (4) Anchors:** 3/8-inch diameter deformed reinforcing steel at least 18 inches long, including a hook formed as a 4-inch segment bent perpendicular to the anchor stem.

c. Temporary Illuminated Panel.

- (1)** Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program (ALECP). The AC 150/5345-53, the latest certified equipment list, and the address list of certified airport lighting equipment manufacturers are available on the FAA webpage at: https://www.faa.gov/airports/engineering/airport_lighting/.

CONSTRUCTION REQUIREMENTS

671-3.1 Meet the following requirements.

- a. **Vinyl Mesh Panel.** Secure by driving anchors into the embankment through all grommets.
- b. **Snow Fence Panel.** Apply to the upper side of the panels, two coats of paint that result in a dense and consistent color. Construct panels double layered, with upper layer wood lathe oriented to lower lathe at right angles to provide a solid yellow appearance.

Combine standard manufactured widths to provide plan dimensions, if necessary.

Secure panels by driving anchors into the embankment at 30-inch intervals around the perimeter of each panel. If more than one standard manufactured width is combined to obtain plan dimensions, provide anchors on each strip.

- c. **Temporary Illuminate Panel.** Locate the marker where shown on the plans or as directed by the Engineer. The contractor shall maintain an uninterrupted operation of the closure marker. Maintenance records shall be kept by the Contractor for all portable lighted markers and will be turned in to the Engineer when construction is complete.

METHOD OF MEASUREMENT

671-4.1 By the number of markers of the specified type, installed and accepted as completed units in place. No additional measurement will be made for removing and relocating markers for various stages of work.

BASIS OF PAYMENT

671-5.1 Payment will be made at the contract unit price for each furnished and accepted item of the marker type specified.

Payment will be made under:

Item P671.010.0000	Runway Closure Marker, Vinyl Mesh – per each
Item P671.020.0000	Runway Closure Marker, Illuminated – per each
Item P671.030.0000	Runway Closure Marker, Runway Designator Cover – per each
Item P671.040.0000	Taxiway Closure Marker, Vinyl – per each

TESTING REQUIREMENTS

ASTM D 471	Rubber Property – Effect of Liquids
ASTM D 750	Rubber Deterioration in Carbon-Arc Weathering Apparatus

ITEM P-675 GUARDRAIL

DESCRIPTION

675-1.1 Construct new guardrail, terminal sections, and guardrail/bridge rail connections of the kind and type specified. Remove and reconstruct or remove and dispose of existing guardrail, terminal sections, and transition rail.

MATERIALS

675-2.1 CONCRETE. Provide commercial grade concrete with a minimum 28-day compressive strength of 3,000 psi.

675-2.2 WIRE CABLE. Provide guardrail cable anchor assembly conforming to TF13 Guide to Standardized Roadside Hardware, designator FCA01, with the cable meeting AASHTO M 30, Type II, Class A.

675-2.3 METAL BEAM RAIL.

a. W-Beam and Thrie Beam Guardrail. Meet AASHTO M 180, Class A, Type II.

b. Box-Beam Guardrail. Meet:

(1) ASTM A500 Grade B, or

(2) ASTM A501.

Galvanize the rail per AASHTO M 111 after fabrication.

675-2.4 POSTS AND BLOCKOUTS. Furnish posts and blockouts, as specified, meeting the following requirements.

a. **Wood Posts and Blockouts.** Use timber with a stress grade of 1200 psi or more. Testing must meet the standards of the West Coast Lumber Inspection Bureau. Use timber for posts and blockouts that is either rough sawn (unplaned) or S4S with nominal dimensions indicated. Allowable size tolerance of rough sawn blockouts in the direction of the bolt holes is $\pm 1/4$ -inch. Only one combination of post and blockout finish may be used for any one continuous length of guardrail.

Treat all timber using the preservatives and treatment processes of AASHTO M 133 and *Best Management Practices for the Use of Treated Wood in Aquatic Environments* (BMPs), published by the Western Wood Preservers Institute, 12503 SE Mill Plain Blvd, #205, Vancouver, WA 98684 (Phone:360-693-9958). Products shall be treated according AWPA Standard U1, Commodity Specification A: Sawn Products for soil and freshwater applications meeting Use Category 4B.

b. **Steel Posts and Blockouts.** Meet the section and length specified or shown on the Plans. Use copper bearing steel when so specified. Use steel meeting the requirements of ASTM A36 and galvanized per ASTM A123.

c. **Synthetic Blockouts.** Products made from alternate materials may be used if accepted by the FHWA for use on the National Highway System.

675-2.5 HARDWARE. Meet AASHTO M 180. Galvanize after fabrication fittings, bolts, washers, and accessories meeting AASHTO M 111 or AASHTO M 232, whichever applies.

675-2.6 GUARDRAIL TERMINALS. W-beam shall meet requirements of AASHTO M 180, Class A, Type II. Galvanize after fabrication.

Components made from rolled pressed and forged shapes, castings, plates, bars, and strips shall meet the coating requirements of AASHTO M 111. Galvanize after fabrication.

All hardware or fasteners supplied shall meet the coating requirements of AASHTO M 232.

Provide one of the following terminal types, as shown on the plans, for single-rail W-beam guardrail. Design requirements: 31-inch top of rail height, 8-inch blockouts, W6 x 8.5 steel posts, 12ft-6in w-beam panels, and mid-span splice connection to run of rail.

a. Parallel Terminal.

(1) Provide terminals meeting the following:

(a) Crashworthiness: MASH-compliant Test Level 3 terminals

(b) Length: 50 feet nominal effective length.

(c) End Offset: 0 to 2 feet (25:1 or flatter straight taper). Offset end as shown on the plans.

b. Buried in Backslope Terminal. Provide MASH-compliant Test Level 3 terminals.

675-2.7 GUARDRAIL CONNECTION PLATE. Meet the requirements of ASTM A709, Grade 36 or Grade 50.

675-2.8 HIGH STRENGTH BOLTS, NUTS AND WASHERS. Meet the requirements of ASTM F3125, Grade A325; ASTM A563; and ASTM F436.

675-2.9 TERMINAL MARKERS, POST-MOUNTED DELINEATORS, AND SIDE-MOUNTED GUARDRAIL REFLECTORS.

Terminal Marker. Single piece marker, meeting the following requirements: Durable fiberglass composite or plastic material meeting the dimensions and colors shown on the Plans. Resistant to ultraviolet light, ozone and hydrocarbon damage and remain flexible at a temperature of minus 40 °F. Provide posts with reflectors that are capable of self-erecting and remaining serviceable after 5 head-on impacts at 55 mph and 10 impacts at 35 mph with an automobile at an air temperature of plus 40 °F.

Post-mounted flexible delineators. Single piece marker, meeting the requirements for Terminal Marker, above.

Furnish terminal markers, color as shown on the plans, nominally 0.125 by 3.75 inches by 66 inches long or as shown on the plans, with a 3-inch by 12-inch retroreflective sheeting matching the color of the adjacent lane line, or as shown on the plans.

Furnish post-mounted flexible delineators with retroreflective sheeting, color and dimensions as shown on the plans.

Fabricate side-mounted guardrail reflector assembly brackets from aluminum alloy.

Retroreflective sheeting for terminal markers, post-mounted flexible delineators, and side-mounted guardrail reflectors shall meet ASTM D4956 requirements for Type IX, or XI.

CONSTRUCTION REQUIREMENTS

675-3.1 GENERAL. Install guardrail and terminals at the locations shown on the Plans. Conform with the Alaska Standard Plans and these Specifications.

At locations where public traffic is adjacent to guardrail work, have all materials on site, including crashworthy terminals, that are required to completely install a segment of guardrail before beginning work on the segment.

Start guardrail installation at the "upstream" end (the end adjacent traffic will encounter first) by either installing a crashworthy terminal or connecting to an existing barrier. Continue installation in the direction of traffic. Exception: if the guardrail run will connect to existing barrier, buried in the backslope, or guardrail, existing or new bridge railing, or other existing structure at the "downstream" end, guardrail installation may be started at the point of connection.

Do not leave posts installed for guardrail within the clear zone for more than 48 hours before installing the rail. At the end of each work shift, install drums or Type II barricades with flashing warning lights to delineate incomplete sections of guardrail and terminal sections.

If guardrail runs are not completed within 10 calendar days after beginning installation, install temporary crash cushions meeting NCHRP 350 or MASH Test Level 3 at all non-crashworthy guardrail ends within the clear zone. Apply Traffic Price Adjustment if the Contractor does not comply with the crash cushion requirement.

Where necessary, adjust the height of existing guardrail to provide a smooth transition to new guardrail. Use 25 linear feet of guardrail or two 12'-6" pieces of guardrail to transition to match the existing or new guardrail elements and/or end treatments.

After shaping the slopes and staking proposed guardrail terminal section locations, request the Engineer to field verify their locations. Receive approval of the staked locations before installing terminal sections.

Treat field cuts to timber posts and blockouts according to AWPA standard M 4.

Install blockouts according to manufacturer's recommendations and as shown on the plans.

Install side-mounted guardrail reflectors and post-mounted flexible delineators as follows:

- a. At intervals noted on the plans or Alaska Standard Plans, starting with the first [mid-span hole](#) beyond terminal sections
- b. With the retroreflective sheeting facing approaching traffic
- c. With retroreflective sheeting on both sides, on two-way roadways
- d. Not on the terminal sections, except as shown on the plans.

Attach terminal markers, in a vertical position, to the P.T. post of Short Radius Guardrail sections and to the post where the flare begins for parallel guardrail terminals. Coordinate terminal marker locations with the Engineer.

At the end of each work shift, install drums or Type II barricades with flashing warning lights to delineate incomplete sections of guardrail and terminal sections.

675-3.2 POSTS. Set posts to accommodate the line, grade, and curvature shown on the Plans.

- a. **Selection of Post Materials.** Use either wood or steel posts when allowed by the type of guardrail specified, subject to the following:
 - (1) Use one type of post material on the project unless extending an existing run of guardrail.
 - (2) Match existing post material to extend an existing run of guardrail.
- b. **Setting Posts.** Set posts as follows:
 - (1) Set posts plumb, in the location and to the depth shown on the Plans or Alaska Standard Plans.
 - (2) Choose an installation method that does not damage the post, adjacent pavement, structures, utility conduits, and final slopes. Repair all damage to the satisfaction of the Engineer or replace the damaged item, as per subsection 50-11

- (3) Set wood or steel posts in dug, drilled, or pre-punched holes. Steel posts may also be set by ramming or driving if:
 - (a) the underlying material is no larger than 6-inch; and
 - (b) the posts are not damaged during installation.
- (4) For placement in solid rock or in broken rock embankment greater than 6-inch, set wood or steel posts in pre-dug, pre-drilled or pre-punched holes.
- (5) Backfill and compact around posts with material as specified in the typical section, to firmly support the post laterally and vertically. Compact under and around posts to the Engineer's satisfaction.

675-3.3 BEAM RAIL. Fabricate metal work in the fabricator's shop. Bend curved guardrail elements with radii less than or equal to 100 feet in the fabricator's shop or with an approved bending apparatus.

Receive approval before field punching, cutting, or welding. Repair damaged spelter coat areas on galvanized rail elements according to AASHTO M 36.

Lap rail elements so that the exposed ends face away from approaching traffic in the adjacent lane.

Use bolts long enough to extend at least 1/4-inch beyond the nuts. Except where required for adjustments, do not extend bolts more than 1-inch beyond the nuts.

Locate bolts at expansion joints at the center of the slotted holes.

Tighten bolts at expansion joints to snug-tight. Make all other bolts fully-tight.

675-3.4 CABLE RAIL. Install cable guardrail according to the Plans and Specifications. Install at the locations shown on the Plans.

675-3.5 TERMINAL SECTIONS.

- a. Parallel Terminals. Install terminal sections according to the manufacturer's recommendations for the entire length of the terminal then, if required, transition rail height over 25 feet to match guardrail height and splice location. Install where shown on the Plans.

Follow Item P-152 for excavation and embankment requirements.

Install ASTM D4956 Type III, IV, or V retroreflective sheeting on the end section of parallel terminals consisting of yellow and black bards sloping 45 degrees downward toward the traffic side of the terminal according to guidance for Object Markers Adjacent to the Roadway in Chapter 2C of the Alaska Traffic Manual.

- b. Buried-in-Backslope Terminals. Install buried-in-backslope terminals where shown on the plans. If required, transition rail height over 25' to match height and splice location.

Attach terminal markers, in a vertical position, to the first post of each parallel guardrail terminal, and to the post where the flare begins for parallel terminals and buried-in-backslope terminals. Orient terminal markers to face traffic approaching in the near lane. Coordinate terminal marker locations with the Engineer.

675-3.6 REMOVAL AND RECONSTRUCTION OF GUARDRAIL. Remove and reconstruct guardrail as specified. Replace lost or damaged materials without extra compensation.

675-3.7 REMOVAL AND DISPOSAL OF GUARDRAIL. Remove the existing guardrail shown on the Plans, including the rail, cable elements, terminal sections, hardware, posts, concrete bases, and steel tubes.

Backfill resulting holes with material in 6-inch layers that is similar to the existing embankment and compact to the same approximate density. Removed items become your property.

675-3.8 ADJUST EXISTING GUARDRAIL. When called for on the Plans, reset existing guardrail to the height shown on the applicable Alaska Standard Plan, measured from the top of the rail to the finished shoulder surface below the rail. Raise and lower the posts several times to prevent settlement and then re-drive them to the height shown on the Plans. Use other methods if approved.

675-3.9 INSTALL NEW GUARDRAIL. Install guardrail as shown on the applicable Alaska Standard Plans, measured from the top of the rail to the finished shoulder surface below the rail.

Install MASH Test Level 3-compliant W31 guardrail as shown on the plans. Install new guardrail in conformance with tolerances shown on the plans.

METHOD OF MEASUREMENT

675-4.1 GUARDRAIL. See Section 90 and as follows:

- a. Guardrail. Measured along the face of the rail or cable, from the center of the end posts.
- b. Short Radius Guardrail. Per each, installed in place.

When the guardrail is connected to a terminal section, the pay limit for the rail ends where the specified terminal section begins.

675-4.2 TERMINALS. Per each, installed in place.

675-4.3 TRANSITION RAIL (BRIDGE RAIL TRANSITION). Per each accepted connection.

BASIS OF PAYMENT

Payment for temporary crash cushions installed to protect motorists from guardrail installations that have not been completed within 10 calendar days of beginning installation is subsidiary to other items.

675-5.1 GUARDRAIL.

- a. **Guardrail.** At the contract unit price per linear foot. Side-mounted guardrail reflectors, post-mounted flexible delineators, terminal markers, guardrail beam, posts, blockouts, and associated hardware are subsidiary. Installation of downstream anchors, transitions for rail height or splice location, long span guardrail sections, and guardrail stiffening sections are subsidiary to guardrail installation.
- b. **Short Radius Guardrail.** The contract price includes all materials from the terminal anchor to and including the first wood or steel post of standard guardrail or guardrail end terminal, and including the terminal anchor assembly, in-line anchor, terminal posts, CRT posts, rail elements, terminal markers, and associated hardware required for a complete installation.

675-5.2 TERMINAL SECTIONS.

- a. **Parallel Guardrail Terminal.** The contract price includes rail elements, posts, blockouts, pipe sleeves, cable assemblies, guardrail extruders, terminal markers, and all associated hardware required for a complete installation.
- b. **Buried in Backslope Guardrail Terminal.** The contract price includes rail elements, posts, blockouts, concrete, rebar, anchors, and all associated hardware required for a complete installation.

675-5.3 TRANSITION RAIL. The contract price includes all brackets, beam sections, transition pieces, and all posts and associated hardware required for a complete connection of the guardrail section to a bridge rail or barrier.

All material required for embankment widening for guardrail and terminal sections is paid for under the appropriate pay items shown in the bid schedule.

Payment will be made under:

Item P675.010.0000	W-Beam Guardrail – per linear foot
Item P675.020.0000	Thrie Beam Guardrail – per linear foot
Item P675.030.0000	Box Beam Guardrail – per linear foot
Item P675.040.0000	Cable Guardrail – per linear foot

MATERIAL REQUIREMENTS

AASHTO M 30	Zinc-Coated Steel Wire Rope and Fittings for Highway Guardrail
AASHTO M 36	Zinc-Coated (Galvanized) Corrugated Iron
AASHTO M 111	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
AASHTO M 133	Preservatives and Pressure Treatment Process for Timber
AASHTO M 180	Corrugated Sheet Steel Beams for Highway Guardrail
AASHTO M 232	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A36	Structural Steel
ASTM A123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A563	Carbon and Alloy Steel Nuts
ASTM A709	Structural Steel for Bridges
ASTM A3125	High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated
ASTM D4956	Retroreflective Sheeting for Traffic Control
ASTM F436	Hardened Steel Washers

ITEM P-680 GEOTEXTILE FOR SILT FENCE

680-1. 1 DESCRIPTION. Furnish, install, maintain, and remove temporary silt fence as shown on the Plans or as directed.

MATERIALS

680-2.1 SILT FENCE. Meet AASHTO M 288 for Temporary Silt Fence.

- a. Prefabricated Silt Fence Meet the Plans and Section P-680 requirements.
- b. Attachment Devices Staples; wire; self-locking nylon, plastic, wire ties; or other approved means to attach fabric to posts.
- c. Support Mesh between Posts 14-gage welded wire fencing, metal chain-link fabric, or geosynthetic mesh with equivalent strength. Use maximum mesh spacing of 6 inches. Use height shown on the Plans, or specified in the Bid Schedule.
- d. Posts Wood 1.5-inch x 1.5-inch x 36-inch minimum, steel, or approved synthetic material.

CONSTRUCTION REQUIREMENTS

680-3.1 INSTALLATION. Install silt fence according to Plans. Use Trenchless Detail when installing silt fence over permanently frozen ground. Drill holes for support posts, if required.

When joining to another roll, place both end posts together and wrap them with silt fence by turning them one full rotation. Drive the wrapped posts.

680-3.2 MAINTENANCE. Maintain the integrity of the fence to contain sediment in runoff until final stabilization.

680-3.3 REMOVAL. After disturbed area has been accepted as permanently stabilized or when sediment protection is no longer needed, remove silt fence.

680-4.1 METHOD OF MEASUREMENT. See Section 90. Measure silt fence by the length of fence installed. No allowance will be made for overlap, whether at joints or patches.

680-5.1 BASIS OF PAYMENT. The contract price includes installation, maintenance, removal and disposal of the silt fence.

Payment will be made under:

Item P680.010.0000 Silt Fence – per linear foot

ITEM P-681 GEOTEXTILE FOR SEPARATION AND STABILIZATION

681-1. 1 DESCRIPTION. Prepare ground surface, and furnish and place geotextiles for separation, stabilization, and/or reinforcement as shown on the Plans.

681-2.1 MATERIALS. Use materials that conform to the following:

1. **Separation.** Meet AASHTO M 288 for Separation, except provide a minimum permittivity of 0.50 sec^{-1} , and meet Class 3 Strength Property Requirements.
2. **Stabilization.** Meet AASHTO M 288 for Stabilization, except provides a minimum permittivity of 0.50 sec^{-1} , and meet Class 1 Strength Property Requirements.
3. **Reinforcement.** Meet the requirements in Table 681-1 for Type 1 or Type 2.

Package, label, handle and store geotextile materials according to ASTM D 4873.

**TABLE 681-1
GEOTEXTILE REINFORCEMENT PROPERTIES**

Property	Test Method	Units	Requirement ^a	
			Type 1	Type 2
Grab Tensile	ASTM D4632	lb.	200/200	400/400
Grab Elongation	ASTM D4632	% (MD)	10	10
Wide Width Tensile	ASTM D4595	lb/in. (ultimate)	200/200	400/400
Wide Width Tensile	ASTM D4595	lb/in. (@ 5% strain)	100/100	200/200
Seam Breaking Strength	ASTM D4632	lb./in.	180	360
Puncture	ASTM D6241	lb.	500	1500
Trapezoidal Tear	ASTM D4533	lb.	100	150
AOS	ASTM D4751	U.S. sieve size	#30 ^b	#30 ^b
Permittivity	ASTM D4491	sec^{-1}	0.20	0.20
Flow Rate	ASTM D4491	gal./min./ft ²	10	10

^a Minimum Average Roll Values (MARV) in machine direction (MD) / cross-machine direction (XD) unless otherwise specified

^b Maximum average roll value

Sewing Thread. Use high strength polypropylene, or polyester. Do not use nylon thread. Use thread of contrasting color to that of the geotextile itself.

CONSTRUCTION REQUIREMENTS

681-3.1. SURFACE PREPARATION. Prepare ground surface by removing stumps, brush, boulders, and sharp objects. Fill holes and ruts over 3 inches deep, with material shown on the Plans or as approved by the Engineer.

681-3.2. GEOTEXTILE PLACEMENT. Unroll geotextile directly onto the prepared surface. Stretch geotextile to remove any creases, folds or wrinkles. Do not drag the geotextile through mud or over sharp objects that could damage the geotextile. Do not expose geotextiles to sunlight for longer than 14 days after removal of protective covering. Do not allow geotextiles to get wet prior to installation.

- a. **Separation and Stabilization.** Lay geotextile for embankment separation and stabilization parallel to roadway centerline. On horizontal curves, place in segment lengths not exceeding those listed in Table 681-1, with butt ends cut to match and sewn or overlapped. On tangents, straighten the geotextile and sew or overlap butt ends. Shingle overlaps in the same direction as fill placement. Prevent overlapped edges from lifting during construction.
- b. **Reinforcement.** Lay the machine direction of the geotextile for embankment reinforcement perpendicular to the roadway centerline or as shown on the Plans. Join segments by sewing or an approved bonding or attachment process. Shingle overlaps in the same direction as fill placement if seams are not sewn. Prevent overlapped edges from lifting during construction.

TABLE 681-2

GEOTEXTILE PLACEMENT ON CURVES

Degree of Curve	Maximum Segment Length (ft.)
1	125
2	90
3	75
4	65
5	55
6	50

681-3.3. JOINING. Join adjacent geotextiles for separation or stabilization by overlapping or sewing. Join adjacent geotextiles for reinforcement by sewing or as shown on the Plans.

- a. Sew seams with a Butterfly or J-Seam using a double-thread chain stitch (lock stitch). Bring adjacent sections of geotextile together and fold so that the stitching penetrates four layers of geotextile for the full seam length. Make the stitching line 1-1/4 inches ($\pm 1/4$ -inch) from the folded edge of the seam and at least 1/2-inch from the free edge of the geotextile. Sew seams so that they face upward and can be easily inspected by the Engineer. Illustrations showing correct stitch formation and seam configurations are provided in Figure 1-2 (page 1-28) of the FHWA publication, *Geosynthetic Design & Construction Guidelines*, FHWA-NHI-07-092, August 2008.
- b. Overlap geotextile sections by a minimum of 3 feet at all longitudinal and transverse joints. Place the beginning of each new roll beneath the end of the previous roll to prevent the advancing fill from lifting the geotextile. Shingle in the direction of construction.

681-3.4. MATERIAL PLACING AND SPREADING. During placing and spreading of material, maintain a minimum depth of 12 inches of cover material; or a minimum depth equal to the separation distance between multiple layers of geotextile as shown on the Plans when this separation distance is less than 12 inches; at all times between the geotextile and the wheels or tracks of the construction equipment. Limit the size and weight of construction equipment to reduce rutting in the initial lift above the geotextile to not greater than 3 inches deep to prevent overstressing the geotextile.

Spread the material in the direction of the upper overlapped geotextile. Maintain proper overlap and geotextile continuity. If sewn or bonded seams are used, place the cover material and spread in only one direction for the entire length of the geotextile. On weak subgrades limit height of dumped cover material to prevent localized subgrade and/or geotextile failure. Do not drop stones or frozen material larger than 1 foot in diameter directly onto the geotextile from a height of more than 1 foot.

Compact using a smooth drum roller. Do not allow construction equipment to make sudden stops, starts, or turns on the cover material. Do not allow turning of vehicles on the initial lift of cover material above the geotextile. Fill any ruts over 3 inches deep occurring during construction with material shown on the Plans; do not grade adjacent material into rut; and compact to the specified density.

681-3.5. GEOTEXTILE REPAIR. Repair and replace damaged geotextile (torn, punctured, or disturbed at the overlaps or sewn joints). For damage evidenced by visible geotextile damage, subgrade pumping, intrusion, or embankment distortion, remove the backfill around and under the damaged or displaced area, and repair with material matching the damaged material. Make patches overlap or sew patches to the existing geotextile..

- a. **Separation and Stabilization.** Overlay torn area with geotextile with a minimum 3 foot overlap around the edges of the torn or damaged area or sew and bond according to Subsection 681-3.3.a. Ensure the patch remains in place when cover material is placed over the affected area.
- b. **Reinforcement.** Sew according to Subsection 681-3.3.a unless joining by overlap is shown on the Plans. Ensure the patch remains in place when cover material is placed over the affected area.

681-4.1 METHOD OF MEASUREMENT. By multiplying plan neat line width by the measured length in final position parallel to installation centerline along the ground surface. No allowance will be made for overlap, whether at joints or patches.

681-5.1 BASIS OF PAYMENT. Payment will be made at the contract unit price per square yard. Material used to fill ruts and holes will be paid for under separate materials pay items.

Payment will be made under:

Item P681.010.0000	Geotextile, Separation – per square yard
Item P681.020.0000	Geotextile, Stabilization – per square yard
Item P681.030.0000	Geotextile, Stabilization – per lump sum
Item P681.040.0000	Geotextile, Reinforcement - Type 2 – per square yard

ITEM P-682 GEOTEXTILE FOR DRAINAGE AND EROSION CONTROL

682-1.1 DESCRIPTION. Prepare ground surface, and furnish and place geotextiles for subsurface drainage and erosion control, as shown on the Plans.

682-2.1 MATERIALS. Use materials that conform to the following for the class specified in the bid schedule:

- a. **Subsurface Drainage.** Meet AASHTO M 288 for Subsurface Drainage, except provide a minimum permittivity of 0.50 sec^{-1} , and meet Class 2 Strength Property Requirements.
- b. **Erosion Control.** Meet AASHTO M 288 for Permanent Erosion Control and meet Class 1 Strength Property Requirements.

Package, label, handle and store geotextile materials according to ASTM D 4873.

Sewing Thread. Use high strength polypropylene, or polyester. Do not use nylon thread. Use thread of contrasting color to that of the geotextile itself.

CONSTRUCTION REQUIREMENTS

682-3.1 SURFACE PREPARATION. Prepare ground surface by removing stumps, brush, boulders, and sharp objects. Fill holes and ruts over 3 inches deep, with material shown on the Plans or as approved by the Engineer. Construct smooth and stable trench walls.

682-3.2. GEOTEXTILE PLACEMENT. Unroll geotextile directly onto the prepared surface. Stretch geotextile to remove any creases, folds or wrinkles. Place geotextile in a manner which will ensure intimate contact between the trench wall and the geotextile (i.e., no voids, folds, or wrinkles). The geotextile may be held in place with securing pins at 3-foot spacing along all edges (but not closer than 2 inches from the edge) to prevent movement during construction. Do not expose geotextiles to sunlight for longer than 14 days after removal of protective covering. Do not allow geotextile rolls to get wet prior to installation.

- a. **Subsurface Drainage.** In trenches, after placing the geotextile and material shown on the Plans, fold the geotextile over the top of the material shown on the Plans to produce a minimum overlap of 12 inches, for trenches greater than 12 inches wide. In trenches less than 12 inches wide, make the overlap equal to the width of the trench. Then cover the geotextile with the subsequent course of material.
- b. **Erosion Control.** Place and anchor geotextile on the approved surface so it will not be torn or excessively stretched by placement of the overlying materials. Secure the geotextile to the slope but secure it loosely enough so that the geotextile will not tear when riprap or other cover material is placed on the geotextile. The geotextile shall not be keyed at the top of the slope until the riprap or other cover material is in place at the top of the slope. Anchor the terminal ends of the geotextile using key trenches or aprons with a minimum of 24 inches depth into the soil substrate at the crest and toe of slope, or as shown on the Plans. Place geotextile with the machine direction parallel to the direction of water flow (normally parallel to the slope for erosion control runoff and wave action, and parallel to the stream or channel).

682-3.3. JOINING. Join geotextile by sewing or overlapping.

- a. Sew seams with a Butterfly or J-Seam using a double thread chain stitch (lock stitch). Bring adjacent sections of geotextile together and fold so that the stitching penetrates four layers of geotextile for the full seam length. Make the stitching line 1-1/4 inches ($\pm 1/4$ -inch) from the folded edge of the seam and at least 1/2-inch from the free edge of the geotextile. Sew seams so that they can be easily inspected by the Engineer or representative. Illustrations showing correct stitch formation and seam configurations are provided in Figure 1-2 (page 1-28) of the FHWA

publication, *Geosynthetic Design & Construction Guidelines*, FHWA-NHI-07-092, August 2008. Conform both factory and field sewn seams to the strength requirements of Table 1 as outlined in the AASHTO M288 for subsurface drainage and erosion control applications.

- b. Overlap geotextile sections by a minimum of 3 feet at all longitudinal and transverse joints. Overlap successive geotextile sheets in the direction of flow so that the upstream sheet is placed over the downstream sheet and/or upslope over downslope. In trenches, where overlapped seams are constructed in the longitudinal trench direction, make the overlap equal to the width of the trench.

682-3.4. PLACEMENT OF COVER MATERIAL. Following placement of the geotextile on the prepared surface, place cover material of the type shown on the Plans. Place the cover material and armor from the bottom to the top of the slope using methods which minimize tearing and/or excessive stretching of the geotextile. In underwater applications, place the geotextile and the required thickness of cover material in the same day. Maintain proper overlap and geotextile continuity. Do not exceed the allowable drop heights for cover material shown in Table 682-1. Do not allow stones with a weight of more than 100 pounds to roll down the slope on the geotextile. Do not grade the slope in a way that will disturb the cover material or armor stone once it has been placed. Backfill all voids in the riprap or other cover material, which allows the geotextile to be visible, with material shown on the Plans, so that the geotextile is completely covered.

TABLE 682-1

ALLOWABLE DROP HEIGHT FOR GEOTEXTILE

INDIVIDUAL STONE Max. Weight (lbs)	ALLOWABLE DROP HEIGHT (ft)	
	UNPROTECTED GEOTEXTILE	PROTECTED GEOTEXTILE*
< 5	3	3
5-250	0	3
> 250	0	0**

**Protected geotextile is defined as having a gravelly covering (cushion layer) at least 6 inches thick.*

***If stones greater than 250 pounds must be dropped or if a height of drop greater than 3 feet is required, then perform field trials to determine the minimum cushion thickness and/or maximum height of safe drop without damaging the geotextile.*

Maintain a minimum depth of 12 inches of cover material between the geotextile and the wheels or tracks of the construction equipment.

682-3.5. GEOTEXTILE REPAIR. Should the geotextile be torn, punctured, or the overlaps or sewn joints disturbed – as evidenced by visible geotextile damage – remove the backfill around the damaged area and repair or replace the damaged area at no additional expense to the State. Make repairs to the damaged area with a patch of the same type of geotextile originally placed. Overlay torn area with geotextile with a minimum 3 foot overlap around the edges of the torn area. Ensure that the patch remains in place when material is placed over the affected area.

682-4.1 METHOD OF MEASUREMENT. By multiplying plan neat line width by the measured length in final position parallel to installation centerline along the ground surface. No allowance will be made for geotextile in key trenches or for overlap, whether at joints or patches.

682-5.1 BASIS OF PAYMENT. Payment will be made at the contract unit price per square yard. Material used to fill ruts and holes will be paid for under separate materials pay items at the unit price for the type of material used.

Payment will be made under:

Item P682.010.0000 Geotextile, Drainage – per square yard

Item P682.020.0000 Geotextile, Erosion Control – per square yard

ITEM P-683 PAVING FABRIC

683-1.1 DESCRIPTION. Furnish and install geotextile paving fabric where shown on the Plans.

MATERIALS

683-2.1 PAVING FABRIC. Meet AASHTO M 288 for Paving Fabric.

683-2.2 ASPHALT BINDER. Asphalt Binders shall conform to AASHTO M 320 or M332 for the specified Performance Grade noted in Table 683-1, below.

TABLE 683-1.

TABLE OF EXCEPTIONS TO PERFORMANCE-GRADED ASPHALT BINDER SPECIFICATION

Performance Grade	AASHTO Spec.	Viscosity AASHTO T 316	MSCR, AASHTO T 350			PAV, Dynamic Shear AASHTO T 315	Direct Tension AASHTO T 314	Elastic Recovery AASHTO T 301
			J _{NR3.2} kPa ⁻¹	J _{NR} Diff	% Rec _{3.2}			
PG 52-28	M320	(none)				(none)	Delete	(none)
PG 52-40	M320	(none)				(none)	Delete	(none)
PG58-28ER	M320	(none)				(none)	Delete	70% min
PG58-34ER	M320	(none)				(none)	Delete	70 % min
PG64-28ER	M320	(none)				(none)	Delete	70% min
PG52-40V	M332	(none)	0.50 max.	Delete	75 min.	(none)	Delete	(none)
PG58-34E	M332	(none)	0.25 max.	Delete	85 min.	(none)	Delete	(none)
PG64-40E	M332	1.0 PaS max.	0.10 max.	Delete	95 min.	5000 max @ 4°C	Delete	(none)

The AASHTO T 301 test shall be run on Rolling Thin Film Oven (RTFO) samples, and the water bath temperature shall be specified to be 77°F (25°C) under the APPARATUS SECTION, note 3.3 of the AASHTO T 301 procedure.

The Contractor shall furnish vendor's certificate of compliance and certified test reports for each lot of asphalt binder shipped to the project. The vendor's certified test report for the asphalt binder can be used for acceptance or tested independently by the Engineer.

The following documents shall be furnished at delivery:

- a. Manufacturer's certificate of compliance
- b. Certified test reports for the lot.
- c. Lot number, storage tanks, and shipping containers (if applicable) used.
- d. Date and time of load out for delivery.
- e. Type, grade, temperature, and quality of asphalt binder loaded.
- f. Type and percent of anti-stripping agent added.

All excess asphalt binder shall remain the property of the Contractor. Removal of excess asphalt binder from the project area shall be incidental to the contract and no separate payment will be made.

683-2.3 EMULSIFIED ASPHALT. Meet AASHTO M 140 and the following subsections. Store, mix, and apply emulsified asphalt within the temperature ranges recommended by the manufacturer or as shown in Table 683-2.

- a. **Cationic Emulsified Asphalt.** Meet AASHTO M 208.
- b. **Special Tack Emulsion, STE-1.** Meet the following, when tested using AASHTO T 59:

TESTS ON EMULSION

Viscosity @ 77 °F, SSF	30, max.
Storage Stability, 1 day, %	1, max.
Demulsibility, 35 mL 0.8% SDS, %	25, min.
Particle Charge	Positive*
Sieve Test, % Retained	0.10, max.
Distillation Oil by Vol. of Emulsion, %	5, max.
Distillation Residue by Wt. of Emulsion, %	45, min.

TESTS ON RESIDUE

Penetration @ 77 °F	100-250 (when tested under ASTM D 5)
Ductility @ 77 °F, 5 cm/min., cm	40, min. (when tested under ASTM D 113)
Solubility in TCE, %	97.5, min.

* If Particle Charge test is inconclusive, material having a max. pH value of 6.7 is acceptable.

**TABLE 683-2
STORAGE AND APPLICATION TEMPERATURES**

Type and Grade of Material	Spray °F	Mix °F	Storage °F
CSS-1	90-120	90-160*	50-125
STE-1	70-140	70-150	50-125

* Temperature of the emulsified asphalt in the pugmill mixture.

CONSTRUCTION

683-3.1. SURFACE PREPARATION. Prepare the surface on which the fabric is to be placed as follows:

- a. Remove excess asphalt material, loose aggregate, and other foreign materials from the surface.
- b. Fill all potholes and cracks wider than 1/4-inch with emulsified asphalt (CSS-1) sand slurry.

683-3.2. APPLICATION OF SEALANT. Apply asphalt sealant by distributor meeting all requirements set forth under Subsection P-603-3.2. Apply asphalt sealant (emulsified asphalt, tack coat) uniformly at 0.20 to 0.30 gallons per square yard and at a temperature shown in Table 683-2, or as recommended by the Paving Fabric manufacturer. Do not apply asphalt material on a wet surface or when the ambient air temperature is below 45 °F or when other conditions would prevent proper application.

683-3.3. FABRIC LAYDOWN EQUIPMENT. Use approved mechanical laydown equipment to place fabric.

683-3.4. FABRIC PLACEMENT. Place fabric directly on top of the asphalt sealant (emulsified asphalt, tack coat) before the sealant has cooled and lost its tackiness. Lay fabric in full rolls without wrinkles and/or folds. Place the fabric per the manufacturer's recommendations. Overlap geotextile joints to ensure full closure of the joint, but do not exceed 6 inches of overlap. Overlap transverse joints in the direction of paving. Apply 0.20 gallons per square yard of additional asphalt sealant beneath all fabric joints. Remove and replace damaged geotextiles. Removal and replacement of damaged geotextiles is subsidiary.

683-3.5. BITUMINOUS SURFACE COURSE OVERLAY. Place the bituminous surface course closely following the fabric laydown to avoid exposure of uncovered fabric overnight or to traffic or inclement weather. Do not allow the temperature of the hot-mix asphalt to exceed manufacturer's recommendations. If asphalt sealant bleeds through the fabric before the placement of the overlay, apply sand or bituminous surface course evenly over the affected area to prevent fabric pick-up by construction equipment. Prevent paver or other construction equipment from turning and/or pivoting on the fabric.

683-4.1 METHOD OF MEASUREMENT. By multiplying plan neat line width by the measured length in final position parallel to installation centerline along the ground surface. No allowance will be made for overlap, whether at joints or patches.

683-5.1 BASIS OF PAYMENT.

Item P683.010.0000 Paving Fabric – per square yard

ITEM P-684 FLOATING SILT CURTAIN

DESCRIPTION

684-1.1 Furnish, place, maintain, and remove temporary floating silt curtain as shown on the Plans for control of sediment and debris.

MATERIALS

684-2.1 GENERAL. Provide a silt curtain of commercial manufacture, with demonstrated ability to trap and hold sediment and debris.

684-2.2 SUBMITTALS AND APPROVAL. Submit for approval of the silt curtain that is proposed for use in the work. Obtain approval prior to shipment to the project site. Provide submittals that include certificates of compliance, manufacturer's printed instructions and/or shop drawings and proposed installation/removal procedures.

684-2.3 CURTAIN FABRIC. For curtains used in standing water, provide pervious geotextile meeting AASHTO M 288 for Temporary Silt Fence or impervious coated fabric such as nylon reinforced polyvinyl chloride, treated polypropylene/polyester fabric or approved equal adhering to the following:

Grab tensile strength (ASTM D4632 or equivalent)	200 lb
Maximum apparent opening size (ASTM D4751 or equivalent)	0.008 inch
UV ³ Resistance	Required
Panel Lengths	100 feet or less (for depths less than 13 feet)

684-2.4 FLOTATION. Provide Flotation consisting of rigid, closed cell expanded polystyrene, ethafoam or polyethylene floats attached to the top of the silt curtain along its entire length. Provide flotation material with protection from mechanical damage and deterioration that would cause pollution. Employ flotation that provides the curtain with a minimum of free board without gaps. Ensure that the buoyancy ratio (weight of displaced fluid to barrier weight) is greater than 3 to 1.

Provide high visibility color fabric cover for the flotation devices with a 1-inch minimum width reflective band attached on the side of the flotation covering along the entire length of the boom. Ensure that the flotation is secured to the boom to prevent shifting or slipping. Provide manufacturer installed grommets or equivalents to reinforce stress points and provide attachment points.

684-2.5 LINES AND ATTACHMENT POINTS. Provide a curtain that incorporates anchor lines, top load lines and bottom load lines, as required, that are minimum 1/2-inch diameter nylon rope. Provide a curtain with anchor lines, additional ballast, and floats that are attached to the silt curtain at reinforced attachment points provided by the manufacturer.

684-2.6 ANCHOR/BALLAST. Provide anchor and ballast chain of minimum 1/2-inch diameter galvanized steel with ballast chain sewn into a hem at the bottom of the curtain and secured to the material of the hem to prevent shifting or accidental removal.

CONSTRUCTION REQUIREMENTS

684-3.1 GENERAL. Provide a curtain high enough to extend to the bottom of the water channel plus 10 %. Weight the base of the curtain with ballast so that it will remain in continuous contact with the bottom to prevent sediment and silt migration.

Maintain the silt curtain in a basically vertical position. Allow a minimum of 6 inches free board at the top of the curtain for curtain depths less than 6.5 feet and 12 inches free board for curtain depths more than 6.5 feet at all times along its continuous length.

684-3.2 JOINING PANELS/SECTIONS. For ease of handling and transportation, individual panels/sections may be connected or sewn together in the field. Do not use heat welding methods to join panels. Join the panels in a manner that will prevent silt, sediment, debris or turbidity to migrate from the work area. If joints are sewn together, use heavy duty #350 polyester twine thread to make double row 1/4-inch maximum stitches that will not unravel if broken.

684-3.3 CONDITIONS AND TIMING FOR INSTALLATION. Install silt curtain instead of silt fence when fence free board is anticipated to be less than 1-foot or as directed by the Engineer. Install as soon as open water appears in the spring and before the embankment begins to thaw.

684-3.4 ANCHORS. Provide anchors in the size and number required to maintain the curtain in position for proper and continuous operation once deployed. Mark the vertical position of the anchors with crown buoys to warn of their hazard and facilitate easy recovery.

Attach anchor chains between the anchor line and anchor to prevent line fouling, to lower the angle of load pulling on the anchor, and to act as a shock absorber.

Employ anchor line buoys to help prevent line entanglement and stress on the boom.

Equip each anchor with a minimum of 10 feet of anchor chain.

684-3.5 MAINTENANCE. After installation, maintain the floating silt curtain in proper working order until the embankment has 70 percent vegetative cover. Maintain curtain used to control other areas of the work until sediment in suspension has settled and floating debris has been removed. Removal must be approved by the Engineer. Conduct the removal during periods of calm weather. Remove the curtain carefully to minimize the release of trapped sediment and debris. Do not drag the curtain while in contact with the water channel bottom.

Maintain the integrity of the curtain as long as it is necessary to contain sediment. Inspect daily and correct deficiencies immediately. Remove and dispose of the curtain when adequate vegetative growth insures no further erosion of the slopes.

METHOD OF MEASUREMENT

684-4.1 See Section 90. At the water line along the face of the flotation at the contract price per foot.

BASIS OF PAYMENT

684-5.1 Payment will be made as follows: 60 percent for installation. 25 percent for maintenance and repairs, prorated over the anticipated active construction period with a portion included as part of each interim payment. If the anticipated construction period changes, the remainder for maintenance will be prorated over the new period. 15 percent for removing it from the site.

Payment will be made under:

Item P684.010.0000 Floating Silt Curtain – per linear foot

ITEM P-686 FIBER ROLL

DESCRIPTION

686-1.1 Furnish, place, maintain, and remove fiber rolls as shown on the Plans or as directed.

MATERIALS

686-2.1 FIBER ROLL. Fiber Rolls shall be constructed with a pre-manufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 6 feet and 8 feet in width and between 65 feet and 95 feet in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 6 inches or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 6 feet apart along the full length of the roll and placed 6 inches from the ends of each roll. The finished roll shall be between 8 inches and 10 inches in diameter, a minimum of 20 feet in length, and shall weigh a minimum of 0.5 pound per linear foot. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 6 inches along the length of the blanket.

686-2.2 STAKES. Wood stakes shall be a minimum of 1-inch by 1-inch by 24 inches long in size. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

CONSTRUCTION REQUIREMENTS

686-3.1 Install fiber rolls before excavation or embankment construction begins.

686-3.2 INSTALLATION. Fiber rolls shall be installed as follows:

- a. Furrows shall be constructed to a depth between 2 inches and 4 inches, and to a sufficient width to hold the fiber roll. Stakes shall be installed 24 inches apart along the length of the fiber rolls and stopped at 12 inches from each end of the rolls. Stakes shall be driven to a maximum of 2 inches above, or flush with the top of the roll.
- b. Fiber rolls shall be placed 10 feet apart along the slope for slope inclination (horizontal:vertical) of 2:1 and steeper, 15 feet apart along the slope for slope inclination of 2:1 and 4:1, 20 feet apart along the slope for slope inclination between 4:1 and 10:1, and a maximum of 50 feet apart along the slope for slope inclination of 10:1 and flatter.
- c. The bedding area for the fiber roll shall be cleared of obstructions including rocks, clods, and debris greater than 1-inch in diameter before installation.
- d. Fiber rolls shall be installed approximately parallel to the slope contour.
- e. Fiber rolls shall be installed before the application of other temporary erosion control or soil stabilization materials in the same area.

686-3.3 MAINTENANCE AND REMOVAL. Fiber rolls shall be maintained to disperse concentrated water runoff and to reduce runoff velocities. Split, torn, or unraveled rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills or other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

When no longer required, as determined by the Engineer, fiber rolls shall be removed and disposed. The fiber rolls may be abandoned in place when approved in writing by the Engineer. If approved, the stakes shall be removed or pounded into the ground.

METHOD OF MEASUREMENT

686-4.1 Fiber rolls shall be measured by the linear foot measured along the centerline of the installed roll. Where fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

BASIS OF PAYMENT

686-5.1 Payment will be made at the contract unit price per linear foot for fiber roll. Payment includes full compensation for furnishing all labor, materials, tolls, equipment, and incidentals, and for doing all the work involved in stalling fiber rolls, complete in place, including furrow excavation and backfill, maintenance, and removal. Damage to fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense. If the following pay item is absent from the bid schedule, no payment will be made. All work, materials, and equipment required to complete the work will be subsidiary to pay item P641.030.0000 Temporary Erosion, Sediment and Pollution Control.

Payment will be made under:

Item P686.010.0000 Fiber Roll – per linear foot

ITEM P-687 GEOGRID FOR EMBANKMENT AND ROADWAY STABILIZATION AND REINFORCEMENT

687-1.01 DESCRIPTION. Furnish and install geogrid material as shown on the Plans.

MATERIALS

687-2.01 GEOGRID MATERIALS. Provide geogrid consisting of a regular network of connected polymer tensile elements with aperture geometry sufficient to provide significant mechanical interlock with the surrounding material. Provide dimensionally stable geogrid that is able to retain its geometry during construction. Provide geogrid structure that resists ultraviolet degradation and all forms of chemical and biological degradation encountered in the material in which it is buried.

Package, label, handle, and store geogrid material according to ASTM D 4873.

1. **Stabilization.** Provide geogrid that meets the survivability requirements in Table 687-1 and meets the physical requirements in Table 687-2.
2. **Reinforcement.** Provide geogrid that meets the survivability requirements in Table 687-1 and as shown on the Plans.

TABLE 687-1

GEOGRID SURVIVABILITY REQUIREMENTS

Property	Test Method	Units	Requirement	
			CLASS 1	CLASS 2
Ultimate Multi-Rib Tensile Strength ^a	ASTM D6637	lb./ft.	1230	820
Junction Strength ^a	ASTM D7737	lb.	25	25
Ultraviolet Stability (Retained Strength)	ASTM D4355	%	50% after 500 hours of exposure	

^a Minimum Average Roll Value (MARV) in any rib direction.

TABLE 687-2

GEOGRID PHYSICAL REQUIREMENTS

Property	Test Method	Units	Requirement	
			CLASS 2	CLASS 1
2% Tensile Strength ^a	ASTM D6637	lb./ft.	≥ 400	≥ 260
5% Tensile Strength ^a	ASTM D6637	lb./ft.	≥ 800	≥ 540
Percent Open Area	COE, CW-02215	%	50 – 80	50 – 80
Aperture Size ^b	Direct measure	in.	0.5 – 3.0	0.5 – 3.0

^a Minimum Average Roll Value (MARV) in machine and cross-machine directions.

^b measured as the spacing between parallel ribs.

CONSTRUCTION REQUIREMENTS

687-3.1 SURFACE PREPARATION.

- a. **Soft Ground (CBR ≤3).** Prepare surface by removal of stumps, brush, boulders, and sharp objects. Fill holes and ruts over 3 inches deep, with material shown on the Plans or as approved by the Engineer.

- b. **Firm Ground (CBR >3).** Compact and finish subgrade or subbase prior to placement of the geogrid.

687-3.2 GEOGRID PLACEMENT. Unroll geogrid directly onto the prepared ground surface in the direction of advancing construction, parallel to the centerline of the roadway or according to the Plans. Do not drag the geogrid across the subgrade. Install the geogrid in the longest continuous practical length, free from folds, creases or wrinkles. Hold the geogrid in place with pins, staples, sandbags or piles of granular material. Do not expose geogrids to sunlight for longer than 14 days after removal of protective covering.

- a. **Soft Ground (CBR ≤3).** Overlap geogrid panels a minimum of 24 inches at all joints with the upper geogrid in the direction that fill will be placed. Tie panels together securely with cable ties or hog rings at 20-foot intervals, or according to the manufacturer's recommendations.
- b. **Firm Ground (CBR >3).** Overlap geogrid panels a minimum of 12 inches at all joints in the direction that fill will be placed. Tie panels together securely with cable ties or hog rings at 20-foot intervals and hand-tension geogrid and stake to the ground at the edges, overlaps, and in the center of each roll, at 30-foot intervals or as shown on the Plans.

Place the beginning of each new roll beneath the end of the previous roll to prevent the advancing fill from lifting the geogrid. Stagger end overlaps at least 10 feet from other end overlaps in adjacent rolls.

687-3.3 PLACEMENT OF COVER MATERIAL. Do not operate equipment directly on the unprotected geogrid. Spread fill material in the direction of the fabric overlap. Compact using a smooth drum roller. Do not allow construction equipment to make sudden stops, starts, or turns on the cover material.

- a. **Very Soft Ground (CBR < 1).** End-dump material onto previously placed material and spread over the geogrid with a low ground pressure dozer to the depth permitted. Maintain a minimum depth of 12 inches of cover material at all times between the geogrid and the wheels or tracks of the construction equipment unless otherwise shown on the Plans. Do not dump material directly onto the geogrid. To prevent a mud wave, end-dump fill along the edges of the geogrid to form toe berms or access roads that extend one to two panel widths ahead of the remainder of the embankment fill placement. After constructing the two berms, spread fill in the area between the toe berms by placing material parallel to the alignment and symmetrical from the toe berms inward toward the center to maintain a U-shaped leading edge (i.e., concave outward) to contain the mud wave. Limit height of dumped piles above the geogrid to avoid local bearing failure. Traffic on the first lift should be parallel to the embankment alignment. Do not allow construction equipment to turn on the first lift. Compact first lift by tracking in place with dozers or end-loaders. Compact with specified compaction equipment once embankment is at least 2 feet above the geogrid.
- b. **Soft Ground (1 ≤ CBR ≤ 3).** End-dump material onto previously placed material and spread over the geogrid with a low ground pressure dozer to the depth permitted. Maintain a minimum depth of 6 inches of cover material at all times between the geogrid and the wheels or tracks of the construction equipment unless otherwise shown on the Plans. Place the end-dumped material along the roadway centerline and spread it outward to the roadway edges to prevent the development of wrinkles or movement of the geogrid during construction. Fill in any ruts that form during construction with material shown on the Plans. Do not cut down the fill adjacent to the ruts.
- c. **Firm Ground (CBR > 3).** Maintain a minimum depth of 6 inches of cover material at all times between the geogrid and the wheels or tracks of the construction equipment.

687-3.4 GEOGRID REPAIR. Should the geogrid be torn, punctured, or the overlaps disturbed – as evidenced by visible geogrid damage – remove the backfill around the damaged area and repair or replace the damaged area at no additional expense to the State. Make repairs to the damaged area with a patch of the same type of geogrid originally placed. Overlay torn area with geogrid with a minimum

3-foot overlap around the edges of the torn area and secure as recommended by the geogrid manufacturer.

687-4.1 METHOD OF MEASUREMENT. By multiplying plan neat line width by the measured length in final position parallel to installation centerline along the ground surface. No allowance will be made for overlap, whether at joints or patches.

687-5.1 BASIS OF PAYMENT. Payment will be made at the contract unit price per square yard. Material used to fill ruts and holes will be paid for at the unit price for the type of material used. Payment will be made under:

Item P687.010.1000	Geogrid, Stabilization, Class 1 – per square yard
Item P687.010.2000	Geogrid, Stabilization, Class 2 – per square yard
Item P687.020.1000	Geogrid, Reinforcement, Class 1 – per square yard
Item P687.020.2000	Geogrid, Reinforcement, Class 2 – per square yard