VOLUME II of IV

JUNEAU INTERNATIONAL AIRPORT (JNU) RUNWAY SAFETY AREA IMPROVEMENTS – PHASE 2A
CBJ Contract No. E12-240
AIP No. 3-02-0133-056-2012

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See index sheet in the plan set.

ITEM D-701 STORM DRAINS AND CULVERTS

DESCRIPTION

701-1.1 This item shall consist of the construction of pipe culverts, end sections, culvert marker posts, and storm drains according to these Specifications and in reasonably close conformity with the lines and grades shown on the Plans.

MATERIALS

701-2.1 Materials shall meet the requirements shown on the Plans and specified below.

701-2.2 PIPE. The pipe shall be of the type called for on the Plans and shall be according to the following appropriate requirements.

Metallic Coated Corrugated Steel Pipe (Type I, IR or II)	AASHTO M 36
Galvanized Steel Corrugated Structural Plates and Fasteners for Pipe, Pipe-Arches, and Arches	ASTM A 761
Polymer Precoated Corrugated Steel Pipe for Sewers and Drains	ASTM A 762
Post-Coated and Lined (Bituminous or Concrete) Corrugated Steel Sewer and Drainage Pipe	ASTM A 849
Steel Sheet, Zinc and Aramid Fiber Composite Coated for Corrugated Steel Sewer, Culvert, and Underdrain Pipe	ASTM A 885
Corrugated Aluminum Alloy Culvert Pipe	ASTM B 745
Non-Reinforced Concrete Pipe	ASTM C 14
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Reinforced Concrete Arch Pipe	ASTM C 506
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Precast Reinforced Concrete Box Sections	ASTM C 789 and C 850
Poly (Vinyl Chloride) Ribbed Drain Pipe & Fittings Based on Controlled Inside Diameter	ASTM F 794
Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings	ASTM F 949
Bituminous-Coated Corrugated Metal Pipe and Pipe Arches	AASHTO M 190
Bituminous-Coated Corrugated Aluminum Alloy Culvert Pipe	AASHTO M 190 and M 196
Bituminous-Coated Structural Plate Pipe, Pipe Arch, and Arches	AASHTO M 167 and M 243
Aluminum Alloy Structural Plate for Pipe, Pipe Arch, and Arches	AASHTO M 219
Polyvinyl Chloride (PVC) Pipe	ASTM D 3034
Corrugated Polyethylene Drainage Tubing	AASHTO M 252
Corrugated Polyethylene Pipe, 300 mm to 1200 mm Diameter	AASHTO M 294
Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter	AASHTO M 304

701-2.3 CONCRETE. Concrete for pipe cradles shall have a minimum compressive strength of 2,000 psi at 28 days and conform to the requirements of AASHTO M 157.

701-2.4 RUBBER GASKETS. Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C 443. Rubber gaskets for PVC pipe and polyethylene pipe shall conform to the requirements of ASTM F 477. Rubber gaskets for zinc-coated steel pipe and precoated galvanized pipe shall conform to the requirements of ASTM D 1056, for the ``RE'' closed cell grades.

701-2.5 JOINT MORTAR. Pipe joint mortar shall consist of one part portland cement and two parts sand. The portland cement shall conform to the requirements of AASHTO M 85, Type I. The sand shall conform to the requirements of AASHTO M 45.

701-2.6 JOINT FILLERS. Poured filler for joints shall conform to the requirements of AASHTO M 324.

701-2.7 PLASTIC GASKETS. Plastic gaskets shall conform to the requirements of AASHTO M 198(Type B).

701-2.8 CULVERT MARKER POSTS. Provide posts made of durable glass fiber and resin reinforced material flexible to -40º F, resistant to impact and ultraviolet light, "T" in cross section, 3.75 inch wide x 72 inches long, and color blue. Provide Carsonite CUM-375 utility marker or approved equal.

701-2.9 CLASS B BEDDING. Use one of the following materials:

a. Suitable material as defined in specification subsection P-152-2.3, except that 100% of the material will pass a 1 inch sieve.

b. P-208 Aggregate Surface Course (when included in this contract).

c. P-209 Crushed Aggregate Base Course (when included in this contract).

701-2.10 BAFFLES. Baffles shall conform to the requirements shown on the plans.

701-2.11 END SECTIONS. End sections for metal pipe must be of the same material as the pipe.

CONSTRUCTION METHODS

701-3.1 EXCAVATION. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 6 inches on each side. The trench walls shall be approximately vertical.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 12 inches or 1/2 inch for each foot of fill over the top of the pipe (whichever is greater) but for no more than 75% of the nominal diameter of the pipe. The width of the excavation shall be at least 1 foot greater than the horizontal outside diameter of the pipe. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved Class B bedding material for the full trench width. The Engineer shall determine the depth of removal necessary. The Class B bedding material shall be compacted to provide adequate support for the pipe.

The excavation for pipes that are placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the Plans.

701-3.2 BEDDING. The pipe bedding shall conform to the class specified on the Plans. When no bedding class is specified or detailed on the Plans, the requirements for Class B bedding shall apply.

a. **Rigid Pipe.** Class A bedding shall consist of a continuous concrete cradle conforming to the plan details.

Class B bedding shall consist of a bed of granular material having a thickness of at least 6 inches below the bottom of the pipe and extending up around the pipe for a depth of not less than 30% of

the pipe's vertical outside diameter. The layer of bedding material shall be shaped to fit the pipe for at least 10% of the pipe's vertical diameter and shall have recesses shaped to receive the bell of bell and spigot pipe.

b. Flexible Pipe. For flexible pipe, the bed shall be roughly shaped to fit the pipe, and a bedding blanket of sand or fine granular material shall be provided as follows:

Pipe Corrugation Depth, in.	Minimum Bedding Depth, in.
½	1
1	2
2	3
2-1/2	3-1/2

c. PVC and Polyethylene Pipe. For PVC and polyethylene pipe, the bedding material shall consist of Class B bedding. The bedding shall have a thickness of at least 6 inches below the bottom of the pipe and extend up around the pipe for a depth of not less than 50% of the pipe's vertical outside diameter.

701-3.3 LAYING PIPE. The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced pipes shall be placed with the manufacturer's top of pipe mark within five degrees of a vertical plane through the longitudinal axis of the pipe.

701-3.4 JOINING PIPE. Joints shall be made with (1) portland cement mortar, (2) portland cement grout, (3) rubber gaskets, (4) plastic gaskets, or (5) coupling bands.

Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints in order to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible watertight seal.

a. Concrete Pipe. Concrete pipe may be either bell and spigot or tongue and groove. The method of joining pipe sections shall be such that the ends are fully entered and the inner surfaces are reasonably flush and even. Joints shall be thoroughly wetted before mortar or grout is applied.

b. Metal Pipe. Metal pipe shall be firmly joined by form fitting bands conforming to the requirements of ASTM A 760 for steel pipe and AASHTO M 36 for aluminum pipe.

c. PVC and Polyethylene Pipe. Joints for PVC and polyethlyene pipe shall conform to the requirements of ASTM D 3212 when water tight joints are required. Joints for PVC and polyethlyene pipe shall conform to the requirements of AASHTO M 304 when soil tight joints are required. Fittings for polyethylene pipe shall conform to the requirements of AASHTO M 252 or M 294.

701-3.5 BACKFILLING. Pipes shall be inspected before any backfill is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense.

Use backfill that is suitable material as defined in subsection P-152-2.3 except that:

a) 100% of the material placed within 1 foot of the pipe will pass a 3 inch sieve.

b) If the pipe is placed in or under the structural section, construct the backfill according to the material and construction requirements of the specifications for the applicable lift of material (P-154, P-208, P-209).

When the top of the pipe is even with or below the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches on both sides of the pipe and shall be brought up 1 foot above the top of the pipe or to natural ground level, whichever is greater. Care shall be exercised to thoroughly compact the backfill material under the haunches of the pipe. Material shall be brought up evenly on both sides of the pipe.

When the top of the pipe is above the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches and shall be brought up evenly on both sides of the pipe to 1 foot above the top of the pipe. The width of backfill on each side of the pipe for the portion above the top of the trench shall be equal to twice the pipe's diameter or 12 feet, whichever is less.

For PVC and polyethylene pipe, the backfill shall be placed in two stages; first to the top of the pipe and then at least 12 inches over the top of the pipe. The backfill material shall meet the requirements of Subsection 701-3.2c.

All backfill shall be compacted to the density required under Item P-152.

701-3.6 CULVERT MARKER POSTS. Install culvert marker posts at each culvert inlet and outlet. Drive posts to 18 inches minimum embedment.

701-3.7 END SECTIONS. End Section installation shall conform to the State of Alaska DOT&PF Standard Drawing D-06.01 Culvert End Sections.

701-3.8 ALUMINUM PLATE CULVERT WITH BAFFLES. Construct and install aluminum plate culvert with baffles as shown on the plans.

METHOD OF MEASUREMENT

701-4.1 PIPE. The length of pipe will be measured in linear feet of pipe in place, completed, and approved. It will be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types and size will be measured separately. All fittings and end sections will be included in the length of the pipe being measured.

701-4.2 CONCRETE. The volume of concrete for pipe cradles will not be measured for payment.
701-4.3 ROCK. The volume of rock will not be measured for payment.

701-4.4 CULVERT MARKER POSTS. Culvert marker posts will not be measured for payment.

701-4.5 END SECTIONS. End sections will not be measured for payment.

701-4.6 EXCAVATION AND BACKFILL. The excavation and backfill for storm drains and culverts will not be measured for payment.

701-4.7 ALUMINUM PLATE CULVERT WITH BAFFLES. The aluminum plate culvert with baffles will not be measured for payment. The Engineer's acceptance constitutes measurement.

BASIS OF PAYMENT

701-5.1 Payment will be made at the contract unit price per linear foot for each kind of pipe of the type and size designated.Culvert marker posts will not be paid for directly, but will be subsidiary to pipe items.

All excavation and backfill required to complete storm drain and culvert installation shall be included in the unit price for the pipe involved.

Payment for Aluminum Plate Culvert with Baffles will be made at the contract unit price for work acceptably completed. All work associated with the construction of the plate culvert and baffles, including but not limited to; labor, equipment, tools, hauling, transportation, and incidentals will be included in the contract price for Aluminum Plate Culvert with Baffles.

Payment will be made under:

Item D-701a(1) CPP Smooth Interior Pipe, 12 inch – per linear foot

MATERIAL REQUIREMENTS

AASHTO M 36	Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
AASHTO M 45	Aggregate for Masonry Mortar
AASHTO M 85	Portland Cement
AASHTO M 157	Ready-Mixed Concrete
AASHTO M 190	Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M 196	Corrugated Aluminum Alloy Culverts and Underdrains
AASHTO M 198	Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
AASHTO M 219	Aluminum Alloy Structural Plate for Pipe, Pipe-Arches, and Arches
AASHTO M 243	Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches
AASHTO M 252	Corrugated Polyethylene Drainage Tubing
AASHTO M 294	Corrugated Polyethylene Pipe, 300 to 1200 mm Diameter
AASHTO M 304	Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO M 324	Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM A 761	Steel Galvanized, Corrugated Structural Plates and Fasteners for Pipe, Pipe-Arches, and Arches
ASTM A 762	Precoated (Polymeric) Galvanized Steel Sewer and Drainage Pipe
ASTM A 849	Post-Coated and Lined (Bituminous or Concrete) Corrugated Steel Sewer and Drainage Pipe
ASTM A 885	Steel Sheet, Zinc and Aramid Fiber Composite Coated for Corrugated Steel Sewer, Culvert, and Underdrain Pipe
ASTM B 745	Corrugated Aluminum Alloy Culvert Pipe
ASTM C 14	Concrete Sewer, Storm Drain, and Culvert Pipe
ASTM C 76	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

ASTM C 443	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C 506	Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C 507	Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
ASTM C 655	Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
ASTM C 700	Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
ASTM C 789	Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers
ASTM C 850	Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers with Less than 2 feet of Cover
ASTM D 1056	Flexible Cellular Materials--Sponge or Expanded Rubber
ASTM D 3034	Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3212	Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM F 477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 794	Poly (Vinyl Chloride) Ribbed Drain Pipe & Fittings Based on Controlled Inside Diameter
ASTM F 949	Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings

ITEM D-704 STEEL ENCASED AUGER BORING

DESCRIPTION

704-1.1 This item includes all labor, equipment, scheduling, supervision, training, and materials to provide a steel pipe sleeve, herein after referred to as the casing, installing this casing by a boring operation, installing the liner pipe, and grouting between the casing and liner pipe as shown on the Plans.

MATERIALS

704-2.1 Materials shall meet the requirements shown on the Plans and specified below.

704-2.2 STEEL CASINGS. The casings shall be of the type called for on the Plans and shall be according to the following appropriate requirements.

1. Steel Casing Pipe. Shall meet ASTM A570 or A139, Grade B, having a minimum yield strength of 35,000 psi, with minimum wall thickness of 0.375 inches. Wall thickness shall be sufficient to withstand anticipated aircraft loading and jacking forces without deformation. The Contractor is responsible for providing documentation showing adequate load bearing capacity and submitting documentation to the Engineer for approval. Casing pipe must be shown to be in good condition and approved by the Engineer.

   The casing pipe shall have an inside diameter approximately 3 inches greater than the outer diameter of the liner pipe, 36-inch (inside diameter) Type S corrugated polyethylene pipe, assumed to be 43 inches.

2. Joints. All joints shall be welded. All field welded joints shall comply with AWS Code for procedures of manual shielded metal arc welding, appearance and quality of welds made and methods used in correcting welding work.

704-2.3 CONTROLLED DENSITY FILL. The controlled density fill shall fill the void space between the liner pipe and the steel casing and shall meet the following requirements.

1. Portland Cement. Type I Portland Cement shall meet ASTM C150 and should be used as a cementitious material in combination with fly ash.

2. Fly Ash. Class F Fly Ash shall meet ASTM C618 and should be used as a cementitious material in combination with Portland Cement.

3. Air-Entraining Admixture. Admixture shall meet ASTM C260. Total calculated air content, prepared in accordance with ASTM C231, shall not exceed 30 percent.

4. Aggregate. Graded aggregate shall meet ASTM C33. The mixture shall contain no aggregate larger than 3/8 inch. Amount passing a No. 200 sieve shall not exceed 12 percent. No plastic fines shall be present.

5. Water. Shall be potable and shall be used as needed to achieve the proper flowability.

704-2.4 END SEALS. Casing end seals shall be 1/8-inch thick synthetic rubber with stainless steel bands and clamps, for a watertight seal. The end seal shall be made from oakum soaked in water-activated urethane sealant.

CONSTRUCTION METHODS

704-3.1 GENERAL. No construction in the property shall be started until construction coordination with the Project Engineer has been finalized. Where shoring, sheeting, or other approved construction is required for

the excavation of the jacking or boring pits, sufficient Plans and specifications on shoring construction shall be submitted by the Contractor to the Project Engineer as applicable for their approval before any excavation is started.

704-3.2 BORING AND JACKING. Boring and jacking of casing pipe shall be accomplished in such a manner that there will be no damage to the runway section or taxiway section. Acceptable repairs must be made if soil is removed outside of the casing. Removal of the material from the bored hole by washing or sluicing will not be permitted.

All excess excavated material shall be disposed of in a manner approved by the Engineer.

Pipe sleeve shall be jacked into place for that length of casing as shown on the plans.

The end of the pipe opposite the jacking pit shall not deviate from: (a) the horizontal alignment shown on the plan sheet by more than 2 feet in either direction; (b) the vertical alignment shall be as indicated on the construction Plans. It shall not deviate from its shown elevation by more than 0.25 feet. No high points shall be created in or adjacent to the pipe casing.

The Contractor shall coordinate his work schedule with the Project Engineer. The Contractor shall also furnish and maintain the necessary safety precautions at all times during construction.

704-3.3 EXCAVATION. Trench excavation and backfilling operations shall conform in all respects to applicable portions of Section 204 Structure Excavation of Conduits and Minor Structures, of these specifications. Laying and jointing of the casing pipe shall conform to the recommendations of the manufacturer of the pipe used.

The casing pipe shall be installed as shown on the plans with care being taken to disturb as little of the embankment as possible. Backfill shall be compacted to no less than 95% of maximum density at ±2% of optimum moisture as determined by ASTM D698. The Contractor's installation and backfilling operations shall be completed in a manner acceptable to the Project Engineer and owner of the retaining walls being crossed.

704-3.4 LINER PIPE INSTALLATION. Liner pipe shall be installed in the casing on the invert of the casing. The liner pipe shall be installed with a smooth operation without jerking. After installation of the pipe in the casing, the ends of the casing shall be sealed with a temporary frame to facilitate installation of controlled density fill between the liner pipe and casing as indicated on the Plans.

704-3.5 CONTROLLED DENSITY FILL. Controlled density fill shall be batched in accordance with ASTM C94. The mixture shall be pumped in under low pressure into the steel casing and around the pipe beginning at the upstream end and allowed to flow toward the downstream end. Pumping should continue slowly to allow all void space between the pipe and the steel casing to fill.

704-3.6 END SEALS. End seals shall be placed around the inlet and outlet of the culvert to prevent controlled density fill mixture from seeping out during and after construction. The oakum and urethane material should be wrapped around the culvert tightly and water should be added, expanding the sealing material when the culvert end is ready to be sealed. End seals shall be securely placed around the outlet before the controlled density fill is pumped in, and the point of entry of the controlled density fill shall be sealed once all of the void space has been filled.

BASIS OF PAYMENT

704-4.1 Payment will be made at the contract unit price per linear foot for each casing by a boring operation. All costs associated with the auger boring, installation of the casing and liner pipe, grouting, and end seals, are incidental to the casing.

TESTING REQUIREMENTS

ASTM C33	Specifications for Concrete Aggregates
ASTM C150	Specifications for Portland Cement
ASTM C260	Specifications for Air-Intraining Admixtures for Concrete
ASTM C231	Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C618	Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

ITEM G-100 MOBILIZATION AND DEMOBILIZATION

DESCRIPTION

100-1.1 This item consists of preparatory work and operations, including but not limited to operations necessary to move personnel, equipment, supplies and incidentals to the project site; to establish offices, buildings and other facilities, except as provided under Section G-130; to perform all other work and operations, including costs incurred, before beginning work on the project; and to complete similar demobilization activities, including submittals such as as-builts, certificates, payrolls, civil rights reports, equipment warranties, etc.

METHOD OF MEASUREMENT

100-2.1 Payment for mobilization and demobilization will be made in partial payments as follows:

a. Up to sixty percent of the amount bid for mobilization and demobilization may be paid when equipment and supplies are landed in serviceable condition at the project site and other necessary preparations have been completed so that work can commence on other pay items.

b. The remaining balance will be paid as contractor facilities are dismantled and equipment is removed from the airport property, with the final increment paid upon completion of demobilization or as approved by the Engineer.

The Owner reserves the right to require submittal of invoices, receipted bills, payrolls, and other appropriate documents to justify any or all payments under this item.

BASIS OF PAYMENT

100-3.1 Payment will be made at the contract lump sum price for mobilization and demobilization. This price and payment shall be full compensation for all costs associated with this item.

Payment will be made under:

Item G-100a Mobilization and Demobilization - per lump sum

ITEM G-135 CONSTRUCTION SURVEYING AND MONUMENTS

DESCRIPTION

135-1.1 GENERAL. Perform surveying and staking essential for the completion of the project and perform the necessary calculations required to accomplish the work in conformance with the Plans and Specifications and standard survey and engineering practices.

Furnish and install survey monuments and monument cases in conformance with the Plans or as directed.

135-1.2 DEFINITIONS.

a. Monument: A fixed physical object marking a point on the surface of the earth; used to commence or control a survey; mark the boundaries of a parcel of land; or the centerline of a right-of-way corridor. Monuments will be Primary or Secondary, as shown on the Plans.

b. Point: An identified spot located on the surface of the earth. For purposes of this definition, a point can be a PK nail, wooden hub, rebar, large nail or other structure capable of being utilized as a marker.

c. Witness Corner: A material mark or point usually placed on a property or survey line, at a known distance from a property corner or other survey point. A witness corner is employed to witness the location of a corner/point that cannot be monumented at its true location.

d. Reference Monument: A material mark or point placed at a known distance and direction from a property corner or other survey point, usually not on a property or survey line. A reference monument is employed to perpetuate a corner/point that cannot be monumented at its true location or where the corner monument is subject to destruction.

e. Surveyor: The Contractor's Professional Land Surveyor, currently registered in the State of Alaska.

MATERIALS

135-2.1 MONUMENT CASES. Castings shall conform to AASHTO M 105, Class 30A. Castings shall be coated with a bituminous damp-proof coating. Bolting tops shall be used.

135-2.2 PRIMARY MONUMENT. A minimum 2-inch diameter nonferrous pipe at least 30 inches long, with a minimum 4-inch flange at the bottom and having magnets attached at the top and bottom. A minimum 2-1/4-inch diameter nonferrous metal cap must be permanently attached to the top. Mark the cap around the outside edge with the words "CITY AND BOROUGH OF JUNEAU". Permanently stamp every monument with the Surveyor's registration number, the year set, and the point/corner identification. Orient cap so that the data may be read facing up-station.

135-2.3 SECONDARY MONUMENT. A minimum 5/8-inch x 30-inch rebar with a 2-inch aluminum cap attached to the top. Permanently stamp every secondary monument with the Surveyor's registration number and the year set.

CONSTRUCTION REQUIREMENTS

135-3.1 GENERAL. Use competent, qualified personnel and suitable equipment for the layout work required and furnish traffic control, stakes, templates, straight-edges and other devices necessary for establishing, checking and maintaining the required points, lines and grades.

Furnish computer services to accomplish the work. Check data received from the computer for completeness and accuracy. As soon as practical after completion of the work, and in no case later than acceptance of the

project, deliver field books, computer forms and computer output data to the Engineer. This data becomes the property of the Owner.

Supervise construction surveying personnel. Correct errors resulting from the operations of said personnel at Contractor expense. The Contractor is responsible for the accuracy of the work.

Work classified as Land Surveying under AS 08.48, and work involving the location, control, and monumentation of construction centerline and right-of-way, shall be performed by or under the responsible charge of a Professional Land Surveyor.

Follow the Owner's Construction Surveying Requirements.

Ensure that the contract surveyor contacts the Owner's survey manager prior to performing survey work under this item.

The Owner will provide sufficient centerline or reference thereto, and at least one benchmark to enable the establishment of planned elevations and centerline.

Keep field notes in standard hardbound notebooks in a clear, orderly, and neat manner consistent with the Owner's procedures, including titles, numbering, and indexing. Make field books available for inspection by the Engineer's project personnel at any time. Legible copies of the reduced field notes shall be made daily. Store the field books in the Engineer's Project Office during periods of non-use. Copies of the field books shall be kept in a separate secure location.

Perform the following:

a. Staking necessary to delineate clearing and/or grubbing limits.

b. Cross sections necessary for determination of excavation and embankment quantities, including intermediate and/or remeasure cross sections as needed. Take cross sections after clearing and grubbing has been completed.

c. Slope staking.

d. Staking of signs, culverts, minor drainage structures and other appurtenances, including the necessary checking to establish the proper location and grade to best fit the conditions on site.

e. Bridge staking.

f. Setting finishing stakes.

g. Measurement of pay quantities that require measurement.

h. Staking of right-of-way and material source limits.

i. Staking, referencing and other actions required to preserve or restore land monuments and property corners.

j. As-built surveying as required under Section 50-08 Survey Control. Tie as-built measurements and locations to project horizontal and vertical survey control.

k. Asphalt pavement surveying necessary to comply with subsection P-401-5.2 acceptance criteria for smoothness and grade of finished asphalt pavement surfaces.

l. Staking and hubbing of bottom of excavation and the top of each layer in the pavement structure.

m. Provide interim calculations for measured items to the Engineer prior to progress payments for each specific item. Ensure that the calculations are completed, checked, and signed by the person in responsible charge of the work.

n. Other surveying and staking necessary to complete the project.

Notify the Engineer immediately if an Owner-established reference point is discovered to be in error or a reset point is not in relationship to the adjacent centerline points.

Furnish a notekeeper to record field survey notes, including documentation for quantity computations for payment. Ensure that the notekeeper is thoroughly familiar with generally accepted standards of good survey notekeeping practice and the Owner's Construction Surveying Requirements.

The Engineer may randomly spot check the Contractor's surveys, staking, and computations. After the survey or staking has been completed, provide the Engineer with a minimum of 72 hours notice before performing work, and furnish the appropriate data, to allow for random spot checking. The Owner assumes no responsibility for the accuracy of the work.

Measure, compute, and plot all field-measured pay item quantities, including but not limited to excavation and disposal of asphalt cement concrete (AC), portland cement concrete (PCC) pavement, and classified/unclassified excavation volumes. Stake for measurement and calculation of excavation quantities after AC and PCC pavement removal. Submit a proposed method of measuring and computing volumes to the Engineer in writing for approval before performing any field work under this item.

Provide item quantities, including computations and plots to the Engineer prior to payment for each specific item. The Owner will review and accept or modify the quantities provided.

Digital terrain modeling (DTM) may be used in determining earthwork quantities as an alternative to before and after cross sections by average end area if the Engineer has agreed in writing to the DTM method prior to commencement of any field work. If DTM is approved and used, provide plotted cross-sections on 50-foot stations with elevations, offsets and computed end areas in square feet for each section prior to earthwork payments for each item. Provide these cross-sections and associated data for the entire area of earthwork computations along with the terrain model.

Accomplish staking in accordance with the following:

a. Perform the topographic survey by grid or cross section method of surveying 25 feet beyond the project match lines. Take elevation shots at 25-foot intervals, at all terrain breaks, and at topographic features.

b. Record and locate all baselines and connect them to the project's centerline, both horizontally and vertically.

c. Upon completion of the before and after survey, provide the Engineer a grid layout sheet showing the baseline, stations and all spot elevations.

d. Provide the Engineer a contour map of the original ground and an identical size map showing the final elevations with 0.5 foot contour intervals. Provide the Engineer with plotted cross-sections for each station grid with elevations and offsets shown.

e. At the end of each day's work, hand deliver a copy of the downloaded raw data from the data collector, in hard copy form, to the Engineer. This hard copy will be signed by the Contractor or Surveyor. If editing is deemed necessary, show all changes in an amended hard copy.

Provide the above products to the Engineer before payment will be made for that work. Provide as-builts and electronic data to the Engineer prior to final inspection.

135-3.2 CROSS-SECTION SURVEYS. When required, obtain right-angle cross sections to the construction centerline at the interval detailed in the Owner's Construction Surveying Requirements.

The following will be supplied by the Owner:

- **a.** Construction Plans and Specifications.
- **b.** Design Cross Sections, if any.
- **c.** State of Alaska Land Survey Monument Record forms.
- **d.** Department's Construction Surveying Requirements. One copy.
- **e.** Design centerline grades.

The following shall be required of the Contractor:

- **a.** Field Books (Level, Cross-Section, Slope Stake, etc.). Use "Rite-in-the-Rain" or similar weather resistant hardbound field books. Field books become the property of the Owner upon completion of the work.

- **b.** Label the books and number the pages. Make a heading in the appropriate book (date, weather, names and duties of crew members) at the beginning of each day's work.

- **c.** Update the index of the appropriate book at the end of each day's work.

- **d.** Reduce, check, and adjust level notes.

- **e.** The notekeeper shall compute the cross-section level notes and slope stake catches and a different crew member shall check the computation on a continual basis in the field.

- **f.** Enter the grade data, shoulder width and/or ditch distance, stationing, slope, etc., in the slope stake books.

- **g.** Maintain the position and identifying marks of slope stakes and reference points until used for their intended purpose.

- **h.** Correct errors by drawing a line through them and writing the correct entry directly above. Erasures will not be allowed.

- **i.** Return field books and copies of the field books to the Project office at the end of each work day or as directed.

- **j.** Provide copies of grade sheets and temporary bench mark elevations to the Engineer 48 hours before beginning work on unclassified excavation or embankment.

- **k.** The Contractor's survey crews shall comply with approved traffic control plans. Coordinate crew activities with the Worksite Traffic Supervisor.

- **l.** Keep a survey Party Chief diary, and give a copy of the diary to the Engineer each day. The diary shall contain the following information:

    - **(1)** Date.
    - **(2)** Weather.
    - **(3)** Crew members' names and duties.
    - **(4)** Type and location of work performed.
    - **(5)** Hours worked.
    - **(6)** Type of equipment used (brand) and date equipment was double centered or "peg" test was performed.

(7) Signature of person in responsible charge.

m. Submit the survey field notes, for the specific area, relating to monument referencing, before beginning clearing, grubbing or excavation.

n. Draw cross-sections and complete quantity calculations for all earthwork quantities.

135-3.3 MONUMENTS. Install primary and secondary monuments, as called for in the Plans, at the positions established by the Owner. Prior to the start of construction, reference monuments, to include property markers/corners and accessories, that may be disturbed or buried during construction. In addition, reference monuments designated for referencing on the Plans. Prepare and record Monument Record Forms in the appropriate Recorder's Office before disturbing monuments. Monument Record Forms may be obtained from the Engineer. Re-establish monuments in their original position before completion of the project. Prepare and file a Monument Record Form for each reestablished monument.

Keep records and report to the Engineer evidence that a monument has been disturbed and is no longer reliable or cannot be located and is presumed to be missing. Establish a minimum of two in-line reference points, or three swing-tie reference points in situations where in-line referencing is not desirable. Set reference points outside of the construction limits. Measure distances from the monument to the nearest 0.01 foot. Record referencing of monuments in a separate field book stamped by the Surveyor.

Replace existing monuments disturbed by construction with Primary or Secondary Monuments meeting the requirements of Subsections 135-2.1 through 3. When it is impractical to establish a monument in its original position, install a witness corner (WC). Place the WC to a property corner on the property line when the other property corner that defines said line is existing or there has been sufficient retracement to define said line. In other cases, place a reference monument (RM) perpendicular to the centerline at the station of the original position and at a distance from the original position measured in whole feet.

Those monuments found that are not shown on the Plans will be recognized by the Engineer when the following is provided by the Surveyor: Field notes identifying type and location of the monument, and a description of the point the monument marks, with the reason to preserve its location. Monuments not shown on the Plans will be considered additional work and paid by Item G-135b, Extra Three Person Survey Party.

The Surveyor shall complete a State of Alaska Land Survey Monument Record form for each primary and secondary monument referenced, removed, installed, relocated or replaced. Provide the required survey information on the form according to statutory requirements, including section, township and range. Meet requirements for recording at the District Recorder's Office in which the project is located for each monument record. Deliver conforming copies of the recorded forms to the Engineer before monument removal or disturbance, and after setting any final monuments requiring monument records.

Set each monument and monument case accurately to lines established at the required location and in a manner as to ensure being held firmly in place. Set existing monuments and monument cases to be adjusted to new elevations in the manner and at the elevations directed.

Primary Airport Control (PAC) and Secondary Airport Control (SAC) monuments are present in the project area as shown on the Plans. This control is important and if disturbed, must be reestablished by the Contracting Agency. For this reason, the Contractor is required to employ all reasonable measures to preserve the existing control monuments in an undisturbed condition. If any PAC or SAC is disturbed by the Contractor's actions, the Contractor shall reimburse the Owner for the cost of replacing monuments, performing geodetic surveys and related data processing, and filing the completed survey with the National Geodetic Surveys office. The estimated cost for reestablishing a disturbed monument is approximately $50,000, but costs will vary depending on location, season, availability of staff, and other factors.

135-3.4 OFFICE ENGINEERING. Calculate finish grades for the embankments as specified according to Plans and/or Specifications. Use information available in the field, on as-builts, or as provided by the

Engineer. This work shall be performed by or under the responsible charge of a Professional Land Surveyor or a Professional Engineer currently Registered in the State of Alaska.

135-3.5 FINAL TRAVERSE. Within 30 days after the Engineer receives a letter stating that construction activities that may disturb the monuments have ceased, the Surveyor shall run a final closed traverse to verify the positional accuracy of installed survey monuments. Tie into the traverse the primary and secondary monuments placed or replaced and undisturbed Owner-provided control points. Meet the requirements of a secondary monument for traverse points established during this work. The Surveyor shall sign and stamp a letter that lists each monument and its coordinates. The letter shall certify that the monuments are each located within 0.1 foot of their proposed position based on the project survey control points provided by the Owner. Deliver the certification letter and field notes for this work to the Engineer.

135-3.6 EXTRA THREE PERSON SURVEY PARTY. This pay item is for extra, additional, or unanticipated work made necessary by changes in the project. Work performed under pay item G-135b may include field work, office engineering, or any work described under the construction requirements of item G-135.

135-3.7 FINISH GRADE CHECKING. Perform all survey work required to verify that the finished surface of all asphalt concrete pavement meets the requirements for grade as specified in subsection P-401-5.2, f(4), Grade Acceptance Criteria. Multiple surveys may be necessary in areas that require reworking.

METHOD OF MEASUREMENT

135-4.1 The work will be measured according to Section GCP-90, as directed by the Engineer, and as follows:

- **a.** Lump Sum. No measurement of quantities will be made.
- **b.** Hour. By the number of hours, as directed by the Engineer and as recorded by certified payrolls.

BASIS OF PAYMENT

135-5.1 Pay Items include all necessary personnel, equipment, transportation, and supplies to accomplish the work described in the Contract, or as directed by the Engineer.

Pay Item G-135a Construction Surveying by the Contractor, includes all Contractor surveying work described in the Contract.

Pay Item G-135b Extra Three Person Survey Party, includes payment by the hour for extra, additional or unanticipated work made necessary by changes in the project. Adjustment according to GCP-90-04 is not allowed for this pay item. Work accomplished by a three person survey party will be paid at 100% of the contract unit price, by a two person survey party at 75% of the contract unit price, or by a one person survey party at 32% of the contract unit price, for Pay Item G-135b.

Payment will be made under:

Item G-135a	Construction Surveying by the Contractor - per lump sum
Item G-135b	Extra Three Person Survey Party - per hour

G-150 EQUIPMENT RENTAL

DESCRIPTION

150-1.1 This item consists of furnishing construction equipment, operated, fueled and maintained, on a rental basis for use in construction of the proposed improvements and in performing work incidental to construction at the direction of the Engineer as such work is generally defined in these Plans and Specifications. Construction equipment is defined as that equipment actually used for performing the items of work specified and shall not include support equipment such as, but not limited to, hand tools, power tools, electric power generators, welders, small air compressors and other shop equipment needed for maintenance of the construction equipment.

REQUIREMENTS

150-2.1 EQUIPMENT FURNISHED. The construction equipment to be provided under this contract shall be that shown in the Special Provisions and/or the bid schedule supplemented by such non-rental maintenance equipment and support equipment as the Contractor elects to provide. The equipment shall be of modern design and in good working condition and shall be maintained in good working condition throughout the life of the project. All equipment to be used in the construction of this project as noted in the Bid Schedule shall be made available for inspection by the Engineer prior to its shipment to the project site. Each item of equipment shall have company numbers clearly displayed for ready identification. The Engineer shall have the authority to prohibit the use of rental payment for any equipment which is not maintained in good working condition or which has a production capacity below construction industry standards.

150-2.2 EQUIPMENT OPERATORS. Equipment operators shall be competent and experienced and shall be capable of operating the equipment to its capacity. The Contractor shall replace those operators who, in the opinion of the Engineer, misconduct themselves, either on the job or in the community, or are incompetent or negligent in the operation of the equipment.

150-2.3 HOURS OF OPERATION AND TIMEKEEPING. The Engineer shall begin recording time for payment each shift when the equipment begins work on the project. Time during which the equipment is being serviced or repaired shall not be included. The stated equipment rental rates shall apply only to that time during which the equipment is actively engaged in construction, as directed by the Engineer. No standby payment will be made for any piece of equipment prior to, during the life of, or after the project has been completed. "Stuck Time" payment shall be made for each piece of equipment that becomes stuck while actively engaged in construction work on the airport and shall be limited to 1 hour per shift for each piece of equipment that becomes stuck.

150-2.4 CONSTRUCTION METHODS. The work shall be constructed according to the Plans, Special Provisions and as directed by the Engineer.

METHOD OF MEASUREMENT

150-3.1 The serial number and brief description of each item of equipment listed in the bid schedule will be recorded by the Engineer, and they will record the number of hours, or fractions thereof to the nearest one-quarter hour, during which the equipment is actively engaged in construction of the project. The furnishing and operating of equipment of heavier type, larger capacity, or higher horsepower than specified will not entitle the Contractor to any extra compensation over their applicable contract unit price. Each day's activity will be recorded on a separate sheet or sheets, which shall be verified and signed by the Contractor's representative at the end of each shift, and a copy will be provided to the Contractor's representative. No idle time will be recorded unless authorized by the Engineer.

BASIS OF PAYMENT

150-4.1 Payment will be made at the contract unit price bid for equipment rental per hour. This payment shall be full compensation for all fuel, operator's and mechanic's wages, parts, tools, maintenance items, shop equipment, and all other incidentals necessary to keep the equipment in good condition and available for work on the project. No payment for equipment standby time resulting from unfavorable weather, or any other reason, is implied or intended and no payment therefore will be made by the Owner. No payment will be made separately or directly for embankments.

Payment will be made under:

Item G-150a Equipment Rental, Dozer (minimum 70 HP) - per hour

ITEM G-200 CONTRACTOR QUALITY CONTROL PROGRAM

DESCRIPTION

200-1.1 Perform work as described in Section 100 Contractor Quality Control Program.

REQUIREMENTS

200-2.1 The requirements for this work are described in Section 100 Contractor Quality Control Program.

METHOD OF MEASUREMENT

200-3.1 This item will not be measured for payment. The Engineer's acceptance of the work constitutes measurement of this item.

BASIS OF PAYMENT

200-4.1 Propose a schedule percentage of payment of the lump sum based upon your implementation of the quality control program. In this schedule of payment provide a detailed list of items to be completed prior to payment of each scheduled payment. The Engineer may modify in part or reject in its entirety the proposed schedule of payment by the Contractor. In any case, the Engineer will be the final authority in determining the schedule of payment and the acceptance of the work.

Payment will be made under:

Item G-200a Contractor Quality Control Program - per lump sum

ITEM G-300 CRITICAL PATH METHOD (CPM) SCHEDULING

DESCRIPTION

300-1.1 Provide and maintain a Critical Path Method (CPM) progress schedule for the project. Use the schedule in coordinating and monitoring of all work under the Contract including activity of subcontractors, manufacturers, suppliers, and utility companies, and reviews by the Owner. Update the CPM schedule, as required.

Provide work plans.

SUBMITTAL OF SCHEDULE

300-2.1 Submit a detailed initial CPM Schedule at the pre-construction conference for the Engineer's acceptance as set forth below.

The construction schedule, for the entire project, may not exceed the specified contract time.

Allow the Engineer 14 days to review the initial CPM Schedule. If revisions are required, make them promptly. The finalized CPM Schedule must be completed and accepted prior to commencement of any work on the project.

REQUIREMENTS AND USE OF SCHEDULE

300-3.1

a. Schedule Requirements. Prepare the CPM schedule as a Precedence Diagram Network developed in the activity-on-node format which includes:

(1) Activity description

(2) Activity duration

(3) Resources required for each of the project activities, including:

(a) Labor (showing work days per week, holidays, shifts per day, and hours per shift)

(b) Equipment (including the number of units of each type of equipment)

(c) Materials.

Show on the activity-on-node diagram the sequence and interdependence of all activities required for complete performance of all items of work under this Contract, including shop drawing submittals and reviews and fabrication and delivery activities.

No activity duration may be longer than 15 work days without the Engineer's approval.

The Engineer reserves the right to limit the number of activities on the schedule.

Consider that schedule float time is shared equally with the Owner.

The contract completion time will be adjusted only for causes specified in this Contract.

As determined by CPM analysis, only delays in activities which affect milestone dates or contract completion dates will be considered for a time extension.

b. Schedule Updates. Hold job site progress meetings with the Engineer for the purpose of updating the CPM Schedule. Meet with the Engineer every two weeks, or more frequently as

deemed necessary by the Engineer. Review progress and verify finish dates of completed activities, remaining duration of uncompleted activities, and any proposed logic and/or time estimate revisions. Submit a revised CPM schedule within 5 working days after this meeting showing the finish dates of completed activities and updated times for the remaining work, including any addition, deletion, or revision of activities required by Contract modification.

c. Work Plans. In addition to the CPM schedule, submit a work plan every 2 weeks with the schedule updates , detailing your proposed operations for the forthcoming two weeks. Include:

(1) Work activities
(2) Manpower involved by trade
(3) Work hours
(4) Equipment involved
(5) Location of the work to be performed

METHOD OF MEASUREMENT

300-4.1 Payment for CPM Scheduling will be made in partial payments as follows:

a. Up to twenty five (25) percent of the amount bid for CPM Scheduling may be paid when a complete project schedule is delivered and approved by the Engineer.

b. The remaining balance may be paid on a prorated basis for delivering schedule updates and work plans acceptable to the Engineer. This will be calculated based on the duration of the schedule and months

BASIS OF PAYMENT

300-5.1 Payment will be made at the contract lump sum price for the completed and accepted job. This price and payment shall be full compensation for all costs associated with this item.

Payment will be made under:

Item G-300a CPM Scheduling - per lump sum

ITEM G-700 TRAFFIC CONTROL FOR AIRPORTS

DESCRIPTION

700-1.1 Provide suitably equipped airport flagger(s) with no other assigned duties to monitor and control the Contractor's personnel and equipment crossing or occupying any portion of the Air Operations Area of the airport, as required under Section 80-04 Limitation of Operations.

REQUIREMENTS

700-2.1 Furnish airport flaggers and all necessary equipment. Equip each airport flagger assigned to an aircraft operations area with a two-way radio that broadcasts and receives on the designated Common Traffic Advisory Frequency (CTAF) for the project airport as found in the Alaska Supplement of the United States Government Flight Information Publication and as listed below:

1. Common Traffic Advisory Frequency (CTAF) – 118.7 MHz
2. Tower – 278.3, 118.7 MHz. Between May and September, an additional Tower Frequency of 120.7 MHz will be in use. Its use will be announced via the ATIS on 135.3 MHz.
3. Ground Control – 121.9 MHz

Provide each airport flagger with a two-way radio to contact construction equipment and other airport flaggers on the project. Equip each airport flagger for vehicular traffic control with a flagging paddle that conforms to the requirements of the Alaska Traffic Manual.

Locate each airport flagger at a position as shown on the Plans or as described in the Safety Plan, or at an alternate location as directed by the Engineer. Ensure that each airport flagger maintains their assigned post at all times. Airport flagger positions will be adjusted as conditions warrant.

METHOD OF MEASUREMENT

700-3.1 Airport flagger will be measured by the hour for the actual number of hours that each airport flagger performed as directed by the Engineer.

BASIS OF PAYMENT

700-4.1 Payment will be made at the contract unit price for each Airport Flagger per hour. The hourly rate for Airport Flagger is set at $54.00 per hour for this contract. The Engineer does not require a change order/directive for this pay item.

Payment will be made under:

Item G-700a Airport Flagger - per contingent sum

ITEM G-705 WATERING FOR DUST CONTROL

DESCRIPTION

705-1.1 Furnish all equipment and labor necessary to supply watering for dust control as required by the approved traffic control plans or as directed by the Engineer. This item is for dust control outside of the construction work area. Dust control within the work area is incidental to the contract and no separate payment will be made.

REQUIREMENTS

705-2.1 WATERING. Furnish, haul, and place water for dust control as directed. Use water trucks capable of adjusting the rate of water flow from the operators position. Distribute a light-water spray pumped from a tanker in a uniform spray pattern to cover a minimum 30 foot width in one pass and without causing erosion. Gravity flow will not be allowed. The Engineer will control water application.

If you take water from a lake, stream, or other natural water body, first obtain a water removal permit from the Alaska Department of Natural Resources (DNR). Comply with the Alaska Department of Fish and Game and/or DNR Office of Habitat Management and Permitting screening requirements for all water removal operations.

METHOD OF MEASUREMENT

705-3.1 By the 1,000 gallons (M-gallon) of water applied. The water will be measured by means of calibrated tanks or distributors, accurate water meters, or by weighing. If by weight, convert to gallons at 8.34 pounds per gallon. If by volume, convert to gallons at 7.48 gallons per cubic foot.

BASIS OF PAYMENT

705-4.1 The contract price includes all resources required to provide watering, as directed.

Payment will be made under:

Item G-705a Watering for Dust Control – per M-gal

ITEM G-710 TRAFFIC CONTROL FOR ROADS, STREETS, AND HIGHWAYS

710-1.1 DESCRIPTION. Protect and control traffic during the contract. Furnish, erect, maintain, replace, clean, move and remove the highway traffic control devices required to ensure the public's safety. Perform all administrative responsibilities necessary to implement this work.

Maintain all public corridors affected by the work in a smooth and passable condition. Construct and maintain approaches, crossings, intersections, and other necessary features throughout the project for the life of the contract.

710-1.2 ACRONYMNS AND DEFINITIONS.

ATM. When used in this section, ATM stands for the *Alaska Traffic Manual*, which is the MUTCD with the *Alaska Traffic Manual Supplement*.

HIGHWAY. A main direct road. Used throughout this section for the sake of brevity, the word "highway" also applies to roads and streets.

HIGHWAY TRAFFIC CONTROL ZONE. A portion of a construction project, haul route, utility work, or similar operation that affects traffic and requires highway traffic control to safely guide and protect motorists, pedestrians, bicyclists, or workers, outside of the AOA.

HIGHWAY TRAFFIC CONTROL PLAN (TCP). A drawing or drawings indicating the method or scheme for safety guiding and protecting motorists, pedestrians, bicyclists, and workers in a highway traffic control zone. The TCP depicts the highway traffic control devices and their placement and times of use.

TRAFFIC. The movement of vehicles, ATV's, equipment, pedestrians, and bicyclists through public corridors, construction areas, utility work, or similar operations.

710-1.3 HIGHWAY TRAFFIC CONTROL PLAN. Design and implement an approved TCP before beginning work within a highway traffic control zone.

The TCP includes, but is not limited to, signs, barricades, traffic cones, plastic safety fence, special signs, warning lights, highway flaggers, temporary lighting, temporary roadways and all other items required to direct traffic through or around the highway traffic control zone according to these Specifications and the ATM. Address in the TCPs, placement of highway traffic control devices, including location, spacing, size, mounting height and type. Include code designation, size, and legend per the ATM and the ASDS.

When a TCP is included in the Plans, use it, modify it, or design an alternative TCP. When a TCP is omitted from the Plans, provide one according to this Section and the ATM.

Submit new or modified TCPs to the Engineer for approval. Allow 1 week for the Engineer to review any TCP or each subsequent correction. You may change an approved TCP during construction provided you allow 48 hours for review and the Engineer approves the changes.

Certify by signature of the Worksite Traffic Supervisor that all TCPs conform with the ATM and Specifications. The Engineer will not accept the TCP without Worksite Traffic Supervisor's certification. Have your superintendent review and sign all TCPs before you submit them.

In all TCPs you submit, include the periods for which the TCP will be in effect. Provide the name and 24-hour telephone number of the Worksite Traffic Supervisor.

The TCPs, Plans, and Standard Drawings show the minimum required number of highway traffic control devices. If unsafe conditions occur, the Engineer may require additional highway traffic control devices.

Use of equipment in a highway traffic control zone must conform to an approved TCP, including all highway traffic control devices these operations require.

Rural projects that are off the NHS and the Alaska Highway System require a waiver per 17 AAC 25.800 to operate oversize and overweight vehicles off of airport property.

710-1.4 WORKSITE TRAFFIC SUPERVISOR. Provide a Worksite Traffic Supervisor responsible for maintaining 24-hour traffic operations.

a. Qualifications. Ensure the Worksite Traffic Supervisor understands ATM requirements, the Plans, the Specifications, your proposed operations, and is certified as one of the following:

(1) Worksite Traffic Supervisor certified by the American Traffic Safety Services Association (ATSSA).

(2) Level One Signs and Markings Specialist certified by the International Municipal Signal Association (IMSA).

Item (2) requires documentation of at least 12 months of supervisory-level worksite highway traffic control or 12 months of responsible charge of such work. "Responsible charge" means that the Worksite Traffic Supervisor has been accountable for selecting devices and placing them in the highway traffic control system, or for continued system operation. The Worksite Traffic Supervisor satisfies this requirement if they have supervised persons performing this labor.

Renew certification no less frequently than every 4 years, and be able to show their certification anytime they are on the project.

b. Duties.

(1) Prepare the TCPs and public notices and coordinate highway traffic control operations between the Project Superintendent and the Engineer.

(2) Physically inspect the condition and position of all highway traffic control devices used on the project at least once each day and once each night. Ensure that highway traffic control devices work properly, are clean and visible, and conform to the approved TCP. Complete and sign a detailed written report of each inspection on the form provided by the Engineer within 24 hours.

(3) Supervise the repair or replacement of damaged or missing highway traffic control devices.

(4) Review and anticipate highway traffic control needs. Make available proper highway traffic control devices necessary for safe and efficient traffic movement.

(5) Review work areas, equipment storage, and traffic-safety material handling and storage.

(6) Hold traffic safety meetings with superintendents, foremen, subcontractors, and others as appropriate before beginning construction, prior to implementing a new TCP, and as directed. Invite the Engineer to these meetings. Conduct monthly open house public meetings to discuss the TCP and construction phasing.

(7) Supervise all highway traffic control workers and highway flaggers.

(8) Certify that all highway flaggers are certified as required by subsection 710-3.4c. Submit a copy of all highway flagger certifications to the Engineer.

MATERIALS

710-2.1 Provide highway traffic control devices meeting the following requirements:

a. Signs. Use signs, including sign supports, that conform to Section P-661, the ATM, the ASDS, and AASHTO M 268. Make orange background signs from sheet aluminum, and use Type II or Type III orange reflective background sheeting on projects advertised before 1/01/2007, or use Type VIII or Type IX fluorescent orange reflective background sheeting at any time.

(1) Construction Signs: Regulatory, guide, or construction warning signs designated in the ASDS.

(2) Permanent Construction Signs: As designated on the Plans or an approved TCP.

(3) Special Construction Signs: All other signs are Special Construction Signs. Neatly mark the size of each sign on its back in 3-inch black numerals.

b. Portable Sign Supports. Use wind-resistant sign supports with no external ballasting. Use sign supports that can vertically support a 48 X 48 inch highway traffic control sign at the height above the adjacent roadway surface required by the ATM.

c. Barricades and Vertical Panels. Use barricades and vertical panel supports that conform to the ATM. Use Type III Barricades at least 8 feet long. Use reflective sheeting that meets AASHTO M 268 Type II or III.

d. Warning Lights. Use Type A (low intensity flashing), Type B (high intensity flashing) or Type C (steady burn) warning lights that conform to the ATM.

e. Drums. Use plastic drums that conform to the requirements of the ATM. Use reflective sheeting that meets AASHTO M 268 Type II or III.

f. Traffic Cones and Tubular Markers. Use reflectorized traffic cones and tubular markers that conform to the requirements of the ATM. Use traffic cones and tubular markers at least 28 inches high. Use reflective sheeting that meets AASHTO M 268 Type II or III.

g. Plastic Safety Fence. Use 4 foot high construction orange fence manufactured by one of the following companies, or an approved equal:

(1) "Safety Fence" by Services and Materials Company, Inc., 2200 South "J" Street, Elwood, Indiana, 46036. Phone (800) 428-8185.

(2) "Flexible Safety Fencing" by Carsonite, 1301 Hot Springs Road, Carson City, Nevada, 89706. Phone (800) 648-7974.

(3) "Warning Barrier Fence" by Plastic Safety Systems, Inc. P.O. Box 20140, Cleveland, Ohio, 44120. Phone (800) 662-6338.

h. Flagger Paddles. Use flagger paddles with 24 inches wide by 24 inches high sign panels, 8 inch Series C lettering (see ASDS for definition of Series C), and otherwise conform to the ATM. Use reflective sheeting that meets AASHTO M 268 Type VIII or IX. Use background colors of fluorescent orange on one side and red on the other side.

710-2.2 CRASHWORTHINESS. Submit documentation, that all highway traffic control devices conform to the requirements of National Cooperative Highway Research Program (NCHRP) Report 350 (Test Level 3).

CONSTRUCTION METHODS

710-3.1 GENERAL CONSTRUCTION REQUIREMENTS. Keep the work, and portions of the project affected by the work, in good condition to accommodate traffic safely. Provide and maintain highway traffic control devices and services on and off of airport property within the highway traffic control zone, day and night, to guide traffic safely.

Unless otherwise provided in this Section, keep all roadways, business accesses, and pedestrian facilities open to traffic. Obtain the Engineer's approval before temporarily closing residential, commercial, or street approaches. Provide access through the project for emergency vehicles and school and transit buses. Properly sign and/or flag all locations where you must redirect or stop the traveling public.

Stop your equipment at all points of intersection with the traveling public unless an approved TCP shows otherwise.

Operate flood lighting at night according to the ATM. Adjust flood lighting so that it does not shine into oncoming traffic.

Provide and maintain safe routes for pedestrians and bicyclists through or around highway traffic control zones at all times, except when regulations prohibit pedestrians or bicyclists.

Immediately notify the Engineer of any traffic related accident that occurs within the highway traffic control zone as soon as you, an employee, or a subcontractor becomes aware of the accident.

710-3.2 ROADWAY CHARACTERISTICS DURING CONSTRUCTION. Obtain an approved TCP before reducing existing roadway lane and shoulder widths before starting construction. Maintain a clear area with at least 2 feet between the edge of traveled way and the work area. Use barricades, traffic cones, or drums to delineate this area. Place highway traffic control devices on the work side of the clear area. Space them according to the ATM.

If you are allowed to maintain traffic on an unpaved surface, conduct construction to provide a smooth and even surface that public traffic can use at all times. Properly crown the roadbed surface for drainage. Before beginning other grading operations, place sufficient fill at culverts and bridges to permit traffic to cross smoothly and unimpeded. Use part-width construction techniques when routing traffic through roadway cuts or over embankments under construction. Excavate the material or place it in layers. Alternate construction activities from one side to the other. Route traffic over the side opposite the one under construction.

You may detour traffic when the Plans or an approved TCP allows it. Maintain detour routes so that traffic can proceed safely. When detours are no longer required, obliterate the detour. Topsoil and seed appropriate areas.

If you cannot maintain two-way traffic on the existing roadway or detour, you may use half-width construction or a road closure if it is shown on an approved TCP. Make sure the TCP indicates closure duration and conditions. Schedule roadway closures so you do not delay school buses and peak-hour traffic. For road closures, post closure-start and road-reopen times at the closure site, within view of waiting traffic.

710-3.3 PUBLIC NOTICE. Make sure the Worksite Traffic Supervisor gives notices of major changes, delays, lane restrictions, or road closures to local officials and transportation organizations, including but not necessarily limited to:

- **a.** Local Police Department
- **b.** Local Fire Department
- **c.** Local Government
- **d.** School and Transit Authorities
- **e.** Local Emergency Medical Services
- **f.** Local Media (newspapers, radio, television)

g. U.S. Postal Service
h. Major Tour Operators

710-3.4 HIGHWAY TRAFFIC CONTROL DEVICES. Before starting construction, erect permanent and temporary highway traffic control devices required by the approved TCPs. Use highway traffic control devices only when they are needed. The Engineer will determine advisory speeds when necessary.

During hours of darkness when required by the approved TCP use flashing warning lights to mark obstructions or hazards and steady-burn lights for channelization.

Use only one type of highway traffic control device in a continuous line of delineating devices, unless otherwise noted on an approved TCP. Use drums or Type II barricades for lane drop tapers.

During non-working hours and after completing a particular construction operation, remove all unnecessary highway traffic control devices. Store all unused highway traffic control devices in a designated storage area, which does not present a nuisance or visual distraction to traffic. If sign panels are post mounted and cannot be readily removed, cover them entirely with either metal or plywood sheeting.

Keep signs, drums, barricades, and other devices clean at all times.

Use only highway traffic control devices that meet the requirements of the "Acceptable" category in ATSSA "Quality Standards for Work Zone Traffic Control Devices".

Immediately replace any devices provided under this Section that are lost, stolen, destroyed, inoperable or deemed unacceptable while used on the project.

All items paid under this Section remain your property unless otherwise stated. Remove them after completing the project.

a. Embankments. Install plastic drums, barricades, tubular markers, plastic safety fence, and cones as specified on the Plans or TCPs to delineate open trenches, ditches, other excavations and hazardous areas when they exist along the roadway for more than one continuous work shift.

b. Fixed Objects. Use flashing warning lights on all vehicles when they are working within 15 feet of the edge of traveled way. Use emergency flashers, flashing strobes or rotating beacons.

Locate private vehicles, idle construction equipment, construction material stockpiles and other items deemed by the Engineer to be fixed objects at least 30 feet from the edge of traveled way at all times. Do not park equipment in medians.

If you cannot meet the preceding restrictions because of land features or lack of right-of-way, park equipment as far away as practical but at least 15 feet from the edge of traveled way, as approved by the Engineer. Use drums or Type II barricades with flashing warning lights to delineate parked equipment. These highway traffic control devices are subsidiary.

c. Highway Flagger. Furnish trained and competent highway flaggers and all necessary equipment, including lighting of the highway flagger position during nighttime operations, to control traffic through the highway traffic control zone. The Engineer will approve each highway flagger operation before it begins and direct adjustments as conditions change.

Highway flaggers must be certified by one of the following:

(1) Flagging Level I Certification by IMSA
(2) Flagger Certification by ATSSA

Acceptable substitutions for items (1) and (2) are certified ATSSA Worksite Traffic Supervisors, IMSA Work Zone Traffic Safety Specialists, IMSA Signs and Markings Specialists and ATSSA Flagger Instructors.

Renew highway flagger training and certification no less frequently than every 4 years. Highway flaggers must be able to show their flagger certification anytime they are on the project.

Highway flaggers must maintain their assigned posts at all times, unless another qualified highway flagger relieves them, or you no longer need to flag traffic. Remove, fully cover, or lay down flagger signs when no highway flagger is present. Keep the highway flaggers' area free of encumbrances, such as parked vehicles, so that highway flaggers can be seen easily.

Provide approved equipment for two-way radio communications between highway flaggers when they are not in plain, unobstructed view of each other.

d. Watering. Furnish, haul, and place water for dust control, as directed. Use water trucks that can provide a light-water spray to control dust. The Engineer will control water application.

If you take water from a lake, stream, or other natural water body, first obtain a water removal permit from the Alaska Department of Natural Resources. Comply with the Alaska Department of Fish and Game screening requirements for all water removal operations.

710-3.5 AUTHORITY OF THE ENGINEER. When the Engineer believes existing conditions may adversely affect the traveling public's safety and/or convenience, you will receive a written notice. The notice will state the defect(s), the corrective action(s) required, and the time required to complete such action(s) not to exceed 24 hours. If you fail to take corrective action(s) within the specified time, the Engineer will immediately close down the offending operations until you correct the defect(s). The Engineer may require outside forces to correct unsafe conditions. The cost of work by outside forces will be deducted from any monies due under the terms of this Contract.

710-3.6 HIGHWAY TRAFFIC PRICE ADJUSTMENT. A Highway Traffic Price Adjustment, under Item G-710c, will be assessed for unauthorized lane closures or lane reductions. Highway Traffic Price Adjustments are liquidated damages representing highway user costs. The Highway Traffic Price Adjustment Rate is a deduction from the Contract amount of $30 per minute for unauthorized lane closure or lane reduction, per lane.

Authorized lane closures and/or lane reductions are those shown in the Contract, an approved TCP, or authorized in writing. Unauthorized lane reductions include unacceptable driving surfaces, such as severe bumps, ruts, washboarding, potholes, excessive dust or mud, and non-conforming, dirty, or out of place highway traffic control devices. The Engineer will make the sole determination as to whether the roadway, trail, or pedestrian facility is acceptable for full unimpeded use by the public. Failure to maintain an acceptable infrastructure or highway traffic control plan will result in a price adjustment equal to 100 percent of the Highway Traffic Price Adjustment Rate, for the time the roadway, trail, or pedestrian facility is in an unacceptable condition.

710-3.7 MAINTENANCE OF TRAFFIC DURING SUSPENSION OF WORK. Approximately one month before you suspend work for the season, schedule a preliminary meeting with the Engineer to outline the work you expect to complete before shutdown and the anticipated roadway condition. Schedule a field review with the Owner for winter maintenance acceptance. At the field review the Engineer will prepare a punch list for implementation before acceptance.

To be relieved of winter maintenance responsibility, leave all roads with a smooth and even surface for public use at all times. Properly crown the roadbed surface for drainage and install adequate safety facilities.

After the project is accepted for winter maintenance and until you are ordered to resume construction operations, the Owner is responsible for maintaining the facility. The Owner will accept maintenance

responsibility only for portions of the work that are open to the public, as determined by the Engineer. The Owner will not accept maintenance responsibility for incomplete work adjacent to accepted roads. You are responsible for maintaining all other portions of the work. The Engineer will issue a letter of "Acceptance for Winter Maintenance" that lists all portions of the work that the Owner will maintain during a seasonal work suspension. You retain all contractually required maintenance responsibilities until you receive this letter.

If you suspend work due to unfavorable weather (other than seasonal) or due to your failure to correct unsafe conditions, carry out Contract provisions, or carry out the Engineer's orders, you must bear all costs for highway traffic maintenance during the suspended period.

When you resume work, replace or renew any work or materials lost or damaged during temporary use. If the Owner caused damage during winter suspension, payment will be made for repairs by unit pay item or in accord with Subsection GCP-90-05, Compensation for Extra Work. When the Engineer directs, remove any work or materials used in the temporary maintenance. Complete the project as though work has been continuous.

710-3.8 CONSTRUCTION SEQUENCING. The construction sequencing is detailed in these provisions, the Special Provisions, and the Plans. You may propose alternative construction sequencing.

Throughout the project, maintain the existing roadway configuration (such as the number of lanes and their respective widths) except for restrictions to traffic allowed in the Special Provisions or on the Plans, and addressed through approved TCPs. A restriction to traffic is any roadway surface condition, work operation, or highway traffic control that reduces the number of lanes or impedes traffic. Obtain an approved TCP before restricting traffic.

Obtain the local school bus schedule and coordinate your work to ensure the school buses are not delayed through the highway traffic control zone. Submit this plan, as a TCP, to the Engineer for approval before implementation.

710-3.9 INTERIM PAVEMENT MARKINGS – RESERVED.

710-3.10 LIGHTING OF NIGHT WORK – RESERVED.

710-3.11 HIGH VISIBILITY GARMENTS. Ensure all workers within the highway traffic control zone wear outer garments that are highly visible and comply with the following requirements:

a. Tops. Wear fluorescent orange-red vests, jackets, or coverall tops at all times. Furnish each vest, jacket and coverall top with at least one 360-degree horizontal retroreflective band around the torso; and with two vertical retroreflective bands that begin at the horizontal band or lower in front, reach over the shoulder, and end at the horizontal band or lower in back. Furnish each jacket and coverall top with two horizontal retroreflective bands on each sleeve; one above and one below the elbow.

b. Bottoms. Wear fluorescent orange-red pants or coverall bottom during nighttime work (sunset to sunrise). Worksite traffic supervisors, employees assigned to highway traffic control duties, and flaggers wear fluorescent orange-red pants or coverall bottom at all times. Furnish each pants or coverall bottom with two horizontal retroreflective bands on each leg.

c. Raingear. Raingear tops and bottoms, when worn as the outer visible garment, conform to the requirements listed in this Subsection 710-3.11.

d. Exceptions. When workers are inside an enclosed compartment of a vehicle, they are not required to wear high visibility garments.

e. Standards. All high visibility garments conform to the requirements of ANSI/ISEA 107-2004, Class 2 for tops or Class E for bottoms, and Level 2 retroreflective material.

Retroreflective bands are made of material conforming to either:

(1) A two inch wide strip, fluorescent yellow-green color, made of retroreflective microprisms; or

(2) A two inch wide strip, silver color, made of retroreflective lenses bonded to a durable cloth backing; and on two long edges apply one inch wide strips, fluorescent yellow-green color, made of durable cloth material. Total width of band is 4 inch.

f. Labeling. Garments are labeled in conformance with Section 11.2 of ANSI/ISEA 107-2004; except you may use garments labeled in conformance with ANSI/ISEA 107-1999 until 1/1/08.

g. Condition. Furnish and maintain all vests, jackets, coveralls, rain gear, hard hats, and other apparel in a neat, clean, and presentable condition. Maintain retroreflective material to Level 2 standards.

h. Subsidiary. Payment for high visibility garments for workers is subsidiary to other items.

710-3.12 OVERSIZE AND OVERWEIGHT VEHICLES. Comply with the legal size and weight regulations of 17 AAC 25 and all restrictions of the *Administrative Permit Manual*, except when the Owner waives the requirements.

The engineer will waive the permit requirements of regulation 17 AAC 25 regarding oversize and overweight vehicles provided that the contractor submits and follows an approved Highway Traffic Control Plan.

Submit a highway traffic control plan for hauling operations from the material site(s) to the project. Include all the highway traffic control devices required for these operations in the highway traffic control plan. Indicate the type, number and frequency of oversize and overweight hauling equipment.

The following items are required of oversize or overweight vehicles or equipment:

a. Truck and equipment headlights must be on at all times during vehicle use;

b. A roof mounted flashing or rotating amber beacon, visible from 360 degrees, must be on during vehicle use;

c. For overweight street legal vehicles, mount clearly visible oversize signs on front and rear of vehicle; and

d. For oversize equipment and/or overweight non-street legal equipment, mount 16” X 16” clean red/orange flags on the outboard points, in addition to clearly visible oversize signs on front and rear of equipment.

When oversize or overweight vehicles are used, add the following to the Highway Traffic Control Plan:

a. Install and maintain orange plastic safety fence that separates the haul route from any adjacent school, business, residence, community center or public gathering place;

b. Furnish highway flaggers as specified by the Highway Traffic Control Plan, and at additional locations where necessary, to control the haul route during all hauling operations. Coordinate their placement with the Engineer. Haul route highway flaggers will be in addition to airport flaggers required by FAA Advisory Circular150/5370-2E, and the Construction Safety Plan;

c. Limit haul unit speed to 10 mph when passing through any developed area or significant hazard. The Engineer is sole judge of what constitutes a developed area or significant hazard;

d. Obey bridge load restrictions and all height restrictions on haul route;

e. Maintain the haul route in a smooth and dust free condition. Remove all haul debris from the roadway and the surroundings;

f. When overweight loads are hauled over existing pavement, remove the existing pavement and replace with new pavement of similar material and equal thickness to old pavement, as a subsidiary cost, after the haul is finished;

g. Hauler is responsible for the costs of repair for damage to the highway structures, including but not limited to the bridge railings, guardrail, light poles, signs, signal, highway traffic control devices, utilities, and mailboxes on the roadways;

h. Immediately reinstall all signs, signals, guardrail and other safety features that were removed for the haul; and

i. If mailboxes were removed for the haul, reinstall mailboxes by the next day after the haul.

j. Maintain a minimum 12 foot lateral separation between the nonstreet legal vehicles and the motoring public. Specify the highway traffic control devices required for these operations in the highway traffic control plan.

METHOD OF MEASUREMENT

710-4.1 Section GCP-90 and as follows. Quantities will not be measured during winter suspension of work.

Highway Traffic Maintenance will not be measured for payment.

BASIS OF PAYMENT

710-5.1

a. Highway Traffic Maintenance. The contract price includes all resources required to provide the Worksite Traffic Supervisor, all required TCPs and public notices, monthly open house meetings, the Construction Phasing Plan, and the maintenance of all roadways, approaches, crossings, intersections and pedestrian and bicycle facilities, as required. This item also includes any Highway Traffic Control Devices required but not shown on the bid schedule.

Items required by the Contract that are not listed on the bid schedule or not included in other items are subsidiary to Item G-710a Highway Traffic Maintenance

Payment will be made under:

Item G-710a Highway Traffic Maintenance – per lump sum

ITEM L-100 RUNWAY AND TAXIWAY LIGHTING

DESCRIPTION

100-1.1 This item consists of furnishing and installing runway and taxiway lighting systems as indicated on the Plans and as specified herein. Remove the existing and provide new runway edge and centerline lighting as shown. Remove the existing taxiway lights and replace them with new as shown. Remove the existing lighted signs and replace them with new lighted signs as shown. Provide Runway Guard lights as shown if alternate is awarded. Provide temporary lighting as shown and as required. Provide all other work shown on the drawings that is covered under the bid items for this specification.

Perform all work necessary to the above systems to make them fully functional and operational at the completion of the work performed under this section.

Remove all unused or replaced portions of the above systems as shown on the drawings.

Furnish all labor, equipment, supplies and materials and perform all operations necessary to complete the work described in this section and work shown on the plans which is covered under this section of the specifications. All work shall comply with the applicable FAA advisory circulars, the National Electrical Code (NEC), National Electrical Safety Code (NESC), and any applicable National Fire Protection Association (NFPA) codes.

100-1.2 This item also includes furnishing and installing L-829 constant current regulator in accordance with these specifications. And it shall include all circuit breakers, wire and cable connections, the furnishing and installing of all necessary raceways and fittings, and all necessary mounting structures. It shall also include the testing of the installation and all incidentals necessary to place the CCRs in operation as completed units to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

100-2.1 GENERAL. Obtain approval of all materials and equipment to be used or incorporated in the work, prior to their shipment to the project site. Submit to the Engineer 5 complete listings of materials and equipment specified herein and on the Plans. Clearly identify the material or equipment by item, name, or designation used on the Plans or specifications and indicate where specified. Include applicable catalog numbers, cuts, wiring diagrams, performance data, and operation and maintenance manuals. Neatly bind and clearly index the submittals. In addition, when specified, include in the submittals certificates of compliance, manufacturer's instructions and/or shop drawings, or proposed construction or installation procedures. The submittal information for any item may not be submitted separately from the bound submittals. All materials for all electrical items (L-100, 107, 108, 110, 130, 132, & 171) shall be submitted in the same bound submittal set for L-100, 107, 108, 110, 130, 132, & 171. If there are more pages than one binder can hold, the submittal shall be split into volumes of more than one binder. If any submittal material in any volume is rejected, all of the volumes have to be resubmitted as one group. Re-submittals and individual submittals shall not be provided as separate sheets, but shall be included in the bound submittals.

a. **Certified Airport Lighting Equipment.** The following items shall conform to the applicable FAA specifications, except as shown on the Plans and/or modified herein. The equipment shall be certified and listed under AC 150/5345-53, Airport Lighting Equipment Certification Program. This AC, the latest certified equipment list, and the address list of certified airport lighting equipment manufacturers are available on the Internet page for the FAA Office of the Associate Administrator for Airports (ARP). The internet address is http://www.faa.gov/airports_airtraffic/airports/construction/

(1) Constant Current Regulator, L-829, class, style, and size as indicated on Plans, 60 Hz input, with brightness control for remote operation. The L-829 shall be Ferroresonant and shall be 6.6A, 5-step, power rating as shown on the Plans; with an input voltage of 480Vac. The remote control voltage shall be 120Vac.

Output current levels shall be maintained within ±3% at any intensity step. Nominal output current levels shall be maintained even when 30% of the isolation transformers have open secondaries. If input power loss occurs, operation shall resume within five seconds after restoration of input power. The input power factor shall be 0.99 minimum for 4kW to 30kW CCRs. The efficiency shall be 90% minimum for 4kW to 20kW CCRs, and 92% efficiency for 30kW CCRs.

Each CCR shall include a Distributed Control and Monitoring Device (DCME) on the front door to provide an integrated control and monitoring package. The DCME on each CCR shall be equipped with a front-mounted output current digital indicator with an accuracy of ±2 percent. The DCME shall perform all FAA L-829 monitoring functions including measurement of True RMS CCR output current and voltage, detection of lamps-out, loss of input power, incorrect current, overcurrent and open-circuit. The DCME shall also be capable of displaying CCR output wattage and VA. The DCME front panel digital display shall be capable of alternately showing all monitored parameters. In case of system failure, the DCME shall include remote control latching relays that allow the CCR to stay either in the last selected state or to revert to a preset state. 5345-10

(2) Runway Edge Marker Light, Bi-directional High Intensity Edge light and Threshold light with 120-watt quartz lamp (edge light) or 200-watt quartz lamp (threshold light) and color lens as shown. Complete with support column, frangible coupling, and upper plug and cord assembly. Overall mounting height shall be 24". Breaking point of frangible coupling shall be no more than 1-1/2" above grade. The light lens assembly shall be constructed to allow the lens to be opened by loosening a wing nut only and swinging the lamp away via a hinge to allow the lamp to be changed. The lens shall not use a clamp band or any other loose parts. The light shall be leveled on a gimbal. No tools shall be required to change a lamp. The support column size shall be I inch in diameter and shall mount into the cover plate with a two inch threaded hole. 5345-46

(3) Taxiway Edge Light, Medium Intensity, L861T, with LED 6.6 A lamp, heater and Lexan lens, with 1" support column, 2" metal frangible coupling with stainless steel hex head set screws, and upper plug and cord assembly with separable connector. 5345-46

(4) Airport Signs, L-858, internally lightedwith legend size, style, and class as indicated on the plans. 5345-44

(5) Airport Light Base, L-867, transformer housing, Class I, hot dipped-galvanized steel Size B, 24 inches deep, one piece with internal grounding lug, gasket, steel cover, base extension, drain opening, and conduit. Provide 6" drain hole offset so edge of hole is one inch from side wall of base, gasket, Hot dipped-galvanized steel cover, and conduit holes with grommets as indicated on the plans and as required. The drain hole shall be drilled by the manufacturer prior to hot dip galvanizing the light base. 5345-42

(6) Airport Light Base, L-868, transformer housing, Class I, hot dipped-galvanized steel, Size B, 12 inches deep, two section light base assembly (sizes as shown on drawings) with grooved and "O" ringed flange ring with concrete ring. Complete with any necessary spacer rings, internal grounding lug, mud plate, anti-rotational fins and conduit hubs. 5345-42

(7) Isolating Transformer, L-830, individual lamp type, series-to-series, 5000 V, 6.6 A to 6.6 A, 30/45 W or 200 W. Provide a 30/45 watt transformer with taxiway edge lights and a 200 watt transformer with runway edge or threshold lights. Provide transformers for airport signs as required by sign per manufacturer's recommendations. 5345-47

(8) Radio Control Equipment, L-854, Type I, with enclosure for surface mounting, antenna and feedline and set to the Common Traffic Advisory Frequency (CTAF) for the project airport as found in the Alaska Supplement of the U.S. Government Flight Publication. 5345-49

(9) Flush Runway Light Fixture, Uni or Bi-Directional, Type L-850A,850C, 850D or L-850E, Class 2, Mode 1, Style 3, as indicated, with 1/4 inch or less clearance above finish surface, with 1,500 watt halogen lamps (size per manufacturer), color filters, a single 200 W transformer, plug and cord assembly, 1/2-inch watertight connector, stainless steel bolts, vibration proof fasteners, "Dry" system with the optical assembly sealed above and below with "O" rings. . Provide lights with a light channel to protect prisms from damage and prevent rubber buildup. Provide inner and outer lens color for each light per the Plans and as required per FAA guidelines. 5345-46

(10) Primary Handhole, L-868, class 1, size B, hot dipped-galvanized steel, , 24 inches deep x 12 inches diameter, conduit holes with grommets as shown on the plans and as required,1-3/8 inch N.P.T. conduit hubs (with number and location of hubs as indicated, 6 inch bottom drain hole, steel cover and gasket, internal ground lug with connector and other misc. items. Handhole and cover shall be suitable for vehicle and aircraft wheel loading. 5345-42

(11) Wind Cone Primary Handhole, L-867, class 1, size D, steel, 24 inches deep x 16 inch diameter, one piece with internal ground lug with connector, hot dipped-galvanized steel cover with gasket, 6 inch drain hole, conduit holes with grommets as shown on the plans and as required, and other misc. items . and materials as required. 5345-42

(12) Temporary Lighting System, Provide a complete temporary lighting system to include edge lighting, and distance to remain signs compliant with applicable FAA Advisory Circulars (AC's). Temporary runway distance to remain signs shall comply with applicable FAA AC's. Provide sand bags and/or other means to secure signs and lights in position. Provide cabling, and all necessary connections to power temporary lighting system. Power system from existing runway edge lighting system or other contractor supplied source.

(13) Elevated Runway Guard Light, L-804, LED, average LED life 56,000 hours under high-intesity conditions and more than 150,000 hours under typical opwerating conditions. Current driven 60Hz with internal flash controller.

(14) Flush Runway Guard Light, L-852G, LED, Style 3 with 1/4 inch or less clearance above finish surface, current driven 60Hz, with synchronous circuitry for autonomous use without monitoring.

b. Sealer. Adhesive sealant shall be a self-leveling silicone sealer.

e. Regularly Used Commercial Items. All other regularly used commercial items of electrical equipment not covered by FAA equipment specifications shall conform to the applicable NEMA rulings and standards for equipment of its type. All electrical equipment not covered by FAA equipment specifications shall be UL listed where standards have been developed by that company

f. Lock Washers. Lock washers shall be two piece cam-type lock washer.

h. Lubricant and Sealant. Lubricant and sealant shall be a general purpose "O"-ring and valve lubricant. Temperature range shall be -40 °F to +400 °F.

i. Soft Gasket. Gaskets to be installed between the base plate and base in watertight lighting systems shall be soft neoprene.

j. Pedestals. The power and communications pedestals shall be fiberglass enclosures constructed to meet the requirements of ANCI C 57.12.28 Standard for Pad-mounted Equipment Enclosure Integrity, an attachment to ANSI C 37.72. Construction details and overall dimensions shall be according to the Plans.

k. Junction Box, Type II. Junction boxes shall be pre-cast reinforced concrete boxes of the size and details shown on the Plans. Junction boxes shall have metal covers. The covers shall be effectively grounded with a 3-foot copper braid.

l. Concrete. Conform to Item P-610 Structural Portland Concrete.

m. Hot Mix Asphalt (HMA). Conform to Item P-401.

n. Washed Rock. Use aggregates that meet the requirements of P-610-2.2, except meet AASHTO M 43, Number 67, for ¾" minus.

o. Crushed Aggregate Base Course. Use material that meets the requirements P-209, and gradation D-1.

CONSTRUCTION METHODS

100-3.1 GENERAL. All work in connection with the airport lighting system shall be according to the applicable provisions of the current NEC of the National Fire Protection Association and all State and local codes. Location of all new fixtures, conduit, cables, etc., shall be as shown on the Plans.

Level and align light fixtures according to manufacturer's instructions. Level to within 1 degree. Align to within 1/2 inch at right angles to centerline and to within 1 inch parallel to centerline.

Where electrical cable or duct is required, such work will be covered under Item L-108 or L-110, as applicable.

Where remote relay assembly and/or remote control panel is required, such work will be covered under item L-109.

The L-829 shall be mounted in the vault at the location shown on the plans.

Provide all labor, materials, systems, equipment, facilities, and other incidental items as may be required to provide temporary electrical power for construction and testing of all contract work.

All equipment shall be installed per the manufacturer's recommendations, per the applicable FAA advisory circulars, per these specifications and as shown on the drawings.

All joints between metal and concrete shall be sealed with a sealant meeting Federal Specification TT-S-001543A – Sealing Compound, Silicone Rubber Base – Class A, Non-Sag. Product shall be DOW Corning 888 Silicone Highway Joint Sealant with 35888 Primer on metal, painted, or epoxy painted surfaces, or approved equal.

Clean all construction debris from all light bases, hand holes, and all other equipment.

Washed rock shall be mechanically compacted in lifts no greater than 8 inches in thickness, to the satisfaction of the Engineer.

Crushed aggregate base course shall be placed and compacted to 100% as specified in P-209.

100-3.2 INSTALLATION OF NON-WATERTIGHT EDGE LIGHTS. The light base shall be placed on a layer of bedding material as shown on the plans.The Contractor shall construct the backfill according to the specifications for the material in which the conduit is placed. The material shall be compacted to the requirements of the material into which it is placed. The light base shall be placed so the light cover plate bolts are ¼" below finished grade. When lights are installed in a sloped section of runway the highest edge of fixture shall be 1/4" below finished grade. The base shall be level to within ±1/16" inch.

Connect the insolating transformer with L-823 connector kits and heat shrink tubing. Ensure that all field installed primary cable connectors have the plug pin connectors and receptacle socket connectors properly positioned within their respective connector bodies, as detailed by the connector manufacturer, prior to the shrinking of heat shrink tubing at the cable-connector interface.

Install isolating transformers in the light bases as shown on the Plans. Where called for on the Plans, ty wrap transformer to light base lid.Provide adequate primary and secondary cable slack in each light base to assure that all connectors can be lifted at least 12 inches above the top of the light base without subjecting the connector to tension.

Label each edge light assembly with the letter and number designation as indicated on the Plans. Label by permanently die-stamping the letter and number designation onto the light base and base cover plate with 1/4 inch figures.

Install the light fixtures with stainless steel hardware and coat the bolts and frangible couplings with a suitable corrosion inhibitor prior to being installed. Install the light fixtures with lamp, clean the lenses, align and adjust each optical system according to the manufacturer's instructions.

The light base shall be connected to the grounding system as shown on the drawings. The edge lights shall be located where shown on the plans. A laser or survey equipment shall be used to position the lights per the tolerances specified.

100-3.3 INSTALLATION OF FLUSH LIGHTS. Install flush light fixtures according to the Plans and specifications.

Install flush runway edge and centerline light fixtures as shown on the drawings. Two different methods are to be used based upon the location of the light. If the light is being installed in an existing asphalt location (runway 08, taxiways C, D, &F), sawcut the existing asphalt as shown. Use the existing asphalt and angle iron to support the setting jig. If the light is being installed in new asphalt (taxiways B, E, G, and runway 26), use the crushed aggregrate base course to support the setting jig.

Core a minimum diameter of 36 inches and remove the base course material to the depth shown. Compact the bottom of the cored hole before pouring concrete.

Use a setting jig to install the bottom section of the light base assembly, as shown in the Plans. The bottom of the light base shall be at least 12 inches above the bottom of the excavation. Provide grommeted conduit holesfor the bottom section of the light base, as shown on the Plans. Connect the bottom section of the light bases to the rigid steel conduit system, using rubber grommets or waterproof nipples and couplings.

Call for inspection of the light base assembly prior to the backfilling of the excavations. Backfill with poured PCC meeting the requirements of Item P-610. Fill the excavation only to the level shown. See plans for the thickness of asphalt pavement over the PCC and over the light base mudplate.

After the PCC has cured at least 72 hours and has reached 3000 psi strength, apply sonneborn KURE-N-HARDEN curing agent to all concrete. Do not finish concrete. Apply tack coat and overlay with Asphalt Concrete Pavement.

Plug the conduit ends during the course of construction to prevent accumulation of water or debris in the conduit.

When ready to install the inset lights, determine the location of the light base and drill a small diameter core hole to locate the center of the mud plate. Next, drill a 16 inch diameter core hole over the center of the mud plate (± 1/4 inch). Use a coring machine of adequate stability to prevent "wobble". After removing the core, mud plate, plywood cover, and any water or debris that has accumulated, apply a thin layer of self-leveling silicone sealer between the bottom flange of the top section and the top flange of the bottom section and bolt the top section using 18-8, 410, or 416 stainless steel all-thread bolts. Coat the bolts with a suitable corrosion inhibitor prior to installing. Use two-piece cam-type lock washers and torque the bolts to 180 inch-pounds or as recommended by the manufacturer.

Make a "dry system" light fixture installation, using a grooved flange ring, "O" ring, and concrete ring. If the actual elevation of the pavement overlay does not equal the estimated elevation, provide spacer rings or flange rings of different thickness. Bolt the fixture to the top section using 18-8, 410, or 416 stainless steel bolts. Coat the bolts with a suitable corrosion inhibitor prior to installing. Use two piece cam-type lock washers, and torque the bolts to 180 inch-pounds, or as recommended by the manufacturer. Set the outboard edge of the fixture 1/4 to 3/8 inch below the adjacent finished pavement.

Install the light fixtures per the Plans and the specifications and the manufacturers recommended procedure. Do not deviate from these procedures, or the materials shown or specified, without the prior approval of the Engineer.

100-3.5 INSTALLATION OF CCR. The CCR shall be calibrated according to the manufacturer's instructions using a True RMS meter. An open-circuit test, conducted according to the manufacturer's instructions, shall also be performed. The CCR shall then be fully tested by continuous operation for not less than 24 hours prior to acceptance. The test shall include operating the constant current regulator in each step (Local and Remote) not less than 10 times at the beginning and end of the 24-hour test.

100-3.6 INSPECTION. Notify the Engineer in writing and request inspection at least 48 hours prior to installing lighting fixtures, making any splices, or covering any buried or concealed work. Immediately correct any deficiencies found during the inspection.

100-3.7 RECORD DOCUMENTS. Maintain at the project site a complete set of contract Plans, specifications and approved changes thereto. In addition to the above, 2 complete sets of electrical plans shall be maintained for as-built purposes upon which all changes, connections, part numbers and conductor routings shall be legibly shown and noted. Where changes to Plans are involved, make notations to show the dates and authorities approving the changes. Permanently store one set of annotated electrical plans in a dry, secure location at the project site. Deliver the second set to the Engineer.

As-built plans shall show locations of all buried items such as conduit, including any existing active lines encountered. All dimensions shall be from runway and taxiway centerlines or other permanent objects. As-built plans shall include complete wiring diagrams, (both power and control), identifying terminals, cables, and connections. As-built plans shall be kept current as the work progresses.

100-3.8 GUARANTEE. Furnish a written guarantee that any materials or workmanship found defective within one year of final acceptance shall be replaced at no additional cost to the Department, promptly upon notification and to the satisfaction of the Engineer.

100-3.9 TESTING. Furnish all necessary labor, equipment and appliances for testing all material and equipment as specified herein. No work will be accepted until all applicable tests have been performed. Tests shall not begin until the work has been approved by the Engineer. All tests shall be neatly tabulated on a reproducible "Test Sheet" which shall be signed and dated by the Contractor upon completion of the test. Test and demonstrate to the Engineer the following:

a. That all lighting, power, and control circuits are continuous, and free from short circuits.

b. That all circuits are free from unspecified grounds.

c. That the resistance to ground of all non-ground 5000 V circuits is not less than 50 megohms. Where additions are made to existing circuits, only the new section shall be tested. The resistance to ground of 600 V capacity shall be 10 megohms for the insulation test.

d. That all circuits are properly connected in accordance with applicable wiring diagrams.

e. That all circuits are operable.

100-3.10 INSTALLATION OF LIGHTED AIRPORT SIGNS. All signs shall be powered from a dedicated isolation transformer located in a light base set in the concrete base for the sign. The transformer shall be fed from the nearest taxiway or runway light base as shown on the drawings. All signs shall have frangible couplings on the bases.

100-4.1 METHOD OF MEASUREMENT.

a. Lump Sum. No measurement of quantities will be made.

b. Unit Prices. The quantity to be paid for will be the number of units installed, complete, in place, accepted, and ready for operation, or the number of units acceptably removed.

BASIS OF PAYMENT

100-5.1 ITEMS OF WORK PAID IN OTHER SECTIONS. All work and materials required to install cable, conduit, and ground rods is paid for under Items L-108, and L-110 unless otherwise noted. Cutting and patching of asphalt as required for equipment removal or installation shall be considered subsidiary to the pay items below..

All work and materials required to install remote relay assembly and remote control panel are paid for under item L-109.

100-5.2 ITEMS OF WORK PAID IN THIS SECTION. At the contract lump sum or unit prices for the completed and accepted job.

Refer to Item P-610 for requirements regarding all work and materials to place Portland cement concrete. Portland cement concrete is subsidiary to L-100 items requiring its use.

Refer to Item P-401 for for requirements regarding all work and materials to place Hot Mix Asphalt. Hot Mix Asphalt is subsidiary to L-100 items requiring its use.

Subsidiary work – All work associated with providing the equipment and materials included in this section of the specifications that is not specifically covered in the pay items below shall be considered subsidiary to the pay items below and shall not be paid for separate from the pay items below. This includes any work required to access the area in and across soft ground or muskeg necessary to perform work under this and related items.
All work required during the construction staging and sequencing of this project including disconnecting and reconnecting equipment, temporary power, temporary wiring, temporary lighting, and all other work needed to keep the FAA equipment and the runway and taxiway lighting systems operational during the construction period when the airport is open for operations is considered subsidiary to the pay items below and shall not be paid for separate from the pay items below.

Item L-100b, Regulator, L829: Includes mounting, electrical connection (with all input control and output circuits), painting and stenciling. Size as indicated on Plans.

Item L-100c, High Intensity Runway Edge Light, L-862: Complete, including L-868 base assembly, gasket, cover, frangible coupling, support column, L-830-6, 200 watt isolating transformer, L-823 cable connectors, grounding lug and connector, conduit grommets, trenching, bedding, backfilling, compaction, cutting and removal of existing asphalt pavement if present and re-paving if required, and all necessary incidentals to provide a complete and operable/acceptable runway marker light installation. Existing lights that will be given a new lens shall be included in this pay item.

Item L-100e, Taxiway Edge Light, L-861T: Complete, including L-867 base assembly, gasket, cover, frangible coupling, support column, L-830-1 45 watt isolating transformer, L-823 cable connectors, grounding lug and connector, conduit grommets, trenching, bedding, backfilling, compaction, cutting and removal of existing asphalt pavement if present and re-paving if required, and all necessary incidentals to provide a complete and operable/acceptable taxiway light installation.

Item L-100f, Wind Cone Handhole, L-867, Size D:, L-823 primary and secondary cable connectors, and PA-4 power adapter (when specified on the Plans). Includes steel cover and gasket, grounding lug and conduit grommets, grounding, conduit, trenching, bedding, backfilling, compaction, cutting and removal of existing asphalt pavement if present and re-paving if required, and all necessary incidentals to provide an installed handhole.

Item L-100g, Primary Handhole, L-868, Size B: Includes traffic rated steel cover and gasket, grounding lug and connector. Includes conduit grommets, grounding, trenching, bedding, backfilling, compaction, cutting and removal of existing asphalt pavement if present and re-paving if required, and all necessary incidentals to provide an installed handhole.

Item L-100h, Remove existing airport electrical: Removal of all electrical in project area as shown on drawings. Includes complete removal of all hand holes, runway or taxiway edge or centerline light bases, isolation transformers, and light assemblies including connection to conduit and/or cable. Backfill of light base location. Patching of asphalt and re-striping if required. All locates of existing underground conduit and cable shall be considered incidental to this item. Includes removal of airport signs with concrete bases, and associated light bases. Includes removal of conduit, cable, backfilling of trenches and all other existing electrical equipment and materials that are to be removed. No other payment for removal or re-routing of existing conduit and conductors shall be made outside of this item. Includes re-routing of conduit and conductors, reconnection of cables, connectors as required to reconnect existing circuits so they properly function after removal of a light or sign, etc.Item L-100i, Flush Runway Centerline Light, L-850A: Includes L-868 base assembly, spacer rings, flange ring, steel cover, concrete work, asphalt patching and sealing. Includes cutting of asphalt, grinding of asphalt, trenching, bedding, backfilling, compaction, new concrete, and all other work detailed in the specifications, shown on the plans, and

required to provide an operational/acceptable installation. No other payment for asphalt or cement associated with flush light installation shall be made outside of this pay item.

Item L-100k, Flush Runway Edge and Threshold Light, L-850C, L-850D, or L-850E: Includes L-868 base assembly, spacer rings, flange ring, L830 isolating transformer, L-823 Cable connectors, concrete work, asphalt patching and sealing. Includes cutting of asphalt, grinding of asphalt, trenching, bedding, backfilling, compaction, new concrete, and all other work detailed in the specifications, shown on the plans, and required to provide an operational/acceptable installation. No other payment for asphalt or cement associated with flush light installation shall be made outside of this pay item. Existing lights that will be given a new lens shall be included in this pay item.

Item L-100m, Complete Runway Guard Lighting System (Alternate bid item). This item covers all work associated with the runway guard lighting system including regulator, conduit, conductors, hand holes, elevated runway guard lights, and flush runway guard lights. No payment for conduit or conductors shall be made outside of this pay item. The Elevated Runway Guard Lights, L-804,includes L-867 base assembly, grounding lug and connector, cover, gasket, support column, frangible coupling, 30/45 W L-830-1 isolating transformer, transformer mounting platform (when shown on Plans), and L-823 cable connectors. The flush runway guard lights, L-852G, includes L-868 base assembly, spacer rings, flange ring, L¬830 isolating transformer, L-823 Cable connectors, concrete work, asphalt patching and sealing. Includes cutting of asphalt, grinding of asphalt, trenching, bedding, backfilling, compaction, new concrete, and all other work detailed in the specifications, shown on the plans, and required to provide an operational/acceptable installation. No other payment for asphalt or cement associated with flush light installation shall be made outside of this pay item.

Item L-100n, Airport Sign, Type L-858: Includes sign, L-868 base, frangible couplings, transformer, concrete base, sign faces as shown. Includes concrete pad, conduit with grommet, cabling, L-823 cable connectors, grounding lug and connector, conduit grommets, trenching, bedding, backfilling, compaction, cutting and removal of existing asphalt pavement if present and re-paving if required, and all other work to provide an operational/acceptable sign that is connected to the runway light circuit as shown.

Item L-100r, Temporary Runway Lighting System: Includes all work shown on the drawings and as required to provide a complete temporary lighting system including temporary distance remaining signs and source of power (circuit breakers, conduit, wire, regulator, etc. All conduit, conductors, cabling, splices, connectors, sand bags, trenching, backfilling, is incidental to this pay item. This includes all trenching and backfilling, splices, etc. Also included is all work associated with changing runway and taxiway lighting configurations as required for the during construction and interim stages as shown on the drawings. No other payment for replacing existing light lenses and making other modifications to other existing lighting for the during construction and interim stages will be made outside of this item.

Item L-100ap, Spare Parts: Includes 10 spare runway edge lights, 10 spare taxiway edge lights, 5 spare runway centerline lights, two spare elevated runway guard lights, and 10 spare flush runway guard lights complete with light base, isolation transformer, and connectors.

Payment will be made under:

Item L-100b	Regulator, L-829- per each
Item L-100c	High Intensity Runway Edge Light, L-862 - per each
Item L-100e	Taxiway Edge Light, L-861T - per each
Item L-100f	Wind Cone Handhole, L-867, Size D - per each
Item L-100g	Primary Handhole, L-868, Size B – per each
Item L-100h	Remove existing airport electrical - per lump sum
Item L-100i	Flush Runway Centerline Light, L-850A - per each
Item L-100k	Flush Runway Edge and Threshold Light, L-850C or L-850D- per each
Item L-100m	Complete Runway Guard Lighting System (Additive Alternate No. 1). - per lump sum
Item L-100n	Airport Sign, Type L-858 - per each

Item L-100r	Temporary Runway Lighting System – per lump sum
Item L-100ap	Spare Parts – per lump sum

MATERIAL REQUIREMENTS

AC 150/5345-10	*Constant Current Regulators and Regulator Monitors*
AC 150/5345-42	*Airport Light Bases, Transformer Houses, Junction Boxes and Accessories*
AC 150/5345-44	*Taxiway and Runway Signs*
AC 150/5345-46	*Runway and Taxiway Light Fixtures*
AC 150/5345-47	*Isolation Transformers for Airport Lighting Systems*
AC 150/5345-49	*L-854, Radio Control Equipment*
AC 150/5345-53	*Airport Lighting Equipment Certification Program*
ASTM D 1557	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb Rammer and 18-in Drop

ITEM L-107 WIND CONE

DESCRIPTION

107-1.1 This item shall consist of furnishing and installing lighted airport wind cones in accordance with these specifications and in accordance with the dimensions, design, and details shown in the Plans.

For lighted wind cones, the work shall include the furnishing and installation of a support for mounting the wind cone, the furnishing and installing of the specified wiring from the wind cone to the hand hole booster transformer, disconnect, and a concrete foundation. The item shall also include all cable connections, the furnishing and installing of the conduit and conduit fittings from the wind cone base to the first hand hole, the furnishing and installation of all lamps, ground rod and ground connection, the testing of the installation, and all incidentals necessary to place the wind cone in operation as a completed unit to the satisfaction of the Engineer.

Furnish all labor, equipment, supplies and materials and perform all operations necessary to complete the work described in this section and work shown on the plans which is covered under this section of the specifications. All work shall comply with the applicable FAA advisory circulars, the National Electrical Code (NEC), and any applicable National Fire Protection Association (NFPA) codes.

EQUIPMENT AND MATERIALS

107-2.1 GENERAL.

a. Airport lighting equipment and materials covered by FAA specifications shall be certified and listed under AC 150/5345-53, Airport Lighting Equipment Certification Program. This AC, the latest certified equipment list, and the address list of certified airport lighting equipment manufacturers are available on the Internet home page for the FAA Office of the Associate Administrator for Airports (ARP). The internet address is http://www.faa.gov/airports_airtraffic/airports/construction/.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

c. Obtain approval of all materials and equipment to be used or incorporated in the work, prior to their shipment to the project site. Submit to the ENGINEER 5 complete listings of materials and equipment specified herein and on the Plans. Clearly identify the material or equipment by item, name, or designation used on the Plans or specifications and indicate where specified. Include applicable catalog numbers, cuts, wiring diagrams, performance data, and operation and maintenance manuals. Neatly bind and clearly index the submittals. In addition, when specified, include in the submittals certificates of compliance, manufacturer's instructions and/or shop drawings, or proposed construction or installation procedures. The submittal information for any item may not be submitted separately from the bound submittals. All materials for all items (L-100, 107, 108, 110, 132, & 143) shall be submitted in the same bound submittal set for L-100, 107, 108, 110, 132, & 143. If there are more pages than one binder can hold, the submittal shall be split into volumes of more than one binder. If any submittal material in any volume is rejected, all of the volumes have to be resubmitted as one group. Re-submittals and individual submittals shall not be provided as separate sheets, but shall be included in the bound submittals

107-2.2 WIND CONES. The 8-foot and 12-foot wind cones and assemblies shall conform to the requirements of AC 150/5345-27, *Specification for Wind Cone Assemblies*. The pole shall be a painted steel pole hinged in the middle.

a. Type L-806, Style 1-B, Size 1, internally lighted wind cone.

b. Type L-807, Style 1-B, Size 2, internally lighted wind cone.

107-2.3 WIRE. Wire in conduit rated up to 5,000 V shall conform to AC 150/5345-7, *Specification for L-824 Underground Cable for Airport Lighting Circuits*, Type C cross-linked polyethylene insulated wire. For ratings up to 600 V, cross-linked polyethylene insulated wire type XHHW, shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the Plans.

107-2.4 CONDUIT. Rigid steel conduit and fittings shall conform to the requirements of UL Standard 6, 514, and 1242.

107-2.5 CONCRETE.. Provide foundation as shown on the plans. Provide a foundation that will allow adjustment of the pole with a wrench by tightening or loosening bolts and a pole adjustment range of 5 degrees minimum without compromising the pole wind rating.

107-2.6 PAINT.

a. Primer for ungalvanized metal surfaces shall be a high solids alkyd primer conforming to Federal Specification TT-P-664D.

b. Primer for galvanized metal surfaces shall be zinc dust-zinc oxide primer paint conforming to MIL-P-24441/19B. If necessary, thin with not more than 1/2 pint of turpentine per gallon of primer.

c. Orange paint for the body and the finish coats on metal surfaces shall consist of a ready-mixed confiding paint meeting the requirements of Fed. Spec. TT-E-489. The color shall be in accordance with Federal Standard 595, Aviation Gloss Orange, Number 12197.

107-2.7 WIND CONE. The wind cone fabric shall be standard international orange.

CONSTRUCTION METHODS

107-3.1 INSTALLATION. The L-807 wind cone hinged pole shall be installed on the concrete foundation in accordance with these specifications and the manufacturer's drawings. The L-806 wind cone shall be installed on a frangible base on the concrete foundation in accordance with these specifications and the manufacturer's drawings. Do not grout between the base plate and the foundation to allow for air circulation and inhibit corrosion inside the pole.

a. Notify the Engineer at least 24 hours prior to placement of concrete. Allow concrete bases to cure for 7 days after pouring before installing the hinged pole

b. Backfill. Material used as backfill around the footing of the lighted wind cone shall be gravel or sand consisting of crushed or naturally occurring granular material. All materials shall be free of frozen lumps and clay particles.

107-3.2 COUNTERWEIGHT. The Contractor shall furnish and install a counterweight on the hinged support for the L-807 12-foot wind cone. The counterweight shall be 25 to 50 pounds less than the weight needed to balance the assembly. The counterbalancing must operate to the satisfaction of the Engineer.

107-3.3 ELECTRICAL CONNECTION. The Contractor shall furnish all labor and materials and shall make complete electrical connections in accordance with the plans and manufacturer's drawings.

The conduit and conductors required to power the wind cone from the hand hole to the wind cone are included in the pay item for the wind cone. The hand holes used in these circuits are paid for in pay item L-100f.

107-3.4 BOOSTER TRANSFORMER., If shown in the plans or specified in the Special Provisions, a booster transformer to compensate for voltage drop to the lamps shall be installed in a suitable weatherproof

housing. The booster transformer shall be installed as indicated in the Plans and described in the Special Provisions. If the booster transformer is required for installation in the transformer vault, it will be paid for as part of the wind cone pay item.

107-3.5 GROUND CONNECTION AND GROUND ROD. The Contractor shall furnish and install a ground rod, grounding cable, and ground clamps for grounding the frame of the 12-foot assembly or pipe support of the 8-foot support near the base. The ground rod shall be ¾" in diameter by 10' long and shall be copper or copper clad. The ground rod shall be driven into the ground adjacent to the concrete foundation so that the top is at least 0.5 foot below grade. The grounding cable shall consist of No. 8 AWG bare stranded copper wire or larger and shall be firmly attached to the ground rod by means of a ground connector or clamp. The other end of the grounding cable shall be securely attached to the frame or to the base of the pipe support with non-corrosive metal and shall be of substantial construction. The resistance to ground shall not exceed 25 ohms.

107-3.6 PAINTING. Three coats of paint shall be applied (1 prime, 1 body, and 1 finish) to all exposed material installed under this item except the fabric cone, obstruction light globe, and lamp reflectors. The wind cone assembly, if painted on receipt, shall be given 1 finish coat of paint in lieu of the 3 coats specified above.

107-3.7 LAMPS. The Contractor shall furnish and install lamps, as required, conforming to the following requirements and as indicated on the drawings:

a. LED. Provide LED fixtures with independent lamp circuits for general illumination of the wind cone. Furnish and install an L-810, LED, 120-V obstruction light as required.

107-3.8 POLE LOWERING.

The L-107 wind cone shall be hinged near the center use a counter balanced pole, requiring no winch to raise or lower. Refer to Plans.

107-3.9 TESTING. Furnish all necessary labor, equipment and appliances for testing all material and equipment as specified herein. No work will be accepted until all applicable tests have been performed. Tests shall not begin until the work has been approved by the Engineer. All tests shall be neatly tabulated on a reproducible "Test Sheet" which shall be signed and dated by the Contractor upon completion of the test. Test and demonstrate to the Engineer the following:

a. That all lighting, power, and control circuits are continuous, and free from short circuits.

b. That all circuits are free from unspecified grounds.

c. That the resistance to ground of all non-ground 5000 V circuits is not less than 50 megohms. Where additions are made to existing circuits, only the new section shall be tested. The resistance to ground of 600 V capacity shall be 10 megohms for the insulation test.

d. That all circuits are properly connected in accordance with applicable wiring diagrams.

e. That all circuits are operable.

107-3.10 GUARANTEE. Furnish a written guarantee that any materials or workmanship found defective within 1 year of final acceptance shall be replaced at the Contractor's expense, promptly upon notification and to the satisfaction of the Engineer.

METHOD OF MEASUREMENT

107-4.1 The quantity to be paid for will be the number of wind cones installed as completed units in place, accepted, and ready for operation.

BASIS OF PAYMENT

107-5.1 Payment will be made at the contract unit price for each completed and accepted job.

Incidental work – All work associated with providing the equipment and materials included in this section of the specifications that is not specifically covered in the pay items below shall be considered incidental to the pay items below and shall not be paid for separate from the pay items below. This includes any work required to access the area in and across soft ground or muskeg necessary to perform work under this and related items.

Item L-107a, 8-foot Lighted Wind Cone, in place: Includes the wind cone and supporting pole, concrete foundation, trenching, backfilling, bedding, compaction, disconnect, booster transformer, ground rod, conduit and wiring between hand hole and wind cone including grounding, and all other work required to provide a complete, operational/acceptable lighted wind cone. Install the conduit and conductors per sections L-108 and L-110 of the specifications. Payment for conduit, and conductors between hand hole and lighting control panel are included in other pay items in Section L-108, and L-110. Payment for hand holes are included in other pay items in Section L-100.

Item L-107b, 12-foot Lighted Wind Cone, in place: Includes the wind cone and supporting pole, concrete foundation, trenching, backfilling, bedding, compaction, disconnect, booster transformer, ground rod, conduit and wiring between hand hole and wind cone including grounding, and all other work required to provide a complete, operational/acceptable lighted wind cone. Install the conduit and conductors per sections L-108 and L-110 of the specifications. Payment for conduit, and conductors between hand hole and lighting control panel are included in other pay items in Section L-108, and L-110. Payment for hand holes are included in other pay items in Section L-100.

Item L-107c, Remove Existing Wind Cones: Includes the removal of wind cone, foundation, conductors, and all other work required to remove existing wind cones.

Payment will be made under:

Item L-107a	L-~~1~~806 8-foot Lighted Wind Cone, in place - per each
Item L-107b	L-~~1~~807 12-foot Lighted Wind Cone, in place - per each
Item L-107c	Remove Existing Wind Cones – Lump Sum

MATERIAL REQUIREMENTS

AC 150/5345-7	*L-824 Underground Cable for Airport Lighting Circuits*
AC 150/5345-27	*Wind Cone Assemblies*
ASTM A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
Commercial Item Description A-A-3067	Paint: Alkyd, Exterior, Low VOC
Fed. Spec. J-C-30	Cable and Wire, Electrical (Power, Fixed Installation)
Fed. Spec. TT-E-489	Enamel, Alkyd, Gloss, Low VOC Content
Fed. Spec. W-P-115	Panel, Power Distribution

Fed. Std. 595	Colors
MIL-P-24441/19B	Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III
UL Standard 6	Rigid Metal Conduit
UL Standard 514	Fittings For Conduit and Outlet Boxes
UL Standard 1242	Intermediate Metal Conduit

ITEM L-108 UNDERGROUND CABLE

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing underground cable according to these specifications at the locations shown in the Plans. This item shall include the excavation and backfill of the trench, where direct buried cable is specified, and the installation of cable, grounding and counterpoise wire in trench, duct or conduit. It shall include splicing, cable marking, and testing of the installation and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the Engineer. This item shall not include the installation of the duct or conduit.

This work includes replacing existing runway and taxiway lighting cable, lighted sign cables and providing new runway, taxiway, lighted sign, and lighted wind cone lighting cables as shown in the Plans.

All conductors and cables rated for 600V or less shall be installed per this section and paid for in other sections unless otherwise noted in another section.

Perform all work necessary to the above systems to make them fully functional and operational at the completion of the work performed under this section.

Remove all unused or replaced portions of the above systems as shown on the drawings.

Furnish all labor, equipment, supplies and materials and perform all operations necessary to complete the work described in this section and work shown on the plans which is covered under this section of the specifications. All work shall comply with the applicable FAA advisory circulars, the National Electrical Code (NEC), and any applicable National Fire Protection Association (NFPA) codes.

EQUIPMENT AND MATERIALS

108-2.1 GENERAL.

a. Airport lighting equipment and materials covered by FAA specifications shall be certified and listed under AC 150/5345-53, Airport Lighting Equipment Certification Program. This AC, the latest certified equipment list, and the address list of certified airport lighting equipment manufacturers are available on the Internet home page for the FAA Office of the Associate Administrator for Airports (ARP). The internet address is http://www.faa.gov/airports_airtraffic/airports/construction/.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the Engineer.

c. Obtain approval of all materials and equipment to be used or incorporated in the work, prior to their shipment to the project site. Submit to the ENGINEER 5 complete listings of materials and equipment specified herein and on the Plans. Clearly identify the material or equipment by item, name, or designation used on the Plans or specifications and indicate where specified. Include applicable catalog numbers, cuts, wiring diagrams, performance data, and operation and maintenance manuals. Neatly bind and clearly index the submittals. In addition, when specified, include in the submittals certificates of compliance, manufacturer's instructions and/or shop drawings, or proposed construction or installation procedures. The submittal information for any item may not be submitted separately from the bound submittals. All materials for all items (L-100,

107, 108, 110, 127a, 130, 132, 145,& 161) shall be submitted in the same bound submittal set for L-100, 107, 108, 110, 127a, 130, 132, 145,& 161. If there are more pages than one binder can hold, the submittal shall be split into volumes of more than one binder. If any submittal material in any volume is rejected, all of the volumes have to be resubmitted as one group. Re-submittals and individual submittals shall not be provided as separate sheets, but shall be included in the bound submittals.

108-2.2 CABLE. Underground cable shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits, and meet the following requirements.

5000 V cable shall be non-shielded, single conductor, FAA type C, with cross-linked polyethylene insulation or FAA type B, ICEA S-19-81 ozone-resistant butyl rubber insulated with overall jacket of heavy duty neoprene. Conductor shall be lead alloy coated, soft annealed stranded copper.

600 V cable shall be non–shielded, single conductor, with stranded annealed copper conductor, rated 190 °F, with cross-linked polyethylene insulation classified as UL type-2 and FAA type C.

Underground Electrical Cable shall be No. 14 AWG, 2 Conductor, copper, 600 V, Type SOOW-A/SOOW. Cable shall remain flexible down to -40 °F. The cable connectors shall be secondary connector kits for the plug and the receptacle meeting specification L-823.

If telephone control cable is specified, copper shielded, polyethylene insulated and jacketed, No. 19 AWG telephone cable conforming to ICEA-S-85-625, Standard, Aircore, Polyolefin, Copper Conductor Telecommunications Cable for direct burial, shall be used.

Where counterpoise conductors are to be installed and where soil conditions would adversely affect bare copper wire, cross-linked polyethylene wire conforming to Fed. Spec. J-C-30, Type XHHW, 600 volt, may be used.

Cable type, size, number of conductors, strand and service voltage will be specified in the Plans and/or specifications.

108-2.3 INSULATEDCOPPER WIRE (COUNTERPOISE OR GROUNDING). Insulatedcopper wire for counterpoise or grounding installations shall be solid or stranded wire conforming to ASTM B 3 and B 8.

108-2.4 CABLE CONNECTIONS. In-line connections of underground primary cables shall be of the type called for in the Plans or in the specifications, and shall be one of the types listed below. When the Plans or the specifications permit a choice of connection, the Contractor shall indicate in the bid the type of connection they propose to furnish.

c. Field-attached Plug-in Splice. Figure 3 of AC 150/5345-26, Specification for L-823 Plug and Receptacle, Cable Connectors, employing connector kits, is approved for field attachment to single conductor cable. 600 V cord sets shall include a Type II, Class A, Style I plug on a 16/2 SJO cord. 600 V secondary receptacles shall be Type II, Class B, Style II. 600 V plugs shall be Type II, Class B, Style 4. 5000 V plugs shall be Type I, Class B, Style 3. 5000 V receptacles shall be Type I, Class B, Style 10.

d. Factory-Molded Plug-in Splice. Specification for L-823 Connectors, Factory-Molded to Individual Conductors, are approved.

108-2.5 CONCRETE. Concrete for cable markers shall conform to Specification Item P-610, "Structural Portland Cement Concrete."

108-2.6 MARKER TAPE. Marker tape shall be APWA-ULCC compliant, detectable, red polyethylene plastic, printed "Caution - Buried Electric Line Below".

108-2.7 INTERSTICE FILLER. When called for on the Plans underground conduit runs shall contain, in addition to the specified conductor(s), one or more runs of compressible interstice filler (as shown on the Plans). Compressible interstice filler shall be 5/8-inch closed cell backer rod (caulk backer).

CONSTRUCTION METHODS

108-3.1 GENERAL. The Contractor shall install the specified cable at the approximate locations indicated in the airport lighting layout plans. The Engineer will indicate specific locations.

Notify the Engineer in writing and request inspection at least 48 hours prior to installing cables, making any splices, or covering any buried or concealed work. Immediately correct any deficiencies found during the inspection. Install cable in a manner to prevent harmful stretching of the conductors, injury to the insulation, damage to tapes and fillers or damage to the outer protective jacket or covering.

Label the circuit conductors in each manhole or handhole by attaching a heat stamped nylon identification tag bearing the circuit designation "R" or "T", as required.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolating transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections, unless otherwise authorized in writing by the Engineer or shown in the Plans.

All equipment shall be installed per the manufacturer’s recommendations, per the applicable FAA advisory circulars, per these specifications and as shown on the drawings.

108-3.2 INSTALLATION IN DUCT OR CONDUIT. This item includes the installation of the cable in duct or conduit as described below. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be according to the latest NEC, or the code of the local agency having jurisdiction.

The Contractor shall make no connections or joints of any kind in cables installed in conduits or ducts. Provide and install cables in continuous lengths free of splices between the points of connection indicated on the Plans. Blow each conduit section clean prior to installing cable.

The duct or conduit shall be installed as a separate item according to Item L-110, "Underground Electrical Duct." The Contractor shall make sure that the duct is open, continuous, and clear of debris before installing cable. The cable shall be installed in a manner to prevent harmful stretching of the conductor, injury to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a duct under the same contract, all cable shall be pulled in the duct at the same time. The pulling of a cable through ducts or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Pulling tensions should be governed by recommended standard practices for straight pulls or bends. A lubricant recommended for the type of cable being installed shall be used where pulling lubricant is required. Duct or conduit markers temporarily removed for excavations shall be replaced as required.

Install cable connectors in light bases so that the male and female ends are oriented in one direction around the runway perimeter. Install the connector with the plug (male end) on the cable entering the left side of each base as viewed from the runway centerline.

Loop all cables at least one revolution manholes. Support cables on hangars in manholes.

Do not splice any cable except in a light base and only where it feeds a light. If the cable passes through the light base it shall not be spliced. Runway and Taxiway lighting cables shall not be spliced except at isolation transformers or at the plug cutout in the ARFF building. No exceptions without the ENGINEER's written permission. No other splices in cables routed underground shall be performed without the ENGINEER's written permission.

Where runway and taxiway series lighting circuit conductors are to be installed together through the same conduit, identify the individual conductors at both ends of the duct by applying identification ties which have been heat stamped with the circuit identification "R", "T1" or "T2" as needed.

Assemble connections in the runway and taxiway series lighting cable at the light assemblies using approved L-823 connector kits. The male end shall be coated with silicone compound. Properly seat both plug and receptacle ends onto cable and check for proper connector pin positioning prior to taping. When completed, wrap the L-823 connection with 2 layers of electrical insulating tape, 1/2 lapped extending at least 1-1/2 inch on each side of the joint. Install heat shrinkable tubing with internal adhesive as shown on Plans. Leave sufficient slack in the cables at points of connection consistent with standard trade practices; and, in the case of the runway and taxiway series lighting cable, leave sufficient slack at each light assembly to permit the connection to be made two feet above grade.

108-3.8 SPLICING. Connections of the type shown in the Plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

c. Field-attached Plug-in Splices. These shall be assembled according to manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. In all cases the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches on each side of the joint.

d. Factory-Molded Plug-in Splices. These shall be made by plugging directly into mating connectors. In all cases, the joint where the connectors come together shall be wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 11/2 inches on each side of the joint.

108-3.10 GROUNDING SYSTEM.

Install a green insulated copper ground conductor as indicated on the plans. The ground conductor shall extend continuously and shall be securely fastened to all ground rods, metal conduits, metal junction boxes, metal handholes, light bases, light base cover plates, light fixtures, metal portions of handholes and manholes, regulator grounding lug, all building grounding grids, metal building frames, metal poles for lighted wind cones, metal portions of all equipment, etc., and all equipment grounding systems. Utilize irreversible compression splices for all connections to ground rods. Irreversible compression splices shall be Burndy or approved equal. Use exothermic connections to conductors installed underground.

108-3.11 TESTING. The Contractor shall furnish all necessary equipment and appliances for testing the underground cable circuits after installation. The Contractor shall test and demonstrate to the satisfaction of the Engineer the following:

a. That all lighting power and control circuits are continuous and free from short circuits.

b. That all circuits are free from unspecified grounds.

c. That the insulation resistance to ground of all nongrounded series circuits is not less than 50 megohms. Where additions to existing circuits, only the new section shall be tested. The resistance to ground of 600 V capacity shall be 10 megohms for the insulation test.

d. That the insulation resistance to ground of all nongrounded conductors of multiple circuits is not less than 50 megohms.

e. That all circuits are properly connected according to applicable wiring diagrams.

f. That all circuits are operable. Operate each control not less than 10 times and operate each lighting and power circuit continuously for not less than 1/2 hour.

108-3.12 RECORD DOCUMENTS. Maintain at the project site a complete set of contract Plans, specifications and approved changes thereto. In addition to the above, 2 complete sets of electrical plans shall be maintained for as-built purposes upon which all changes, connections, part numbers and conductor routings shall be legibly shown and noted. Where changes to Plans are involved, make notations to show the dates and authorities approving the changes. Permanently store one set of annotated electrical plans in a dry, secure location at the project site. Deliver the second set to the Engineer.

As-built plans shall show locations of all buried items such as conduit, including any existing active lines encountered. All dimensions shall be from runway and taxiway centerlines or other permanent objects. As-built plans shall include complete wiring diagrams, (both power and control), identifying terminals, cables, and connections. As-built plans shall be kept current as the work progresses.

108-3.13 GUARANTEE. Furnish a written guarantee that any materials or workmanship found defective within one year of final acceptance shall be replaced at no additional cost to the Department, promptly upon notification and to the satisfaction of the Engineer.

108-3.14 INSPECTION. Notify the ENGINEER at least 48 hours prior to installing any cable.

METHOD OF MEASUREMENT

108-4.1 Items shown as lump sum will not be measured for payment. Payment will cover all work described in the item.

108-4.3 Cable, ground or counterpoise wire, and interstice filler by unit price installed in duct or conduit shall be measured by the number of linear feet measured in place, completed, ready for operation, and acceptedas satisfactory. Separate measurement will be made for each cable, ground or counterpoise wire installed in duct or conduit. Payment will cover all work described in the item.

108-4.5 Lump sum items will not be measured for payment.Payment will cover all work described in the item.

BASIS OF PAYMENT

108-5.1 Payment will be made at the contract unit price or lump sum price for the items listed below and shown in the Bid Schedule.

Payment will be made under:

Subsidiary work – All work associated with providing the equipment and materials included in this section of the specifications that is not specifically covered in the pay items below shall be considered subsidiary

to the pay items below and shall not be paid for separate from the pay items below. This includes any work required to access the area to perform work under this and related items.

Cable used for the Runway Guard Lights shall be paid for in item L-100n Complete Runway Guard Lighting System and shall not be paid for in the pay items below:

Cable used for the Temporary Runway Lighting System shall be paid for in item L-100rand shall not be paid for in the pay items below:

Item L-108a applies to work done on the “E-XX” series drawings.

Item L-108b applies to work done on the “LC-XX” series drawings.

Item L-108a	Underground Cable 6 AWG, copper, 5 kV FAA type “B”, L-824 - per linear foot*
Item L-108b	Underground Cable, No. 6 AWG, copper, 5 kV FAA type “B”, L-824 - per lump sum
Item L-108c	No. 8 XHHW, 600V, Copper Conductor (Ground and Wind Cone Power) - per linear foot*

* For payment purposes, 4% will be added to the straight line measurements for cable and ground conductor wire.

MATERIAL REQUIREMENTS

AC 150/5345-7	*L-824 Underground Electrical Cable for Airport Lighting Circuits*
AC 150/5345-26	*L-823 Plug and Receptacle Cable Connectors*
ASTM B 3	Soft or Annealed Copper Wire
ASTM B 8	Concentric-Lay-Stranded Cooper Conductor, Hard, Medium-Hard, or Soft
ASTM D 4388	Rubber Tapes, Nonmetallic Semi-Conducting and Electrically Insulating
Commercial Item Description A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic
Fed.Spec. J-C-30	Cable and Wire, Electrical Power, Fixed Installation
MIL-I 24391	Insulation Tape, Electrical, Plastic, Pressure Sensitive

ITEM L-109 TRANSFORMER VAULT AND VAULT EQUIPMENT

DESCRIPTION

109-1.1 This item shall consist of constructing a transportable airport transformer vault, prefabricated metal housing or electrical enclosure according to these specifications and with the design and dimensions shown in the Plans. This work shall also include the installation of conduits, painting and lighting of the vault, metal housing or enclosure and the furnishing of all incidentals necessary to produce a completed unit. Included as a separate part under this item or as a separate item where an existing structure (vault, metal housing, enclosure or building) is to be utilized shall be the furnishing of all vault equipment, wiring, cable, conduit, and grounding systems. This work shall also include the painting of equipment and conduit; the marking and labeling of equipment and the labeling or tagging of wires; the testing of the installation; and the furnishing of all incidentals necessary to place it in operating condition as a completed unit to the satisfaction of the Engineer.

EQUIPMENT AND MATERIALS

109-2.1 GENERAL. Obtain approval of all materials and equipment proposed for the work. Submit to the Engineer 5 complete listings of materials and equipment specified herein and on the Plans. The list shall be prepared to clearly identify the material or equipment by item, name, or designation used on the Plans or specifications and shall indicate where specified. The submittals shall be neatly bound, clearly indexed, and shall include applicable catalog number, cuts, wiring diagrams, performance data, operation and maintenance manuals, etc., for all material or equipment listed below or specified elsewhere in these specifications. In addition, wherever called for elsewhere in these specifications, include in the submittal certificates of compliance, manufacturer's instructions and/or shop drawings, or proposed construction or installation procedures. All materials of similar class or service shall be of one manufacturer. Capacities, sizes, and dimensions given are minimum unless otherwise indicated. All manufactured materials shall be delivered and stored in their original containers, which shall indicate clearly the manufacturer's name, brand, and identifying number.

a. Airport lighting equipment and materials covered by FAA specifications shall be certified and listed under AC 150/5345-53, Airport Lighting Equipment Certification Program. This AC, the latest certified equipment list, and the address list of certified airport lighting equipment manufacturers are available on the Internet home page for the FAA Office of the Associate Administrator for Airports (ARP). The internet address is http://www.faa.gov/airports_airtraffic/airports/construction/.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the Engineer.

109-2.2 CONCRETE. The concrete for the vault or electrical enclosure shall be proportioned, placed, and cured according to Item P-610, Structural Portland Cement Concrete, using 3/4 inch maximum size coarse aggregate.

109-2.3 REINFORCING STEEL. Reinforcing steel bars shall be intermediate or structural grade deformed-type bars and shall meet the requirements of AASHTO M 31.

109-2.4 RIGID STEEL AND INTERMEDIATE CONDUIT. Rigid steel conduit or intermediate conduit and fittings shall be according to UL Standard 6 and 514. They shall be galvanized on the outside. All fittings shall conform to the same specification as the conduit.

109-2.5 LIGHTING. Vault, metal-housing or electrical enclosure light fixtures shall be of a vaporproof type.

109-2.6 OUTLETS. Convenience outlets shall be heavy-duty duplex units designed for industrial service. Outlets shall be specification grade NEMA performance receptacles, grounding-type, AC rated 20 A, 125 V, 2-pole, 3-wire NEMA 5-20R, housed in device boxes with cover plates.

109-2.7 SWITCHES. Vault, metal-housing or electrical enclosure light switches shall be single-pole switches. Switches shall be NEMA Specification Grade Standard, 277 V (ac). Rated for inductive and fluorescent lamp loads, up to 20 A. Switches shall be of the type indicated by symbol on the Plans. Where more than 1 switch is shown at a point, they shall be set under 1 plate, unless otherwise noted.

109-2.8 PAINT.

a. Priming paint for ungalvanized metal surfaces shall be a high solids alkyd primer conforming to TTP-644D

b. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to Commercial Item Description A-A-3067.

c. Priming paint for wood surfaces shall be mixed on the job by thinning the above specified white paint by adding 1/2 pint of raw linseed oil to each gallon of paint.

d. Paint for the floor, ceiling, and inside walls shall be according to Fed. Spec. TT-E-487. Walls and ceiling shall be light gray and the floor shall be medium gray.

e. The roof coating for vault shall be hot asphalt material according to ASTM D 2823.

109-2.9 GROUND BUS. Ground bus shall be 1/8 x 3/4 inch copper bus bar.

109-2.10 SQUARE DUCT. Duct shall be square similar to that manufactured by the Square D Company (or approved equal), or the Trumbull Electric Manufacturing Company (or approved equal). The entire front of the duct on each section shall consist of hinged or removable cover for ready access to the interior. The cross section of the duct shall be not less than 4 x 4 inches except where otherwise shown in the Plans.

109-2.11 GROUND RODS. Ground rods shall be copper-cladsteel, 3/4 inch x 10 feet, with copper alloy hex bolt type ground clamps.

109-2.12 PREFABRICATED METAL HOUSING. The prefabricated metal housing shall be a commercially available unit.

109-2.13 FAA-APPROVED EQUIPMENT. Certain items of airport lighting equipment installed in vaults are covered by individual FAA equipment specifications. The specifications are listed below:

AC 150/5345-7	L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-10	Constant Current Regulators and Regulator Monitors

109-2.14 OTHER ELECTRICAL EQUIPMENT. Constant-current regulators, distribution transformers, relays, terminal blocks, transfer relays, circuit breakers, and all other regularly used commercial items of electrical equipment not covered by FAA equipment specifications shall conform to the applicable rulings and standards of the Institute of Electrical and Electronic Engineers or NEMA. When specified, test reports from a testing laboratory indicating that the equipment meets the specifications shall be supplied. In all cases, equipment shall be new and a first-grade product. This equipment shall be supplied in the quantities required for the specific project and shall incorporate the electrical and mechanical characteristics specified in the specifications and Plans.

109-2.15 WIRE. Wire in conduit rated up to 5,000 volts shall conform to AC 150/5345-7, Specification for L824 Underground Electrical Cables for Airport Lighting Circuits, for rubber insulated neoprene-covered wire, or Fed. Spec. J-C-30, Type RHW, for rubber insulated fibrous-covered wire. For ratings up to 600 volts, thermoplastic wire conforming to Fed. Spec. J-C-30, Types TW, THW, and THWN, shall be used. The wires shall be of the type, size, number of conductors, and voltage shown in the Plans or in the specifications.

a. Control Circuits. Wire shall be not less than No. 12 AWG and shall be insulated for 600 volts. If telephone control cable is specified, No. 19 AWG telephone cable conforming to ICEA S-85-625 specifications shall be used.

b. Power Circuits.

(1) 600 volts maximum: Wire shall be No. 6 AWG or larger and insulated for at least 600 volts.

(2) 3,000 volts maximum: Wire shall be No. 6 AWG or larger and insulated for at least 3,000 volts.

(3) Over 3,000 volts: Wire shall be No. 6 AWG or larger and insulated for at least the circuit voltage.

109-2.16 ELECTRICAL ENCLOSURE. The electrical enclosure shall be a pre-engineered structure with minimum dimensions shown on the Plans. The enclosure shall be installed on a concrete floor/foundation as shown on the Plans.

The enclosure shall meet the following requirements:

a. Panels and Facings.

(1) The enclosure may be constructed with separate interlocking panels forming the walls and roof or as a single unit. The enclosure exterior walls shall be foamed in place polyurethane core with 1/2 inch plywood on the interior surface. The exterior surface may be either 1/2 inch plywood with a 26 gauge galvanized steel exterior skin or, fiberglass reinforced polyester. The exterior color shall be a factory applied and shall be white.

(2) The side of the facings which contact the insulation core shall have a coating that will allow core-to-facing bond to be equal or greater than the cohesive strength of the core.

b. Insulation core.

(1) Factory foamed-in-place polyurethane between facings. Insulating value of the composite roof system shall be equal to or greater than R-38, and the wall system equal to or greater than R-19. No voids are allowed in the core.

(2) Polyurethane shall have a minimum 2 lbs/ft3 density.

(3) Polyurethane shall be certified UL flame spread 25 or less per ASTM E 84.

c. The panel joints shall have tongue and groove or ship lap interlock with continuous silicone sealant tape at interior and exterior faces.

d. Panels shall be full length in single piece where practical.

e. Panels shall have State Fire Marshals approval.

f. Metal flashing and trim at corners, intersections, openings, eaves and ridges shall be of the same finish and 24 gauge thickness to effect a neat appearing, weather tight joint and closure. Provide wrap-around door jamb trim-flashing.

g. Enclosure shall have a 12-inch x 12-inch louvered vent installed in one endwall.

h. A refrigerator style door(s) of the dimensions shown shall be provided for the enclosure. The door(s) shall be of similar construction to the enclosure. Mounting hardware shall be of stainless steel or of forged brass with chrome plating, Kason Industries No. 1053, or approved equal. Provide neoprene weather-stripping. The door(s) shall be provided with a refrigerator safety lock with pushrod from interior, Kason Industries, No. 56L, cast zinc with chrome plating. Provide lock(s) consisting of a brass, 6-pin E keyway padlock with a shackle that is 3/8 inch in diameter having a closed clearance of 2-1/4 inches. The lock shall have a control key removable core and shall have one separate replacement core. Provide 4 keys and 1 core removal key.

i. Enclosure construction shall meet the following.

Live Snow Load 70 psf
Live Floor Load 200 psf Wind Load 110 mph,
Basic wind speed, applied according to the InternationalBuilding Code, Exposure Category D, Importance Factor III

Enclosure shall be an Equipment Enclosure for Runway Lighting Systems as manufactured by ALCEM, Inc., of Anchorage, Alaska; Plaschem Shelter as manufactured by Plaschem Supply & Consulting, of Anchorage Alaska; or approved equal.

109-2.17 FLEXIBLE METAL CONDUIT. Conduit shall be water-tight, listed for exposed or direct bury per UL-360, as a grounding conductor per NEC Article 351-9, and rated for temperatures between -67 °F and +220 °F

109-2.18 TAPES.

a. Corrosion preventive tape: "Scotch" No. 50 or approved equal.

b. Electrical insulating tape: "Scotch" No. 88 or approved equal.

109-2.19 DOORS. Doors, unless otherwise specified, shall be metal-clad fireproof class a doors conforming to requirements of the NEC and local electrical codes.

109-2.20 PANEL BOARDS. The enclosure shall be NEMA I with door-in-door front, provided with a circuit index card under plastic on the interior side of the panel door; and the enclosure shall have an engraved phenolic label, lettered to indicate the voltage and current rating of the panel, attached to the panel front exterior.

The panel board circuit breakers shall be bolt-on molded case type, 480Y/277 V and 120/240 V, 10,000 A interrupting capacity, 1- and 2-pole type with current ratings as indicated on Plans. Each pole of the breaker shall provide inverse time delay and instantaneous circuit protection. Breakers shall be operated by toggle type handle and have a quick-make, quick-break over center switching mechanism that is mechanically trip free so that contacts cannot be held closed against short circuits and abnormal currents. Tripping shall be clearly indicated. Non-interchangeable trip breakers shall have sealed covers and interchangeable trip units shall have sealed trip units. Ampere ratings shall be clearly visible.

Panel board circuit breakers shall be UL listed (where procedures exist), conform to the applicable

requirements of the latest NEMA Standard and meet the appropriate classifications of Federal Specifications W-A-375a. Breakers shall be standard thermal-magnetic type unless otherwise noted. Circuit breakers for the duplex receptacles shall incorporate overload, short circuit, and UL Class A ground fault circuit interruption.

109-2.21 IDENTIFICATION TIES. Identification ties shall be self-locking, heavy duty nylon ties and shall be labeled by heat stamp.

109-2.22 SERVICE ENTRANCE EQUIPMENT. The meter/main breaker combination service entrance unit for the Electrical Equipment Enclosure shall be an underground source as shown on the Plans, bottom (under ground) load type, 400 A, 480Y/277 V, three phase with meter and circuit breakers as shown on the Plans. The service entrance enclosure shall be raintight NEMA 3R rated.

The service entrance disconnect switch shall be mounted on the Snow Removal Equipment Building as shown on the Plans. Disconnect switch shall be 100 A, 240 V, 3-wire (third blade not used), S/N, with NEMA 3R enclosure, non-fused, with field installation kit.

109-2.23 SUPPORTS FOR WALL-MOUNTED PANELS, PANEL BOARDS, AND FIXTURES. Supports for wall mounted panels, panel boards and fixtures shall be metal channels with accessory nuts and fittings; Unistrut or approved equal, or 3/4 inch plywood panels.

109-2.24 ELECTRIC HEATER. The electric heater shall be surface mounted and rated 750W at 120V, with mounting kit as required. Thermostat shall be wall mounted on a suitable junction box and be of the line voltage type with an off position and a temperature range of 40 °F to 90 °F. Thermostat current rating shall be suitable to control the specified heater.

109-2.25 INDOOR LIGHTING FIXTURES. Indoor lighting fixtures shall be LED type with clear prismatic lens, surface mounted with steel extension box.

109-2.26 HARDWARE. All miscellaneous hardware items, nails, bolts, and screws shall be galvanized steel.

CONSTRUCTION METHODS

CONSTRUCTION OF VAULT, PREFABRICATED METAL HOUSING AND ELECTRICAL ENCLOSURE

109-3.1 GENERAL. The Contractor shall provide the transformer vault, prefabricated metal housing or electrical enclosure at the location indicated in the Plans. The metal housing shall be prefabricated equipment enclosure to be supplied in the size specified. The electrical enclosure shall be a pre-engineered building placed on a poured concrete foundation. The mounting pad or floor details, installation methods, and equipment placement are shown in the Plans.

If the metal housing or electrical enclosure are to be placed on a site not prepared for that purpose under other items of work, the Contractor shall clear, grade, and seed the area around the metal housing or electrical enclosure for a minimum distance of 10 feet on all sides. The slope shall be not less than 4% away from the vault, metal housing or electrical enclosure in all directions. Cost for site work will be considered incidental to this item and no separate payment will be made.

109-3.2 LIGHTS AND SWITCHES. The Contractor shall furnish and install a minimum of two duplex convenience outlets in the vault room. Where a control room is specified, at least two duplex outlets shall be installed.

INSTALLATION OF EQUIPMENT IN VAULT, PREFABRICATED METAL HOUSING, ENCLOSURE OR BUILDING

109-3.3 GENERAL. The Contractor shall furnish, install, and connect all equipment, equipment accessories, conduit, cables, wires, grounds, and support necessary to insure a complete and operable electrical distribution center for the airport lighting system as specified herein and shown in the Plans. When specified, an emergency power supply and transfer switch shall be provided and installed.
The equipment installation and mounting shall comply with the requirements of the NEC and local code agency having jurisdiction.

109-3.4 POWER SUPPLY EQUIPMENT. Transformers, regulators, booster transformers, and other power supply equipment items shall be furnished and installed at the location shown in the Plans or as directed by the Engineer. All equipment shall be securely anchored to the floor.

If specified in the Plans and specifications, equipment for an alternate power source or an emergency power generator shall be furnished and installed. The alternate power supply installation shall include all equipment, accessories, an automatic changeover switch, and all necessary wiring and connections. The emergency power generator set shall be the size and type specified.

109-3.5 SWITCHGEAR AND PANELS. Panels, panel boards, and other similar items shall be furnished and installed at the location shown in the Plans or as directed by the Engineer. Wall or ceiling-mounted items shall be attached to the wall or ceiling with galvanized bolts of not less than 3/8 inch diameter engaging metal expansion shields or anchors in masonry or concrete vaults.

109-3.6 CABLE ENTRANCE SYSTEM. Incoming underground cable from field circuits and supply circuits will be installed outside the walls of the transformer vault as a separate item under Item L-108. The Contractor installing the vault equipment shall bring the cables from the trench or duct through the entrance conduits into the vault, cabinet or enclosure and make the necessary electrical connections. For the incoming and outgoing high voltage load circuits, the Contractor shall furnish and install rigid metallic vi conduit risers, surmounted by potheads, from floor level to the level as shown in the Plans.

109-3.7 WIRING AND CONNECTIONS. The Contractor shall make all necessary electrical connections in the vault, cabinet or enclosure according to the wiring diagrams furnished and as directed by the Engineer. In wiring to the terminal blocks, the Contractor shall leave sufficient extra length on each control lead to make future changes in connections at the terminal block. This shall be accomplished by running each control lead the longest way around the box to the proper terminal. Leads shall be neatly laced in place.

109-3.8 MARKING AND LABELING. All equipment, control wires, terminal blocks, etc., shall be tagged, marked, or labeled as specified below:

a. Wire Identification. The Contractor shall furnish and install self-sticking wire labels or identifying tags on all control wires at the point where they connect to the control equipment or to the terminal blocks. Wire labels, if used, shall be of the self-sticking preprinted type and of the manufacturer's recommended size for the wire involved. Identification markings designated in the Plans shall be followed. Tags, if used, shall be of fiber not less than 3/4 inch in diameter and not less than 1/32 inch thick. Identification markings designated in the Plans shall be stamped on tags by means of small tool dies. Each tag shall be securely tied to the proper wire by a nonmetallic cord.

b. Labels. The Contractor shall stencil identifying labels on the cases of regulators, breakers, and distribution and control relay cases with white oil paint as designated by the Engineer. The letters and numerals shall be not less than 1 inch in height and shall be of proportionate width. The Contractor shall also mark the correct circuit designations according to the wiring diagram on the terminal marking strips which are a part of each terminal block.

109-3.9 GUARANTEE. Furnish a written guarantee that any materials or workmanship found defective within one year of final acceptance shall be replaced at no additional cost to the Department, promptly upon notifications and to the satisfaction of the Engineer.

METHOD OF MEASUREMENT

109-4.1 The quantity of prefabricated metal housings or electrical enclosures to be paid for under this item shall consist of the number of housings fabricated and installed in place and accepted as a complete unit.

BASIS OF PAYMENT

109-5.1 Payment will be made at the contract unit price for each completed and accepted prefabricated metal housing or electrical enclosure.

109-5.2 Payment will be made at the contract unit price for equipment supplied and installed in a new structure (vault, prefabricated metal housing, electrical enclosure or building) completed and accepted.

Payment will be made under:

Item L-109b	Prefabricated Metal Housing or Electrical Enclosure and Foundation in Place - per each

MATERIAL REQUIREMENTS

AASHTO M 31	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
AC 150/5340-9	*Prefabricated Metal Housing for Electrical Equipment*
AC 150/5345-7	*L-824 Underground Electrical Cable for Airport Lighting Circuits*
AC 150/5345-10	*Constant Current Regulators and Regulator Monitors*
ANSI/ICEA S-85-625	Aircore, Polyethylene Insulated, Copper Conductor, Telecommunications Cable
ASTM D 2823	Asphalt Roof-Coating
Commercial Item Description A-A-3067	Paint: Alkyd, Exterior, Low VOC
Fed.Spec.J-C-30	Cable and Wire, Electrical (Power, Fixed Installation)
Fed. Spec. TT-E-487	Enamel, Floor and Deck
Fed.Spec.W-C-571	Conduit and Fittings, Nonmetal, Rigid; (For Electrical Purposes)

ITEM L-110 UNDERGROUND ELECTRICAL DUCT

DESCRIPTION

110-1.1 This item shall consist of underground electrical ducts and conduit installed according to this specification at the locations and according to the dimensions, designs, and details shown in the Plans. This item shall include the installation of all underground electrical ducts or underground conduits. It shall also include all trenching, marking, backfilling, removal, and restoration of any paved areas; manholes, concrete encasement, mandreling installation of steel drag wires and duct markers, capping, and the testing of the installation as a completed duct system ready for installation of cables, to the satisfaction of the Engineer. In all locations in this specification section, the word duct applies to both ducts and conduit.

This work includes providing new conduit for new taxiway and runway lights, for new lighted signs, and for lighted wind cones.

The conduit used for the FAA systems, shall be installed per the specifications contained in this item and shall be paid for under the pay items for their respective systems and shall NOT be paid for under the pay items in Item L-110.

The conduit used for the Runway Guard Lights, shall be installed per the specifications contained in this item and shall be paid for in pay item L-100m Complete Runway Guard Lighting System and shall NOT be paid for under the pay items in Item L-110.
Perform all work necessary to the above systems to make them fully functional and operational at the completion of the work performed under this section.

Remove all unused or replaced portions of the above systems as shown on the drawings.

Furnish all labor, equipment, supplies and materials and perform all operations necessary to complete the work described in this section and work shown on the plans which is covered under this section of the specifications. All work shall comply with the applicable FAA advisory circulars, the National Electrical Code (NEC), and any applicable National Fire Protection Association (NFPA) codes.

EQUIPMENT AND MATERIALS

110-2.1 GENERAL. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the Engineer.

a. Obtain approval of all materials and equipment to be used or incorporated in the work, prior to their shipment to the project site. Submit to the ENGINEER 5 complete listings of materials and equipment specified herein and on the Plans. Clearly identify the material or equipment by item, name, or designation used on the Plans or specifications and indicate where specified. Include applicable catalog numbers, cuts, wiring diagrams, performance data, and operation and maintenance manuals. Neatly bind and clearly index the submittals. In addition, when specified, include in the submittals certificates of compliance, manufacturer's instructions and/or shop drawings, or proposed construction or installation procedures. The submittal information for any item may not be submitted separately from the bound submittals. All materials for all items (L-100, 107, 108, 110, 127a, 130, 132, 145,& 161) shall be submitted in the same bound submittal set for L-100, 107, 108, 110, 127a, 130, 132, 145, & 161. If there are more pages than one binder can hold, the submittal shall be split into volumes of more than one binder. If any submittal material in any volume is rejected, all of the volumes have to be resubmitted as one group. Re-submittals and individual submittals shall not be provided as separate sheets, but shall be included in the bound submittals.

110-2.4 STEEL CONDUIT. Rigid steel conduit and fittings shall conform to the requirements of UL Standard 6, 514, and 1242. All Rigid Steel conduit shall be hot-dipped galvanized and shall comply with the requirements of ANSI C80.1.

110-2.5 CONCRETE. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, 1 inch maximum size coarse aggregate.

110-2.6 PLASTIC CONDUIT. Plastic conduit and fittings shall conform to the requirements of Fed. Spec. WC-1094 Type I, suitable for underground use either directly in the earth or encased in concrete. The conduit shall be one of the following as shown on the Plans. No PVC conduit may be used for the work shown on the "E" series plans:

a. Underground Plastic Duct shall be rigid, non-metallic, conduit, Schedule 40 PVC conforming to UL Standard 651 and NEMA TC-2, nominal size as indicated on the Plans. All fittings such as elbows, couplings, connectors, expansion joints, adapters, etc., used in the installation shall be Schedule 40 PVC conforming to UL Standard 514 and NEMA TC-3.

b. Underground Plastic Duct shall be Type III, rigid, HDPE pipe. The material shall have a cell classification of 334420C or better according to ASTM D 3350, and shall have a third party, nationally recognized testing lab listing. The nominal size shall be as indicated on the Plans with a minimum wall thickness of for schedule 40 pipe for the given size. The HDPE conduit shall be manufactured per ASTM D2447. The conduit shall be cooled to room temperature after manufacture and prior to being rolled on a spool. Provide a conduit straightening mechanism to remove the "reel memory" from the conduit.

Provide friction fit, water tight "Double E-Loc" type coupling connectors for all splices involving HDPE conduit. The couplings shall provide an air tight, water tight splice. All other fittings for HDPE conduit such as elbows, threaded connectors and adapters to flexible conduit, etc. shall be GRS. Transitions from HDPE to GRS fittings shall be performed using GRS conduit and "Double E-Loc" type connectors.

For Double E-Loc type couplings the following requirements shall be met: The connectors shall have an elastomeric seal inside a Schedule 80 PVC shell. The seal shall be grooved to enhance the friction fit. The couplings shall have a gripper ring and lock nut on each end. Provide Double E-Loc connectors by ETCO Specialty Products, Inc. or an approved equal.

110-2.7 FLEXIBLE METAL CONDUIT. Flexible metal conduit shall be water-tight, listed for exposed or direct bury per UL-360, as a grounding conductor per NEC Article 351-9, and rated for temperatures between -67 °F and +220 °F. All flexible conduit installed outdoors shall be non-metallic liquid tight with a rigid PVC coil core and smooth outer and inner jacket. Provide Hubbell or equal.

110-2.8 TAPES.

a. Pipe sealing tape shall be Teflon, "Scotch" No. 48 or approved equal.

b. Corrosion preventive tape shall be "Scotch" No. 50 or approved equal.

CONSTRUCTION METHODS

110-3.1 GENERAL. The Contractor shall install underground ducts at the approximate locations indicated in the airport layout plans. The Engineer shall indicate specific locations as the work progresses. Ducts shall be of the size, material, and type indicated in the Plans or specifications. Where no size is indicated in the Plans or specifications, the ducts shall be not less than 3 inches inside diameter. All duct lines shall be laid so as to grade toward handholes, manholes and duct ends for drainage. Grades shall be at least

1 inch per 100 feet. On runs where it is not practicable to maintain the grade all one way, the duct lines shall be graded from the center in both directions toward manholes, handholes, or duct ends. Pockets or traps where moisture may accumulate shall be avoided.

Joint Compound for rigid steel conduits runs: Compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity. Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructionsAfter the conduit run has been completed, pull a standard flexible mandrel not less than 12 inches long, having a diameter approximately 1/4 inch less than the inside diameter of the conduit, through the entire length of the conduit run, after which a brush with stiff bristles of at least the diameter of the inside of the conduit shall be pulled through the entire length of the conduit run to make certain that no particles of earth, sand, or gravel have been left in the line.

All ducts installed shall be provided with a No. 10 gauge galvanized iron or steel drag wire for pulling the permanent wiring. Sufficient length shall be left in manholes or handholes to bend the drag wire back to prevent it from slipping back into the duct. Where spare ducts are installed, as indicated on the Plans, the open ends shall be plugged with removable tapered plugs, designed by the duct manufacturers, or with hardwood plugs conforming accurately to the shape of the duct and having the larger end of the plug at least 1/4 inch greater in diameter than the duct.

All ducts shall be securely fastened in place during construction and progress of the work and shall be plugged to prevent seepage of grout, water, or dirt. Any duct section having a defective joint shall not be installed.

All conduit installed under runways, taxiways, and aprons and other paved areas shall be galvanized rigid steel conduit. Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for ducts may be excavated manually or with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of road patrols or graders shall not be used to excavate the trench. The Contractor shall ascertain the type of soil or rock to be excavated before bidding. All excavation shall be unclassified.

Trenches for burial of duct or conduit shall be of sufficient width to provide a minimum of 2 inches of lateral clearance between the duct or conduit and trench walls on both sides as shown on the Plans. Trenches for burial of duct or conduit shall be of sufficient depth as to assure 1.5 feet minimum duct or conduit burial depth below finished grade, plus 2 inches minimum of below duct or conduit bedding as shown on the Plans, plus adequate over excavation depth as required to slope and grade all duct or conduit installations to drain toward light bases or hand holes.

All ducts and conduits shall be placed in the bottom of the trench after trenching work is completed, and before backfilling. No plowing in of conduit is allowed.

The bottom of all trenches shall be sloped and lined with a layer of bedding material of minus 1/4-inch material that is not less than 2 inches in depth, before placing any duct or conduit in the trenches. Bedding material shown on the plans

Excavate foundations, footings, slabs, pads, manholes, handholes, ducts and/or duct banks, or light base assemblies so as to permit the placing or construction of the full width, length, and depth of the structure or object and the layer of bedding material, whenever bedding is required.

Protect and preserve all existing pavement throughout the entire construction period. No tracked equipment may be operated on any pavement without first protecting the pavement with pavement pads approved by the Engineer. All pavement which is damaged in any manner by the Contractor's operations

shall be restored to the original or better condition at the Contractor's expense. Repair work to the Runway, Taxiway, Apron and roadway shall be in all ways satisfactory to the Owner.

Prior to excavating the trench, all necessary stripping shall be completed in accordance with these specifications and is incidental to the contract.

Crushed aggregate base course shall be placed and compacted to 100% as specified in P-209.

110-3.2 DUCTS ENCASED IN CONCRETE. Unless otherwise shown in the Plans, concrete-encased ducts shall be installed so that the top of the concrete envelope is not less than 1.5 feet below the finished subgrade where installed under runways, taxiways, aprons, or other paved areas, and not less than 1.5 feet below finished grade where installed in unpaved areas. Ducts under paved areas shall extend at least 3 feet beyond the edges of the pavement or 3 feet beyond any underdrains which may be installed alongside the paved area. Trenches for concrete-encased ducts shall be opened the complete length before concrete is laid so that if any obstructions are encountered, proper provisions can be made to avoid them. All ducts for concrete encasements shall be placed on a layer of concrete not less than 3 inches thick prior to its initial set. Where two or more ducts are encased in concrete, the Contractor shall space them not less than 1-1/2 inches apart (measured from outside wall to outside wall) using spacers applicable to the type of duct. As the duct laying progresses, concrete not less than 3 inches thick shall be placed around the sides and top of the duct bank. End bells or couplings shall be installed flush with the concrete encasement where required.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where otherwise shown on the Plans under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot intervals.

When clay or soapstone ducts are specified, they shall be installed with concrete encasement as described above. Clay conduit shall be of the single-bore type. Where the self-centering socket-joint type of single clay duct is used, conduit shall be built up, tier by tier, and separated only by sufficient mortar or fine aggregate concrete to bed the ducts evenly and fill all voids between ducts. Single ducts shall be jointed together and the joints grouted with Portland cement mortar. A suitable gasket (of rubber or other approved material) shall first be placed in the receptacle end of the duct, prior to the joining operation, in order to exclude all mortar from the duct.

Where the square bore butt joint type of clay duct, single or multicell, is used, sections shall be aligned with at least 4 steel dowel pins and joints wrapped with duct tape 6 inches wide and lapped 6 inches. All joints in a bank of single-bore ducts shall be staggered, beginning evenly from the manhole or handhole, by means of short lengths 6, 8, 9, 12, and 15 inches long. Cement mortar shall be troweled around each and every joint. Voids in the duct bank, caused by the external shape of the corners of the conduit, shall also be filled with mortar. The joining and joints of soapstone duct shall be done according to the manufacturer's recommendations.

110-3.3 DUCTS WITHOUT CONCRETE ENCASEMENT. Trenches for single-duct lines shall be not less than 18inches, and the trench for 2 or more ducts installed at the same level shall be proportionately wider. Trench bottoms for ducts without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the duct along its entire length.

A layer of bedding as shown on the plans, at least 4 inches thick (loose measurement) shall be placed in the bottom of the trench as bedding for the duct. The bedding material shall be tamped until firm.

Unless otherwise shown in Plans, ducts for direct burial shall be installed so that the tops of all ducts are at least 1.5 feet below the finished grade.

When two or more ducts are installed in the same trench without concrete encasement, they shall be spaced not less than 2 inches apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches apart in a vertical direction.

Trenches shall be opened the complete length before duct is installed so that if any obstructions are encountered, proper provisions can be made to avoid them.

110-3.4 PVC CONDUIT. Install PVC conduit where indicated on the Plans.

Fabricate the conduit runs as recommended by the conduit manufacturer. Make all joints square, tight, and leakproof. Do not allow bends or breaks in the joints. Use only solvents and cements, which are specifically recommended by the conduit manufacturer. Join together the complete run between each light base alongside the trench. Place in the trench and connect to the base assembly after the minimum cure time of the joint cement has elapsed and after inspection and approval is granted by the Engineer.

Make field cuts of the conduit true and square with a tool or lathe designed for the purpose. Debur and ream the conduit as required.

Bend PVC conduit at the job site only with a "Hot Box" or as recommended by the conduit manufacturer. Heat the conduit uniformly to obtain smooth bends without overheating. Conduit with a brown appearance shall not be used. Conduit with extremely sharp bends, kinks in the bends or which exhibits a significant visual defect shall not be used.

Install expansion fittings in each run of conduit between light base assemblies, at spacing not exceeding 60 feet. The expansion fitting shall be of the same manufacturer as the conduit and shall be installed according to the manufacturer's instruction. Expansion joints shall be installed a maximum of 10 feet from the edge light bases or hand holes and shall be installed with joints 1/4 inch expanded, resulting in a minimum requirement of four expansion joints per 190-foot run of conduit.

After the conduit run has been completed, pull a standard flexible mandrel not less than 12 inches long, having a diameter approximately 1/4 inch less than the inside diameter of the conduit, through the entire length of the conduit run, after which a brush with stiff bristles of at least the diameter of the inside of the conduit shall be pulled through the entire length of the conduit run to make certain that no particles of earth, sand, or gravel have been left in the line.

110-3.5 HDPE CONDUIT. Assure that the conduit is open, continuous and free of water and debris prior to installing cable. In underground conduit, pull a stiff bristle brush through the entire length of the conduit run immediately prior to the cable being installed.

All HDPE conduit shall be backfilled at the same temperature that it was installed in the trench at and on the same work day. The HDPE conduit shall not be pulled tight in the trench, it shall be laid in the trench and allowed to snake side to side as it lays unrestrained. This extra length taken up by snaking shall not be pulled out of the conduit prior to splicing at each end and backfilling.

HDPE conduit shall be installed continuous between hand holes or bases. HDPE conduit shall not be spliced together to extend the length of conduit to the next handhole or base.

Where it is necessary to cut a piece of conduit at the job site, the cut shall be made true and square with a tool or lathe designed for the purpose. The conduit shall be de-burred and reamed as required.

The HDPE conduit shall be run through a tool recommended by the manufacturer to remove the “reel memory” prior to being placed in a trench.;

GRS conduit shall be used for all bends greater than 45 degrees. HDPE conduit may be used for long radius sweeps where the radius exceeds 15 feet.

When placing more than one conduit in a single trench, provide a 2 inch separation between conduits.

Use water if lubrication is needed when installing E-lock couplings. Do not use WD-40 or other lubricants.

110-3.6 DUCT MARKERS. Place marker tape 0.5 foot below final grade or below bottom of Crushed Aggregate Base Course in paved areas for the full length of the trenches above all ducts installed as indicated on the Plans.

When called for in the Plans, the location of the ends of all ducts shall be marked by a concrete slab marker 2 feet square and 4 inches thick extending approximately 1 inch above the surface. The markers shall be located above the ends of all ducts or duct banks, except where ducts terminate in a handhole, manhole, or building.

The Contractor shall impress the word “DUCT” on each marker slab, and shall also impress on the slab the number and size of ducts beneath the marker. The letters shall be 4 inches high and 3 inches wide with width of stroke 1/2 inch and 1/4 inch deep or as large as the available space permits.

110-3.7 BACKFILLING. Backfill only after the duct has been placed, inspected and accepted by the Engineer.
After concrete-encased ducts have been properly installed and the concrete has had time to set, the trench shall be backfilled in at least two layers with backfill material as shown on the plans and thoroughly tamped and compacted to at least the density of the surrounding undisturbed soil. If necessary to obtain the desired compaction, the backfill material shall be moistened or aerated as required. If duct is placed in the structural section (P-154, P-208, P-209) of a pavement such as for a runway or taxiway, the Contractor shall construct the backfill according to the specifications for the material in which the duct is placed.

Trenches shall not be excessively wet and shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface: except that, when sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of according to instructions issued by the Engineer.

For ducts without concrete envelope, bedding shall be placed around the ducts and carefully tamped around and over them with hand tampers. Bedding shall be as shown on the plans. Bedding shall be placed to provide a minimum of 2 inches of cover when compacted over and to the sides of the duct. The remaining trench may be filled with backfill and compacted as shown on the plans.. If duct is placed in the structural section (P-154, P-208, P-209) of a pavement such as for a runway or taxiway, the Contractor shall construct the backfill according to the specifications for the material in which the duct is placed. Backfill and bedding shall be as shown on the plans and shall conform to the applicable section of the specifications.

Remove and dispose of all water entering the excavation. Disposal of water shall be done in a manner to prevent damage or nuisance to adjacent property, and in accordance with all applicable laws and regulations. Pumps shall be adequate to maintain a dry trench during the bedding, conduit, handhole, light base, installation, etc. No backfill may be placed in standing water under any circumstances.

Bedding shall be placed in conformance with the lines and grades shown on the plans and to limits depicted in the Details. Before placing any bedding material, the bottom of the trench shall be hand-raked to remove stones and lumps which will interfere with smooth and complete bedding of all items associated with the electrical work and mechanically compacted. The specified bedding material shall be placed the full width of the trench, and compacted per Section P-209 of these specifications.

After the conduit, handholes, etc., have been placed and approved for covering, the bedding material shall be placed evenly around the structures or over conduit for the full width of the trench. Approval for covering does not imply final acceptance of the conduit, handholes, etc., or relieve the Contractor in any way of responsibility to complete the project in conformance with the plans and specifications.

At least 24 hours prior to commencing backfilling operations, notify the Engineer of the proposed method of compaction. No method will be approved until it has been demonstrated, under actual field condition, that such method will produce the degree of compaction required.

The initial density test at any location will be paid for by the Owner. If initial test shows that the material compaction is not as specified, the Contractor shall modify the compaction methods used, as approved by the Engineer, and have the material re-tested until the tests show that the compaction meets the specification requirements. All tests, after the initial test at any given location, shall be paid for by the Contractor.

Exercise care in all compaction operations to prevent damage to fixtures, boxes, or conduits. Any such items damaged as a result of the above operations shall be removed and replaced at no additional cost to the State.

110-3.8 RESTORATION. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the trenching, storing of dirt, cable laying, pad construction and other work shall be restored to its original condition. The restoration shall include any necessary topsoil, fertilizing, liming, seeding, sprigging, or mulching. All such work shall be performed according to the FAA Standard Turfing Specifications. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance.

All surface areas disturbed and/or damaged by trenching, excavation, sorting of materials, or any other construction related activities shall be restored to their original conditions at no cost to the Owner.

110-3.9 RECORD DOCUMENTS. Maintain at the project site a complete set of contract Plans, specifications and approved changes thereto. In addition to the above, 2 complete sets of electrical plans shall be maintained for as-built purposes upon which all changes, connections, part numbers and conductor routings shall be legibly shown and noted. Where changes to Plans are involved, make notations to show the dates and authorities approving the changes. Permanently store one set of annotated electrical plans in a dry, secure location at the project site. Deliver the second set to the Engineer.

As-built plans shall show locations of all buried items such as conduit, including any existing active lines encountered. All dimensions shall be from runway and taxiway centerlines or other permanent objects. As-built plans shall include complete wiring diagrams, (both power and control), identifying terminals, cables, and connections. As-built plans shall be kept current as the work progresses.

110-3.10 GUARANTEE. Furnish a written guarantee that any materials or workmanship found defective within one year of final acceptance shall be replaced at no additional cost to the Owner, promptly upon notification and to the satisfaction of the Engineer.

METHOD OF MEASUREMENT

110-4.1 Underground duct shall be measured by the linear foot of duct installed, measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes. Payment will cover all work described in the item.

Items shown as lump sum will not be measured for payment. Payment will cover all work described in the item.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price for each type and size of single-way or multi-way duct completed and accepted. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Subsidiary work – All work associated with providing the equipment and materials included in this section of the specifications that is not specifically covered in the pay items below shall be considered Subsidiary to the pay items below and shall not be paid for separate from the pay items below. This includes any work required to access the area in and across soft ground or muskeg necessary to perform work under this and related items. Bedding and backfill are subsidiary and are not paid under P-209.

Payment for conduit for the FAA systems will be made under pay items in other specification sections. Payment for this conduit will not be made under the following items.

Payment for conduit for the Runway Guard Lights will be made under pay item L-100n Complete Runway Guard Lighting. Payment for this conduit will not be made under the following items.

Payment for conduit for the temporary runway lighting will be made under pay item L-100r Temporary Runway Lighting System. Payment for this conduit will not be made under the following items.

Payment will be made under:

Item L-110a	2-1/8 inch Rigid Steel Conduit – per linear foot.
Item L-110b	3 inch Rigid Steel Conduit - per lump sum
Item L-110d	3-inch PVC Conduit - per lump sum
Item L-110g	2-inch PE Conduit - per linear foot

MATERIAL REQUIREMENTS

Fed. Spec. W-C-571	Conduit and Fittings, Nonmetal, Rigid; (Asbestos-Cement or Fire-Clay Cement), (For Electrical Purposes)
Fed. Spec. W-C-1094	Conduit and Fittings; Nonmetallic, Rigid, (Plastic)
UL Standard 6	Rigid Metal Conduit
UL Standard 514	Fittings for Conduit and Outlet Boxes
UL Standard 543	Impregnated-Fiber Electrical Conduit
UL Standard 1242	Intermediate Metal Conduit

ITEM L-127 AIRFIELD LIGHTING CONTROLS AND MONITORING SYSTEM (ALCMS)

DESCRIPTION

127-1.1 BACKGROUND. The Airfield Lighting Controls and Monitoring System (ALCMS) shall combine state-of-the-art programming intelligence with high quality industrial strength components. The system shall represent the leading edge in aviation lighting technology with innovative touchscreen control stations; distributed control and monitoring; and powerful database storage and retrieval systems.

127-1.2 QUALIFICATIONS

a. The ALCMS manufacturer shall be ISO 9001 certified and provide a copy of the ISO certification during the submittal process.

b. The ALCMS manufacturer shall be listed in the FAA Approved Equipment List, AC 150/5345-53 (current edition) as a FAA approved supplier of L-890 Airfield Lighting Control and Monitoring Systems in accordance with AC 150/5345-56 (current edition), and be a FAA approved supplier of L-827/L-829 Constant Current Regulator Monitors in accordance with AC 150/5345-10 (current edition).

c. The ALCMS manufacturer shall have a minimum of five (5) years of experience in computerized airfield lighting control and monitoring systems and shall have installed at least five (5) advanced control and monitoring systems of similar size and complexity to the one specified herein.

127-1.3 PROJECT SCOPE

a. The ALCMS Manufacturer shall furnish and commission a complete and functional computerized distributed control and monitoring airfield lighting system based on an industry standard Ethernet network.

b. This project shall include software, programming, computers, manuals, on-site commissioning, on-site testing, on-site training and any other materials, tools and equipment to provide a fully functional system to the satisfaction of the owner.

127-1.4 PROJECT COORDINATION

a. The ALCMS Manufacturer shall provide an experienced and qualified Engineering, Sales and Service staff to support the contractor and airport throughout the installation and life of the system.

b. The project shall follow this basic cycle of events:

	Milestone	**Description**
1.	Submittal	The ALCMS Manufacturer shall submit ALCMS specifications to the contractor.
2.	Submittal Review and Approval	Submittal is reviewed by the contractor, airport, and engineer(s).
3.	Production Release	The ALCMS Manufacturer shall release approved system to manufacturing.
4.	Demo CD 35% Software Completion	The ALCMS Manufacturer shall send to the contractor, airport, and engineers a Demo CD of the planned layout of the touchscreen that will be used for the control of the ALCMS system.
5.	Production	System is manufactured.

6.	Production Testing	System is tested by the ALCMS Manufacturer.
7.	Factory Acceptance Testing	System is available for Factory Acceptance Testing (FAT) witnessed by airport/owner.
8.	Shipment of system	Approved system is shipped to installation site.
9.	Installation	Contractor installs equipment and completes external wiring.
10.	Commissioning	The ALCMS Manufacturer shall arrive at installation site to complete commissioning of system and verify contractor installation and wiring.
11.	System Readiness Check	The ALCMS Manufacturer shall perform a system readiness check to verify proper operation of all equipment prior to cut over.
12.	System Cut-over	The ALCMS Manufacturer and Contractor shall cut over the new system and bring it on-line and operational.
13.	System Acceptance Testing	System is available for System Acceptance Testing (SAT) which shall be witnessed the by airport/owner and/or engineer.
14.	Manuals / As-Built drawings	The ALCMS Manufacturer shall issue operator manuals, maintenance manuals and ATC manuals and final as-built drawings.
15.	On-Site Training	The ALCMS Manufacturer shall complete on-site training of maintenance, Operations, and ATC personnel.
16.	Final Owner Acceptance	Upon completion of all contractual requirements, system is accepted in writing by the airport/owner.
17.	Warranty and Support	The ALCMS Manufacturer shall provide warranty and support per the contractual requirements.

127-1.5 FACTORY ACCEPTANCE TEST (FAT)

a. Before shipment, the ALCMS system shall be assembled as an operating system at the ALCMS Manufacturer's test facilities.

b. The ALCMS Manufacturer shall make the FAT available for representative(s) of the airport/owner and engineer to witness the testing of the system.

c. At a minimum, the FAT shall allow for one (1) day of testing and review, but may require additional time depending on the results of the testing.

d. The ALCMS Manufacturer shall incur the costs of setting up and performing the test excluding airport/owner and engineer related travel and accommodations.

e. During the FAT, minor software comments shall be finalized and incorporated into the final system.

127-1.6 CONTRACTOR INSTALLATION REQUIREMENTS

a. The installing contractor shall be responsible for the physical installation of all associated ALCMS components. At a minimum, this includes the Constant Current Regulators (CCRs), computer cabinets, Touchscreen control stations and Distributed Control and Monitoring Equipment (DCME).

b. The Contractor shall furnish, install, relocate, connect and test all equipment, equipment accessories, conduit cables, wires, buses, grounds and support necessary to insure a complete and operable electrical distribution facility for the airport lighting system as specified in the submittal package.

c. The equipment installation and mounting shall comply with the requirements of the National Electrical Code and local code agency having jurisdiction.

1.6.1 Wire and Connections

a. The Contractor shall make all necessary electrical connections at each location in accordance with the ALCMS manufacturer's wiring diagrams.

b. All wires called out in the drawings associated with equipment that is to be controlled or monitored should be pulled, terminated and dressed at the appropriate terminal blocks and at the associated equipment.

c. The Contractor shall leave sufficient extra wire length on each control/monitoring lead to make future changes in connections at the terminal block.

1.6.2 Marking and Labeling

a. All equipment, control wires, terminal blocks, etc., shall be tagged, marked or labeled as specified below:

(1) Wire Identification: The Contractor shall furnish and install labels or identifying tags on all control wires at the point where they connect to the control equipment or to the terminal blocks.
(2) Wire labels, if used, shall be of the self-sticking, pre-printed type and of the manufacturer's recommended size for the wire involved. Identification markings designated in the plans shall be followed.
(3) Tags, if used, shall be nonferrous metal or plastic. Each tag shall be securely tied to the proper wire by a nonmetallic cord or plastic wire tie.

1.6.3 Installation of Data Cables

a. The Contractor shall install, terminate and test all data cables required for the project. This includes all of the following components: Data cables, terminal cabinets and jumper cables.

b. All associated data cables shall be tested upon completion of the cable installation and termination of connectors.

c. Tests shall include verification of point-point continuity of each wire.

d. All test data shall be recorded and included in a test report that shall be submitted to the airport / owner for approval.

e. Commissioning of the system shall not begin until all test reports are submitted and approved and a copy provided to ALCMS Manufacturer.

1.6.4 Contractor Fiber Optic Communication Equipment Installation

a. The Contractor shall install, terminate and test all fiber optic communications required for the project. This includes all of the following components:

(1) Fiber optic cable

(2) Fiber optic patch panels
(3) Fiber optic jumper cables
(4) Fiber connectors / couplings
(5) Fiber junction boxes

b. Installation of the fiber optic communication equipment shall be done by a trained and qualified fiber optic specialist.
c. All associated fiber optic equipment including fiber cables, splices and jumper cables shall be tested upon completion of the fiber cable installation and termination of connectors.
d. Tests shall include verification that the dB loss is within acceptable limits versus the distance of the fiber pull.
e. All test data shall be recorded and included in a test report that shall be submitted to the airport / owner for approval.
f. Commissioning of the system shall not begin until all test reports have been submitted and approved.

1.6.5 Contractor Hard-wire Data Cable Installation

a. The Contractor shall install, terminate and test all hard-wire communications required for the project. This includes all of the following components:

(1) ALCMS manufacturer specified data cable
(2) Data cable termination panels
(3) Data cable jumper cables
(4) Connectors / couplings
(5) Junction boxes

b. Installation of the data cable shall be done by a trained and qualified specialist.
c. All associated cabling, splices and jumper cable shall be tested upon completion of the cable installation and termination of connectors.
d. Tests shall include verification that the signal strength loss is within acceptable limits versus the distance of the cable pull.
e. All test data shall be recorded and included in a test report that shall be submitted to the airport / owner for approval.
f. Commissioning of the system shall not begin until all test reports have been submitted and approved.

127-1.7 ALCMS MANUFACTURER COMMISSIONING

a. The ALCMS Manufacturer shall perform the following installation and commissioning tasks:

(1) Verify Contractor connections including power, control and monitoring.
(2) Verify proper labeling of equipment.
(3) Verify communication connections.
(4) Perform system testing including control, monitoring and diagnostics.
(5) Training on ALCMS related equipment.
(6) Perform System Acceptance Testing (SAT).

127-1.8 SYSTEM ACCEPTANCE TEST (SAT)

a. Following the final installation and commissioning of the system, the ALCMS Manufacturer shall perform a demonstration of the system performance. This demonstration shall include the following:

(1) Lighting control functions
(2) Monitoring functions
(3) Alarm functions
(4) Print and Display functions

b. The ALCMS Manufacturer shall develop a SAT test plan in accordance with the specifications and issue this to the contractor for approval from the airport engineer.

c. The SAT shall be witnessed by owner representatives, the contractor and the engineer.

1.8.1 Maintenance Manuals

a. The ALCMS Manufacturer shall provide six (6) hard copies of the operation and maintenance manuals that are hard-covered and suitable for daily operation and maintenance of the system. The manuals shall include the following information:

(1) Operational overview and system description
(2) Graphical User Interface (GUI) Screen operation
(3) System Block Diagram
(4) Detailed external wiring diagrams (Electrical Contractor wiring)
(5) Detailed input/output terminal diagrams
(6) Detailed assembly drawings and wiring diagrams
(7) Original Equipment Manufacturer (OEM) Manuals

b. The manuals shall be spiral bound or supplied in 3-ring binders. The cover of each binder shall be labeled with all project-related information.

1.8.2 FAA Air Traffic Control Manuals

a. The ALCMS Manufacturer shall provide six (6) hard copies of the operation manuals for Air Traffic Controller (ATC) use. The manuals shall be hard-covered and suitable for daily operation of the system. At a minimum, the manuals shall include the following information:

(1) Touchscreen operation (graphical user interface)
(2) Touchscreen maintenance (i.e. calibration)

b. The manuals shall be spiral bound or supplied in 3-ring binders. The cover of each binder shall be labeled with all project-related information.

127-1.9 AS-INSTALLED DRAWINGS

a. The ALCMS Manufacturer shall provide six (6) hard copies of As-Installed drawings after system acceptance. The As-Installed drawings shall include the following information:

(1) System Block Diagram (1-line drawings)
(2) System External Wiring Diagrams
(3) Assembly Drawings
(4) Assembly Wiring Diagrams

b. The As-Installed drawings shall be 11" X 17" in size and shall be spiral bound or supplied in 3-ring binders. The cover of each binder shall be labeled with all project-related information.

127-1.10 ON-SITE TRAINING

a. The ALCMS Manufacturer shall provide to the contractor a final training course syllabus and training schedule thirty (30) days before on-site training.

b. All training sessions shall be held in a facility provided by the airport. This facility should have tables, chairs, projection screen and sufficient space to lay out manuals and drawings. The ALCMS Manufacturer shall provide all required visual aids and projectors.

1.9.1 FAA Training

a. FAA Air Traffic Control should designate a Training Coordinator that shall be responsible for scheduling and organizing on-site training for their personnel. In addition, this coordinator shall be responsible for training other personnel that were absent or unable to attend the training sessions.

b. The ALCMS Manufacturer shall provide two (2), 1 hour User Training Class for Air Traffic Control (ATC) personnel. ATC Training Coordinator should be present for both classes. This training shall include discussion and review of the following:

(1) ALCMS General System Overview
(2) Touchscreen Operations
(3) Using the Control System (GUI)
(4) Command and Control Sequences
(5) Alarm and Warning Messages
(6) Failsafe Conditions
(7) Granting Local Control to the Vaults

c. Training classes for FAA ATC personnel should be limited to a maximum of 4-6 people per class.

1.9.2 Maintenance Training

a. Maintenance should designate a Training Coordinator that shall be responsible for scheduling and organizing on-site training for their personnel. In addition, this coordinator shall be responsible for training other personnel that were absent or unable to attend the training sessions.

b. The ALCMS Manufacturer shall provide two (2), 8 hour (one day) training class for maintenance personnel. This training shall include discussion and review of the following:

(1) System Block Diagram
(2) System Assemblies and Wiring Diagrams
(3) Touchscreen Operation
(4) Graphical User Interface (GUI) Screens
(5) Maintenance and Troubleshooting
(6) Granting Local Control to the Vaults
(7) Power Up and Power Down Sequences
(8) Failsafe Operations
(9) Implementing Airfield Lighting Changes
(10) Maintenance Report Generation

c. Training classes for maintenance personnel should be limited to a maximum of 4-6 people per class.

127-1.10 OWNER SYSTEM ACCEPTANCE AND WARRANTY START DATE

a. Upon successful completion of the SAT and on-site training the owner shall issue the ALCMS Manufacturer a written notice of system acceptance within five (5) working days.

b. The date the final acceptance letter is received or five (5) days following successful completion of the SAT (whichever occurs first) represents the start of the warranty period. Please refer to the Warranty section for more information regarding the ALCMS warranty guarantee.

127-1.11 SYSTEM WARRANTY

a. All equipment shall be warranted against defects in workmanship, hardware and software for a period of one (1) year from initial operation of the system but not more than eighteen (18) months from the manufacturer's shipment of the system.

b. During this time period the ALCMS manufacturer shall provide all parts, labor and technical support with the following conditions:

(1) The manufacturer shall correct by repair or replacement, at its option, equipment or parts which fail because of mechanical, electrical or physical defects, provided that the goods have been properly handled and stored prior to installation, properly installed and properly operated after installation, provided further that Buyer gives manufacturer written notice of such defects after delivery of the goods to Buyer.
(2) The manufacturer may examine any goods upon which a claim is made in the same condition as when defect therein is discovered, and may require the return of the goods to establish any claim.
(3) The manufacturer's liability under no circumstances shall exceed the contract price of goods claimed to be defective.
(4) Any returns under this guarantee are to be on a transportation charge prepaid basis. For products not manufactured by, but sold by the manufacturer, warranty is limited to that extended by the original manufacturer.

127-1.12 SYSTEM SERVICE AND SUPPORT

a. The ALCMS Manufacturer shall provide technical assistance and support during the warranty period.

b. The ALCMS Manufacturer shall provide a 7 day a week / 24 hours a day support phone line.

c. The ALCMS Manufacturer shall provide technical phone support within four (4) hours of the initial call.

d. The ALCMS Manufacturer shall provide free phone consultation and technical support as required during the warranty period and if necessary shall be on-site within 24 hours.

e. At the request of the airport/owner, the ALCMS Manufacturer shall provide information about preventative maintenance programs and extended warranty packages.

127-1.13 SPARE PARTS

a. A recommended spare parts list shall be included with the Submittal including part numbers and pricing. These prices shall be valid for (12) months from date of system acceptance.

b. At a minimum, the spare parts package shall include the following components:

<An alternate option is included below if spares parts are a deliverable for the project. Inclusion of spare parts with the project is highly recommended. >

Qty	Part Number	Description
1		Touchscreen
1		Computer, Industrial, to match industrial hardware supplied
2		Distributed Control and Monitoring Equipment (DCME) Assembly
2		Current / Voltage Module (CVM)

2		Insulation Resistance Module (IRM)
2		Ethernet Fiber Optic Transceiver
2		Network Interface Card (NIC)

EQUIPMENT AND MATERIALS

127-2.1 General

a. The ALCMS system shall be based on a network ready system that operates within a Microsoft Windows ™ operating environment.

b. The ALCMS shall be a PC-based system and shall not use any Programmable Logic Controller (PLC) components for control or monitoring.

c. An Ethernet communication network shall be used for data transfer between the electrical vault(s), control tower, maintenance center and any other designated work station location.

d. The computerized airfield lighting control and monitoring system shall consist of the following major hardware components:

(1) Touchscreen control station(s) located in the tower cab.
(2) Tower computer subsystem consisting of an industrial enclosure, industrial tower computer and communication equipment.
(3) Vault computer subsystem consisting of an industrial enclosure, industrial vault computer, communication equipment, and a redundant vault control / monitoring network.
(4) Flight Service Station subsystem consisting of a commercial computer and LaserJet printer.

e. Within the airfield lighting vault shall be a distributed control and monitoring system which operates on a redundant communication network.

f. The Distributed Control and Monitoring Equipment (DCME) shall be of a distributed nature that shall be installed locally at each controlled element within the vault. The vault industrial computer communicates to each DCME via two (2) shielded cables each consisting of two (2) twisted pairs.

g. The system shall monitor the operation of the various lighting systems per AC 150/5345-10 (current edition) requirements.

127.2.2 Communication Network

a. The tower, electrical vault and maintenance center computer shall communicate with each other via two or more of the following communication networks.

2.1.1 Fiber Optic Ethernet, 850nm, multi-mode, [maximum distance 2km / 6600 feet]

a. Supply, installation, termination and testing of the fiber optic cable and associated equipment including fiber cable, fiber patch panels, fiber patch cables, ST connectors and couplings shall be the responsibility of the electrical contractor.
b. The fiber optic cables shall be multi-mode, 850nm wavelength, 62.5/125 micron fiber cable. Each fiber communication link requires 2 fibers.
c. All fiber optic cable shall be terminated at a fiber optic patch panel within each subsystem before being terminated at the communication equipment.
d. Fiber optic jumper cables shall be provided from the fiber patch panel to the computer equipment enclosures.

e. Fiber optic cable shall be terminated with ST style connectors at the fiber optic transceivers located within the vault computer cabinet.
f. Fiber optic runs shall not exceed 2000 meters (6,600 feet) when using multi-mode fiber optic cable.
g. Fiber optic runs shall be direct point-point runs with no splices.
h. Fifty percent (50%) spare fiber cables shall be pulled and terminated within the fiber optic patch panel for future expansion.
i. Upon completion of fiber optic installation, the contractor shall provide airport/owner with a test report which shall include dB loss test results.

2.1.2 Fiber Optic Ethernet, 1300nm, multi-mode, [maximum distance 5km / 16,000 feet]

a. Supply, installation, termination and testing of the fiber optic cable and associated equipment including fiber cable, fiber patch panels, fiber patch cables, ST connectors and couplings shall be the responsibility of the electrical contractor.
b. The fiber optic cables shall be multi-mode, 1300nm wavelength, 62.5/125 micron fiber cable. Each fiber communication link requires 2 fibers.
c. All fiber optic cable shall be terminated at a fiber optic patch panel within each subsystem before being terminated at the communication equipment.
d. Fiber optic jumper cables shall be provided from the fiber patch panel to the computer equipment enclosures.
e. Fiber optic cable shall be terminated with ST style connectors at the fiber optic transceivers located within the vault computer cabinet.
f. Fiber optic runs shall not exceed 5km (16,000 feet) when using multi-mode fiber optic cable. For distances longer than 5km, please contact the ALCMS manufacturer for fiber specifications.
g. Fiber optic runs shall be direct point-point runs with no splices when possible.
h. Fifty percent (50%) spare fiber cables shall be pulled and terminated within the fiber optic patch panel for future expansion.
i. Upon completion of fiber optic installation, the contractor shall provide airport/owner with a test report which shall include dB loss test results.

2.1.3 Fiber Optic Ethernet, 1300nm, single mode, [maximum distance 20km / 65,000 feet]

a. Supply, installation, termination and testing of the fiber optic cable and associated equipment including fiber cable, fiber patch panels, fiber patch cables, ST connectors and couplings shall be the responsibility of the electrical contractor.
b. The fiber optic cables shall be single mode, 1300nm wavelength, 5/125 micron fiber cable. Each fiber communication link requires 2 fibers.
c. All fiber optic cable shall be terminated at a fiber optic patch panel within each subsystem before being terminated at the communication equipment.
d. Fiber optic jumper cables shall be provided from the fiber patch panel to the computer equipment enclosures.
e. Fiber optic cable shall be terminated with ST style connectors at the fiber optic transceivers located within the vault computer cabinet.
f. Fiber optic runs shall not exceed 20km (65,000 feet) when using single mode fiber optic cable.
g. Fiber optic runs shall be direct point-point runs with no splices when possible.
h. Fifty percent (50%) spare fiber cables shall be pulled and terminated within the fiber optic patch panel for future expansion.
i. Upon completion of fiber optic installation, the contractor shall provide airport/owner with a test report which shall include dB loss test results.

127-2.2 COMPUTERS

2.2.1 Industrial Computer

a. All the industrial-grade computers in the ALCMS system are identical and have the following technical specifications:

ID	Options	Description
a)	Type	Industrial-grade computer. Advantech or approved equal
b)	Processor Type	Intel Pentium® 4, or better
c)	Processor Clock Rate	2.5 GHz or better
d)	Memory Capacity	512Mbytes, minimum, RAM
e)	Hard Disk **See details to follow**	4GByte, minimum, Solid State Flash Drive **Standard rotating drives are not acceptable**
f)	Hard Drive Bay	Flash Drive installed in a removable, front accessible drive bay with locking mechanism
g)	Compact Flash Card **See details to follow**	2GByte, minimum, Compact Flash Card, or better **Stores compressed "Ghost" image of Flash Drive, airport specific programs and configurations**
h)	CF Card Reader	Front accessible CF Card reader installed in a 5.25" drive Bay
i)	Floppy Diskette Drive	1.44 MB, 3.5" (not required)
j)	2 X USB Ports	2 Front accessible USB Ports
k)	Cache Memory	L2 512KB, minimum
l)	CD-ROM	52X, or better
m)	Video (Integrated)	SVGA, 8MB VRAM, minimum support 1280 x 1024, or better.
n)	Operating System	Window XP™ Pro, or better
o)	Lockable Drive Bay	Front accessible and lockable drive bay door that protects all drive bays
p)	Redundant Hot Swappable Fans	Front accessible and hot swappable CPU fans that can be removed and replaced while computer is running
q)	Redundant Power Supplies	Rear accessible and hot swappable CPU power supplies that can be removed and replaced while computer is running
r)	Front LED diagnostics	Front viewable LED diagnostic LEDS showing status of Hard Drive, Temperature, Fans and all power supply voltages (+3.3, 5V, +12V, -12V)

Table 1: Industrial Computer Specifications

b. All the industrial-grade computers in the ALCMS system shall be designed using a slot board computer.

(1) The computer back plane shall be passive, meaning a motherboard and daughter-board design is not acceptable.
(2) The central processing unit (CPU) shall be on a slot board type card that is installed on the back plane of the computer chassis.
(3) CPU upgrades shall be as simple as replacing the CPU of the slot board or removing the slot board card and plugging in a new one.
(4) To ensure stability, the slot board computers shall have undergone a 140°F (60°C) dynamic burn-in test.

(5) The slot board computer shall be designed to withstand harsh environmental conditions like shock, vibration, power surges and fluctuations, heavy dust, and extreme temperatures.

2.2.2 Flash Drive

a. The computer shall use a solid state Flash Drive (no moving parts) and it shall be a Memtech or approved equal.
b. The Flash Drive shall be a minimum of 4G Bytes
c. The Flash Drive shall operate at temperatures from -40 degrees C to +85 degrees C
d. The Flash Drive shall have 1000G operating shock and 15G operating vibration rating.
e. The drive shall have a 10 year rated data integrity specification.
f. The Flash Drive shall use Active Remap versus Wear Leveling to assure extended drive life.
g. The Flash Drive shall store the operating system and any programs that require erase/read/write cycles.
h. Flash Drive specification sheets shall be provided with Submittal showing proposed flash drive meets specification requirements.

2.2.3 Compact Flash Card

a. The computer shall use an external Compact Flash (CF) Card which shall be installed using either a PCMCIA Compact Flash Card Reader or an external 5 ¼" bay with a compact flash card reader.
b. The CF Card shall be a minimum of 2 GBytes
c. No erase and/or write cycles shall occur to the Compact Flash Card.
d. The CF Card shall store programs and configuration files that are only read during power-up. These files should be the airport specific programs and configurations.
e. The CF Card shall contain "Ghost" image (Exact image of the original drive) of the Flash Drive which allows for easy Flash Drive replacement and repair.

2.2.4 Flash Drive Service / Repair

a. The touchscreen computer shall be able to be rebuilt using a new blank Flash Drive or blank standard Hard Drive.
b. The computer shall be able to boot from the CF Card and execute a "Ghost" image rebuild program.
c. The rebuild program shall extract and copy the "Ghost" image, all configurations and airport specific programs from the CF Card to the new blank Flash Drive.
d. Upon completion of the rebuild program, the touchscreen computer shall be able to be rebooted and be completely operational.

2.2.5 Commercial Computer Technical Specifications

a. All commercial grade computers in the ALCMS system shall have the following technical specifications:

ID	Options	Description
a)	Type	Commercial grade computer
b)	Processor Type	Intel Pentium® 4, or better
c)	Processor Clock Rate	2.5 GHz or better
d)	Memory Capacity	512Mbytes, minimum, RAM
e)	Hard Disk **See details to follow**	4GByte, minimum, Solid State Flash Drive **Standard rotating drives are not acceptable**
f)	Hard Drive Bay	Flash Drive installed in a removable, front accessible drive bay with locking mechanism
g)	Compact Flash Card **See details to follow**	2GByte, minimum, Compact Flash Card **Stores compressed "Ghost" image of Flash Drive, airport specific programs and configurations**

h)	CF Card Reader	Front accessible CF Card reader installed in a 5.25” drive Bay
i)	Floppy Diskette Drive	1.44 MB, 3.5” (not required)
j)	2 X USB Ports	2 Front accessible USB Ports
k)	Cache Memory	L2 512KB, minimum
l)	CD-ROM	52X, or better
m)	Video (Integrated)	SVGA, 8MB VRAM, minimum support 1280 x 1024, or better
n)	Operating System	Window XP™ Pro, or better

Table 2: Commercial Computer Specifications

2.2.6 Vault Computer

a. The vault computer shall be capable of independently carrying out the following functions:

(1) Decode all commands received and transfer them to the corresponding Distributed Control and Monitoring Equipment (DCME) unit for execution.
(2) Interrogate all the DCME units to determine the status of the Constant Current Regulators (CCRs) and other controllable items.
(3) Transfer the status of the CCRs and other controllable items to the control tower computer and maintenance center computer.
(4) Continuously check for proper operation of all the communication links connected to the computer.
(5) Continuously check for proper operation of the vault distributed control and monitoring network.
(6) Duplicate the tower control and graphical displays for allowing authorized control from the vaults.
(7) The vault shall also duplicate the maintenance center status information.
(8) Provide real-time and historical information on the status of the airfield lighting systems and other controlled and monitored items.
(9) Provide information as to the time, type, location and nature of system problems, alarms or warnings.
(10) Provide hard copies of real-time and historical information on the status of the airfield lighting systems and other controlled and monitored items.
(11) The vault computer application shall not be able to initiate lighting commands unless the control tower authorizes control to Vault.
(12) Provide remote dial-in and diagnostics for the ALCMS Manufacturer technical service personnel.

2.2.7 Tower Computer

a. The Tower computer shall be capable of independently carrying out the following functions:

(1) Receive commands from the Touchscreen control station(s) and transfer lighting control commands to the vault for execution.
(2) Receive the airfield lighting status information from the vault and transfer the status to the Touchscreen display.

2.2.8 Flight Service Station Computer

a. The FSS computer shall be capable of independently carrying out the following functions:

(1) Duplicate the tower control and graphical displays.
(2) Provide real-time and historical information on the status of the airfield lighting systems and other controlled and monitored items.
(3) Provide information as to the time, type, location and nature of system problems, alarms or warnings.

(4) The Flight Service Station computer application shall not be able to initiate lighting commands unless the control Tower authorizes control.

127-2.3 TOUCHSCREEN CONTROL STATIONS

2.3.1 Technical Specifications

a. Touchscreen technology shall be integrated into the display monitor and shall have the following technical specifications:

	Options	Description
a.	Technology	AccuTouch™ Five-Wire Resistive
b.	Screen Resolution	1280 x 1024 (minimum)
c.	Touch Resolution	Touchpoint controller resolution of 4096 x 4096
d.	Input method	Finger or stylus
e.	Positional Accuracy	Standard deviation error less than 0.080" (2mm)
f.	Agency Approvals	UL, CE, FCC Class A
g.	Chemical Resistance	The active area of the Touchscreen is resistant to all chemicals that do not affect glass.
h.	Temperature / Relative Humidity	-10°C to 50°C at 90% RH, non-condensing
i.	Electrostatic	Per EN 61000-4-2
j.	Light Transmission	80% +/- 5% at 550nm wavelength
k.	Face Plate	Anti-glare
l.	Expected Life	35 million touches in one location without failure

2.3.2 Touchscreen Monitor Specifications

a. The touchscreen video graphics display shall have the following technical specifications:

	Options	Description
a.	Type	LCD, active matrix
b.	Mounting	Flush Mount
c.	Size	19" Diagonal viewable
d.	Screen Resolution	1280 x 1024 (minimum)

b. The tower touchscreen video graphics display shall be designed to be installed flush into a cabinet console. A minimum four (4) inch clearance must be provided around the perimeter of the touchscreen installation to allow for proper heat dissipation.

c. Installation of the touchscreen and all cabinetry work and modifications is the responsibility of the Contractor.

d. The Contractor shall install to match existing cabinet construction and color.

127-2.4 SUBSYSTEM EQUIPMENT

2.4.1 Tower Equipment

a. Computer

(1) The Tower computer(s) shall be a 19" industrial rack-mount type.
(2) The computers shall meet previously specified technical requirements.
(3) 120 VAC, uninterruptible power shall be supplied to the computer and the Tower Touchscreen Monitor.

b. Touchscreen Monitors

(1) Touchscreen(s) shall be mounted in the Tower cab console.
(2) 120 VAC, uninterruptible power shall be supplied to the Tower Touchscreen.

c. Video / Serial Communication Extension Equipment

(1) A Video / Serial Communication extension Receiver box shall be installed in conjunction with each Touchscreen display under the tower cab console.
(2) A Video / Serial Communication extension Transmitter box shall be installed in conjunction with the tower computer located in the tower sub-junction.
(3) The video extension transmitter shall allow for simultaneous connection of the local service monitor and the remote touchscreen monitor.
(4) A category 5e communications cable shall be installed between the Receiver and Transmitter. A spare CAT 5e cable shall also be installed, for use as a future troubleshooting aid.

d. Service Monitor (LCD)

(1) The service display shall use a 17" LCD monitor.
(2) The monitor shall be located on a shelf within the tower equipment enclosure.
(3) 120 VAC, uninterruptible power shall be supplied to the monitor.

e. Audible Alarm assembly

(1) An audible speaker shall be installed in conjunction with each Touchscreen display.
(2) An audio and volume control cable shall be installed between the audible speaker and the tower computer located in the tower sub-junction.

f. Uninterruptible Power System

(1) An uninterruptible power system (UPS) shall be provided for supporting power to the tower equipment.
(2) The UPS shall be capable of supplying full load power for 10 minutes after loss of main input power.
(3) The UPS shall be a 19" rack-mount unit installed in the tower computer equipment enclosure.

g. Industrial Enclosures

(1) A NEMA 12 industrial enclosure shall be provided for housing associated tower computer equipment.
(2) The enclosure shall be designed for indoor use to provide protection against dust, dirt, dripping water and external condensation of non-corrosive liquids.
(3) The enclosure shall be an industry standard 19" rack-mount type enclosure.

(4) The industrial enclosure shall include a pagoda top with exhaust fan and ventilation kit for proper convection cooling.
(5) The environmental conditions within the area of the enclosure installation shall not exceed 122°F (50°C) or fall below 32°F (0°C).
(6) Installation of the tower equipment shall be the responsibility of the electrical contractor. The electrical contractor with the airport and/or owner shall coordinate the installation and location of the tower equipment.

2.4.2 Vault Equipment

a. Computer

(1) The vault computer shall be a 19" industrial rack-mount type.
(2) The computers shall meet previously specified technical requirements.
(3) 120 VAC, uninterruptible power shall be supplied to the computer.

b. Monitor (LCD)

(1) The service display shall use a 17" LCD monitor.
(2) The monitor shall be located on a shelf within the vault equipment enclosure(s).
(3) 120 VAC, uninterruptible power shall be supplied to the monitor.

c. Uninterruptible Power System: Vault Computer Equipment

(1) An uninterruptible power system (UPS) shall be provided for supporting power to the vault equipment.
(2) The UPS shall be capable of supplying full load power for 10 minutes after loss of main input power.
(3) The UPS shall be a 19" rack-mount unit installed in the vault computer equipment enclosure.

d. Uninterruptible Power System: DCME Control and Monitoring Equipment

(1) An uninterruptible power system (UPS) shall be provided for supporting power to the DCME equipment.
(2) The UPS shall be capable of supplying full load power for 10 minutes after loss of main input power.
(3) The UPS shall be a 19" rack-mount unit installed in the vault computer equipment enclosure.

e. Printer

The printer shall be a black and white LaserJet printer.

f. Industrial Enclosures

(1) A NEMA 12 industrial enclosure shall be provided for housing associated vault computer equipment.
(2) The enclosure is designed for indoor use to provide protection against dust, dirt, dripping water, and external condensation of non-corrosive liquids.
(3) The enclosure shall be an industry standard 19" rack-mount type enclosure.
(4) The industrial enclosure shall include a pagoda top with exhaust fan and ventilation kit for proper convection cooling.
(5) The environmental conditions within the area of the enclosure installation shall not exceed 122°F (50°C) or fall below 32°F (0°C).

2.4.3 2.5.3 Flight Service Station Equipment

a. Computers

(1) The Flight Service Station computer shall be a a commercial grade desktop computer and meet previously specified technical requirements.
(2) There shall be a 17" desktop LCD monitor in the operations room.

b. Uninterruptible Power System

(1) An uninterruptible power system (UPS) shall be provided for supporting power to the computer equipment.
(2) The UPS shall be capable of supplying full load power for 10 minutes after loss of main input power.
(3) The UPS shall contain a surge suppressor with an input/output RJ-11 jack for the telephone line in order to protect the maintenance center modem from electrical surges and lightning.

c. Installation of the equipment shall be the responsibility of the electrical contractor. The electrical contractor with the airport and/or owner shall coordinate the installation and locations of the equipment.

d. Any computer desks or tables required for the maintenance center computer equipment shall be provided by the airport / owner. No additional office equipment shall be provided.

127-2.5 DISTRIBUTED CONTROL EQUIPMENT

a. The control and monitoring equipment shall be of a distributed nature and shall not be PLC based.

b. The DCME units shall be installed locally at each device (i.e. CCR) which requires control and/or monitoring within the airfield lighting electrical vault.

2.5.1 General

a. Each CCR and each controllable item shall be connected to a DCME.

b. The DCME shall be a microprocessor-based module that includes all of the communication, control commands, input/output connections and failsafe functionality.

c. The DCME shall communicate via a redundant (2 independent communication links) communications network.

d. Connections to the communication network shall be via quick disconnect terminal connectors that can easily be plugged and unplugged from the communication equipment.

e. The DCME shall communicate back to the Vault computer via either of the networks.

f. Removal of any DCME units from the vault network shall not affect the operation of the ALCMS system.

g. The DCME shall be a universal device that can be used on any type of CCR and/or controlled element from any manufacturer.

h. To minimize spare parts needs, each DCME shall be identical and have interchangeable components.

i. The DCME unit shall provide optical isolation from all high voltage equipment including the CCR output current, CCR output voltage and CCR input voltage.

j. All high voltage interfaces to the DCME unit shall be via fiber optic cable.

2.5.2 Redundant Vault Control Network

a. The DCME redundant communication network shall use two (2) independent communication network cables installed in the electrical vault.

b. The vault network shall use two (2) cables each consisting of two (2), 24AWG, shielded twisted pairs with a common (drain wire) meeting EIA RS-485 applications (Belden™ no. 9842) or an ALCMS manufacturer approved equivalent.

c. The network shall be used to control and monitor all the various controllable elements located within the vault such as CCRs and Generator(s).

d. Any malfunction in one network shall not affect the operation of the other communications network.

e. Any malfunction in one of the DCME communication ports shall transfer communication to the remaining port without affecting system functions.

2.5.3 Overview of Operation

a. Each DCME unit shall have a unique factory set address and a field programmable communication address.

b. The DCME receives commands via the vault network, executes those commands, and transfers back the status of the element to the vault computer.

c. The DCME shall perform the following functions:

(1) Brightness setting control of the CCRs or ON/OFF control as required by the controlled element (i.e. generator may only require ON/OFF control).
(2) Perform all failsafe functions.
(3) Communication via both networks to the vault computer.
(4) Self-diagnostic function to monitor for proper operation.
(5) Locally store all data and parameters specific to the controlled element.

d. For maintenance purposes, the DCME shall have an internal ON/OFF switch and shall have a front hinged access door.

2.5.4 Basic DCME components

The DCME shall consist of the following basic components and functions:

a. Input / Output Board

(1) Shall provide eight (8) mechanical latching output points. These control points shall also be self-monitored and provide back-indication to the Vault computer verifying proper execution of the control command.
(2) Shall provide eight (8) optical-isolated input points.
(3) Shall provide quick-disconnect terminal blocks that can be easily plugged and unplugged from the I/O board.

b. Monitor Board

(1) Shall provide redundant communication network circuitry.

(2) Shall provide quick-disconnect terminal blocks for redundant communication network connections.
(3) Receives and transmits data to the vault computer.

c. Digital Display

(1) Shall provide visual display of DCME status (Power, communications and monitoring).
(2) Brightness Step: display indicating the commanded step of the CCR.
(3) Channel A: display indicating the status of channel A of the redundant communication network.
(4) Channel B: display indicating the status of channel B of the redundant communication network.
(5) Ability to put the DCME into a "cycle mode" which alternately displays all monitored parameters.

127-2.6 DISTRIBUTED MONITORING EQUIPMENT

The DCME shall provide the following minimum monitoring:

2.6.1 L-827/9 Monitoring

a. The DCME unit shall provide full FAA L-827/9 monitoring per FAA AC 150/5345-10 (current edition).
b. The DCME shall include the monitoring board and provide the following information for each CCR:

(1) Loss of input power to the CCR.
(2) CCR shutdown by open-circuit / over-current protective devices.
(3) Drop of more than 10% in the CCR VA load.
(4) Failure of the CCR to deliver the selected output current.
(5) The number of burnt-out lamps (L-850, L-852, L-861, L-861 series) in each series circuit. For best accuracy, all lamps/transformers are the same wattage and no film disc cutouts are used.
(6) Remote / Local status of the CCR.
(7) Actual CCR output current
(8) Actual CCR output voltage
(9) Actual CCR output load wattage (W)
(10) Actual CCR output load Volts-Amps (VA)

c. The DCME digital display shall provide local indication of the CCR status including

(1) Remote/Local: display indicating the status of the remote / local switch of the CCR.
(2) Primary Power: display indicating the status of the input power to the CCR.
(3) Over current: display indicating over current, protective shutdown.
(4) Open circuit: display indicating open circuit status.

d. The DCME shall interface to an external current and voltage module (CVM) used to collect current and voltage information. The CVM shall meet the following minimum requirements.

(1) Collects analog current and voltage samples at a high sample rate of 50,000 samples/second.
(2) Transmits current and voltage samples to the DCME.
(3) Provide digital fiber optical isolation between the DCME and the output of the CCR.
(4) Quick disconnect fiber optic connections for interfacing to the DCME.

The ALCMS manufacturer shall provide the fiber optic cable between the CVM and the DCME.

2.6.2 Current Sensing Monitoring

a. The DCME unit shall provide simple ON and OFF monitoring of the CCR output and other controllable elements.
b. The DCME shall include the required inputs to monitor the ON/OFF status.
c. A current sensing relay (CSR) shall be provided for each CCR and controllable element to detect that current is detected in the CCR output circuit.

d. The CSR shall either be installed inside or adjacent to the equipment by the electrical contractor.
e. The Contractor shall provide any additional enclosures/electrical boxes required to interface the CSR to the controlled element.

2.6.3 Insulation Resistance Monitoring

a. The DCME unit shall provide insulation resistance monitoring as an integral component of the DCME unit.

b. The IRMS is capable of automatically or manually monitoring and reporting the insulation resistance value of the series circuit cabling (one IRMS per circuit).

c. The measured resistance shall be displayed locally at the DCME digital display.

d. The DCME unit shall be capable of reading and recording resistance values from less than 20k Ohms to 2G Ohms.

e. The DCME shall interface to an external insulation resistance module (IRM). The IRM shall meet the following minimum requirements.

(1) Collects insulation resistance samples.
(2) Transmits insulation resistance samples to the DCME.
(3) Provide digital fiber optical isolation between the DCME and the output of the CCR.
(4) Quick disconnect fiber optic connections for interfacing to the DCME.

Fiber optic communication shall be used between the IRM board and the DCME. The ALCMS manufacturer shall provide the fiber optic cables between the IRM board and the DCME.

f. The IRMS system shall be capable of taking resistance readings on circuits that are energized or de-energized. This shall allow the system to be used as a troubleshooting tool for assisting in locating circuit faults.

g. The IRMS system shall provide database record keeping that allows for graphical trend analysis of the insulation resistance readings.

h. The IRMS shall provide configurable insulation resistance warning and alarm limit notification to the system.

i. The IRMS shall be able to be configured for a minimum of two (2) reading times per day.

j. The IRMS shall be able to be configured to take readings hourly, daily, weekly or monthly.

k. All user programmable variables shall be able to be changed at any specified computer within the ALCMS system.

l. All the IRMS data shall be viewable either as real-time or as historical data at any specified computer location. The IRMS information shall be available at all times and shall not require any special transfer of data between the IRMS system and the control system (since the IRMS is an integral component of the ALCMS).

127-2.7 LATCHING FAILSAFE

a. Each DCME unit shall provide a self-contained latching failsafe feature that shall perform the following functions:

(1) Insure default operation of the airport lighting, even if the entire airport lighting control system is not functioning.
(2) Display the commands sent by the computer to the CCRs and/or to the other controllable items.
(3) Adaptable to each CCR regardless of internal or external control voltage.
(4) Permits maintenance of portions of the control system, without changing the operational status of the lighting system.

b. The failsafe mode of each DCME unit shall be "Passive Failsafe" (Latching) mode.
c. If the CCR was switched ON before the failure, it shall remain ON at the same brightness level.
d. If the CCR was switched OFF before the failure, it shall remain OFF.
e. Failsafe shall be able to be bypassed by selecting the CCR locally to any desired brightness level.

2.7.1 Failsafe Technical Specifications

a. The failsafe system shall operate independently of the computer, providing failsafe interfacing to the CCR and/or other controllable elements.
b. The failsafe system shall be based on electromechanical latching relays with the following characteristics:

Specification	Rating
Maximum switching voltage	240VAC, 125VDC
Nominal switching capacity	8A / 250VAC 5A / 30VDC
Rated current (resistive)	1A
Operational Life	Mechanical $5X10^7$ Electrical 10^5
Protection	IP67 (protection against ingress of dust and water in harmful quantities)

c. Mode of Operation

(1) The commands executed by the DCME to switch the CCR and/or controllable element shall be momentary commands.
(2) The control commands shall be mechanically latched upon execution.
(3) Failure of the DCME and/or loss of communication to the network shall not change the status of the airport lighting.

127-2.8 DCME MOUNTING

The DCME equipment shall be mounted integral to each Siemens Airfield Solutions CCR.

CONSTRUCTION METHODS

127-3.1 GENERAL

a. The Tower Touchscreen display shall control and monitor the airfield lighting system. The display shall show real-time information on the operational status of the airfield lighting systems.

b. The Touchscreen control stations shall consist of multiple Touchscreen 'pages' each with a specific function. These Touchscreen 'pages' are defined as follows:

(1) **Preset**: Consists of pre-defined preset buttons used to simplify airfield lighting control commands.

(2) Runway Lights: Consists of runway control touch buttons used to individually control runway circuits. Multiple runway pages may be necessary for airports with several runways.

(3) Taxiway Lights: Consists of taxiway control touch buttons used to individually control taxiway circuits if required.

(4) Guard Lights: Consists of guard light control touch buttons used to control guard light circuits if required.

(5) Utilities: Consists of miscellaneous functions for calibrating the Touchscreen, granting lighting control to other locations, setting the date and time, etc.

c. All preset and control configurations shall be defined by the airport/owner in conjunction with Air Traffic Control requirements.

d. The ALCMS manufacturer shall provide preset tables to be used by the airport/owner to define the configuration settings.

127-3.2 OVERVIEW OF OPERATION

a. Airfield lighting control commands are entered into the system by touching the corresponding touch button on the Touchscreen video display. When a command is entered, the Touchscreen shall respond by graphically displaying the button as being depressed and change the button color.

b. The associated circuit graphics shall alternately flash indicating the airfield lighting section that shall be affected when this command is "confirmed".

c. Once confirmed, the Tower Touchscreen shall register the command, generate a data instruction and transmit the command to the vault computer(s) for implementation. The command is also simultaneously transmitted to the maintenance computer and all other computers connected to the network.

d. The tower Touchscreen shall receive confirmation from the vault(s) that the corresponding equipment has responded to the control command and displays the current system status on the Touchscreen display.

e. In the event that communications is lost between the tower and vault(s), an alarm is indicated at each computer location.

f. In the event of a predefined alarm condition, the effected airfield lighting circuit graphic shall flash red and an audible alarm tone shall alert operators to the alarm condition.

127-3.3 TOUCHSCREEN AUDIBLE ALARM

a. The audible alarm shall sound at each Touchscreen display when an alarm condition occurs. In addition, the 'ALARM ACK' button shall flash and the associated airfield circuit graphics shall change to red.

b. The audible alarm shall stop automatically after three (3) seconds unless the 'ALARM ACK' button is pressed.

c. If the alarm is not acknowledged, the audible shall cease for sixty (60) seconds while the 'ALARM ACK' continues to flash. If the 'ALARM ACK' is still not pressed after the sixty (60) seconds, the audible shall sound again for three (3) seconds.

d. This sequence shall repeat indefinitely until the alarm is acknowledged.

3.3.1 Circuit Alarms

a. The ALCMS shall continuously monitor the status of all of the circuits per the monitoring requirements as specified previously.

b. If there are any monitoring discrepancies (i.e. incorrect CCR output current, loss of primary power) an alarm shall be generated at the Touchscreen display for the associated circuit.

127-3.4 TOUCHSCREEN COMMAND SEQUENCES

a. The Touchscreen control station shall allow the airfield lighting circuits to be controlled individually (i.e. RWY Edge) or as a group based on preset tables (See following section).

b. Each control command shall require two distinct operator actions in order for the command to initiate any state changes in the airfield lighting. The command sequence shall be as follows:

(1) ***Select circuit:*** Operator selects the desired circuit to be changed.
(2) ***Select intensity:*** Operator selects the desired brightness step that the circuit is to be changed to.
(3) ***Graphics flash:*** The graphics associated with the selected circuit shall begin to flash visually indicating to the operator the airfield lighting section that is going to be affected by the command.
(4) ***Confirm/Reject:*** Operator selects the 'CONFIRM' button to accept the selection and initiate the lighting change. Operator selects the 'REJECT' button to cancel the selections and make another selection.

127-3.5 Touchscreen Preset Sequences

a. The Touchscreen control station shall allow simultaneous airfield lighting circuit changes to be accomplished using preset lighting sequences.

b. The preset lighting sequences shall be defined by the airport in airfield lighting preset tables.

c. Each preset lighting change shall be based on the following operator inputs:

(1) **Active Runway Selection:** Operator selects the runway(s) that shall be active. This is based on runway direction (i.e. "RWY 9")
(2) **Day/Night Setting:** Operator selects the day/night setting. The day/night setting shall control the intensity of the circuits.
(3) **Visibility:** Operator selects a single visibility setting that is based upon the current airport visibility.
(4) **Confirm/Reject:** Operator selects the 'CONFIRM' button to accept the preset selections and initiate the lighting change. Operator selects the 'REJECT' button to cancel the selections and make another preset selection.

d. Upon confirmation of the preset selections, the intensity of all the circuits associated with the preset condition shall automatically change to match the visibility requirement.

e. The preset visibility setting of the CCRs is based on FAA document 7110.65J. Presets shall also be coordinated with the airport and the FAA to properly define airfield lighting operational usage.
f. The visibility settings shall include Intensity and Preset Invalid monitoring. This indicates when a preset or intensity setting on the airfield is different than the selected preset intensity.

g. According to FAA document 7110.65J, the visibility settings for the 5-step CCRs shall be based on the following table:

Visibility	Day (Brightness step)	Night (Brightness step)
Less than 1 mile	5	4
1 to but not including 2 miles	4	3
2 to but not including 3 miles	3	3
3 to 5 miles inclusive	0	2
More than 5 miles	0	1

Table 3: 5-step Regulators

h. According to FAA document 7110.65J, the visibility settings for the 3-step CCRs shall be based on the following table:

Visibility	Day (Brightness step)	Night (Brightness step)
Less than 1 mile	3	2
1 to but not including 2 miles	0	1
2 to but not including 3 miles	0	1
3 to 5 miles inclusive	0	1
More than 5 miles	0	1

Table 4: 3-step Regulators

Visibility	Day (Brightness step)	Night (Brightness step)
Less than 1 mile	1	1
1 to but not including 2 miles	0	1
2 to but not including 3 miles	0	1
3 to 5 miles inclusive	0	1
More than 5 miles	0	1

Table 5: 1-step Regulators

i. According to FAA document 7110.65J, the visibility settings for the Rotating Beacon shall be based on the following table:

Visibility	Day (Brightness step)	Night (Brightness step)
Less than 1 mile	ON	ON
1 to but not including 2 miles	ON	ON
2 to but not including 3 miles	ON	ON
3 to 5 miles inclusive	OFF	ON
More than 5 miles	OFF	ON

Table 6: Beacon

127-3.6 127-3.6 GRAPHICAL AIRPORT PICTORIAL

a. The ALCMS display screens shall display a graphical pictorial representation of the airport runways, taxiways and other requested airport features.

b. When there is a change in lighting system status, the appropriate graphical detail shall indicate the status by changing color.

c. The circuit intensity display colors shall be represented as seen in the legend as follows.

Figure 1: Brightness Step Color Legend

d. The status monitoring display colors shall be represented as seen in the legend as follows. This includes ATS monitoring, generator monitoring and communications monitoring:

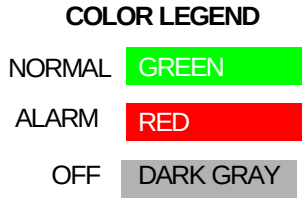


Figure 2: Status Monitoring Color Legend

127-3.7 VAULT AUTOMATIC TRANSFER SWITCH (ATS) AND GENERATOR MONITORING

a. The ALCMS system shall provide the optically isolated digital inputs to monitor the following feedback points:

(1) Utility Available
(2) Utility On-line
(3) Generator Available
(4) Generator On-line
(5) Generator Alarm

b. Locating and wiring of the monitoring points within the ATS and generator equipment shall be completed by the contractor in coordination with the airport/engineer and equipment manufacturer.

127-3.8 BEACON CONTROL

a. The ALCMS shall provide control of the rotating beacon from the Tower ALCMS node.

b. The ALCMS shall provide one (1) optically isolated, dry-contact output point at the Tower. The contact shall be rated 1A at 120Vac.

c. The ALCMS shall close the output to command the beacon ON and open the output to turn the beacon OFF. The contractor shall provide an interface relay/contactor to connect power to the beacon.

d. Locating and wiring of the output points within the Beacon equipment shall be completed by the Contractor in coordination with the airport/engineer and equipment manufacturer

127-3.9 Radio Control Enabled Control Methodology

a. The ALCMS shall provide an interface to the airport's radio control equipment (not provided at this time).

b. One (1) button labeled "Radio Control" will be programmed to allow air-to-ground radio control after normal operating hours.

c. When the radio control button is pressed, all preset settings are changed for radio operations according to the preset control methodology.

d. Radio Control preset lighting settings shall be specified by the airport.

3.9.1 Radio Control Interface

(1) The ALCMS system shall provide three (3) inputs for Radio Control commands. Radio Control inputs shall be connected to a DCME at the <TBD – location>.
(2) The inputs shall be optically isolated and require the monitoring source and common from the monitored device.
(3) The ALCMS DCME inputs shall be rated at 24-48VDC and 120-240VAC at 1 amp.
(4) The ALCMS shall monitor the inputs and adjust the airfield lighting according to the Radio Control preset table.
(5) The ALCMS shall only monitor for the radio control inputs when the "Radio Control" button is enabled at the Tower.
(6) Locating and wiring of Radio Control output points shall be completed by the contractor in coordination with the airport/engineer and equipment manufacturer (if required).

METHOD OF MEASUREMENT

127-4.1 METHOD OF MEASUREMENT.

a. Lump Sum. No measurement of quantities will be made.

BASIS OF PAYMENT

127-5.1 ITEMS OF WORK PAID IN OTHER SECTIONS. All work and materials required to install underground conduit is paid for under Item L-110.

127-5.2 ITEMS OF WORK PAID IN THIS SECTION. Payment will be made at the contract price for provision of an Airfield Lighting Controls and Monitoring System. Payment is for a complete, operating system.

Payment will be made under:

Item L-127a Airfield Lighting Controls and Monitoring System. (ALCMS) – per lump sum.

ITEM L-130 SURFACE SENSORS

DESCRIPTION

130-1.1 Furnish and install a Runway Weather Information System (RWIS) to monitor weather and pavement surface conditions. Plans show the location of new sensors, conduit, cables and remote processing units (RPU).

Provide all necessary hardware, software components and commissioning by a factory representative for an operational system.

Ensure that a factory representative installs new weather sensors, internal components of RPUs, server and associated components, software, and communication equipment.

MATERIALS

Provide a complete system as supplied by Vaisala Inc.or approved equal. The system shall be specifically designed for monitoring and displaying pavement surface conditions, pavement temperature, freeze point temperature, chemical percent concentration, subsurface temperature, Runway atmospheric conditions from the location(s) as shown in the contract plans. Both passive and active in-pavement sensors shall be installed at the RWIS site(s) to monitor Runway surface status conditions including dry, wet, frost, chemical wet, and snow/ice warning. Atmospheric/meteorological conditions monitored include the following; air temperature, relative humidity, dew point, precipitation classification, visibility, barometric pressure, water level, snow depth, or wind/speed direction.

The information from the RWIS station shall be collected by, archived and hosted by the supplier for use in Airport winter maintenance operations. The system shall include all hardware, software, and licenses to operate as follows:

- Active and passive in-pavement surface sensors shall measure bridge deck and Runway pavement surface temperature, freeze point temperature, chemical concentration, surface conditions, and communicate these signals to the RPU.
- Atmospheric sensors shall measure their respective weather parameters and communicate the signals from each to the RPU.
- The RPU shall utilize a Linux based operating system, and be capable of multi-tasking operations to optimize data acquisition from all connected devices. The RPU shall process and temporarily store the output from the camera(s), traffic counters, pavement sensors and atmospheric sensors.
- The RWIS server shall poll each RPU on a scheduled basis via communications telemetry as directed by the engineer. The RPU shall respond to the poll and transfer all of its data and images to the RWIS server.
- All data transfers between the RWIS server and RPUs shall be compliant with the most current Federal standard NTCIP ESS protocols.
- The RWIS server system shall store the RWIS data in a standard SQL Server database for access by CBJ users on any PC running the Internet Explorer web browser.
- A 24-hour pavement specific weather forecast shall be provided by the RWIS vendor for display by the server as an advanced ice/snow control-planning tool for Airport maintenance personnel.
- The RWIS user displays shall include all sensor, forecast and video data in a browser-based data display format.

130-2.1 RWIS SYSTEM COMPONENTS. Provide sensors and other components necessary to complete an operational system. Conform to the following:

a. Surface Sensor. Provide sensors with molded, sealed, and integral cables, sensors capable of operating at extended cable lengths of up to 5000 feet from the RPU, designed to sustain

weather conditions, airplane traffic, or ice control chemicals without degrading performance, thermally passive, single solid-state sensors with thermal characteristics similar to common asphalt pavement, top sensor surface that is approximately the same color and texture as the asphalt pavement, operating temperature range of –39 degrees F to 175 degrees F, and capable of withstanding a temperature range of –59 degrees F to 175 degrees F without sustaining damage. Provide epoxy bedding and encapsulating compounds for installing sensors as approved by the manufacturer.

Provide sensors capable of electronically sampling the following pavement conditions:

(1) Surface temperature
(2) Dry pavement
(3) Wet pavement above 32 degrees F
(4) Wet but not frozen pavement at or below 32 degrees F
(5) Snowy or icy pavement at or below 32 degrees F
(6) Freezing point temperature of commonly used moisture/ice-control chemical solution
(7) Depth of moisture/ice-control chemical solution up to 0.5 inches
(8) Percentage of ice particles in moisture/ice-control chemical solution

Provide Surface Sensor Model FP2000-or approved equal.

b. Subsurface Temperature Probe. Provide electronic temperature probe with molded, sealed, integral cable designed to operate under and withstand the same environmental conditions as stated above for the surface sensor.

c. Surface Sensor Extension Cable. Per the manufacturer specifications.

d. Splice Kits And Splice Tools. Provide cable splice kits and cable splice tools to include crimper and swaging tool.

e. Sealing Material for Asphalt Pavement. Provide a one-part, cold-applied, self-leveling silicone joint sealant meeting ASTM D 5893-96 for filling of cable kerf cuts in asphalt pavement. Provide Dow Corning 890-SL or approved equal.

f. Conduit, Handholes. Conform to the requirements of item L-100.

g. RPU . supply and install a tower mounted RPU electronics package with enclosure on a concrete foundation as shown in the project plans. The contractor shall install 110VAC service to the RPU power disconnects. Primary power should be installed to the RPU and fused for 20 amps, with voltage surge protection. The RPU shall operate in a range of 100-130 VAC at 50-60 Hz and shall use not more than approximately 50 Watts of continuous power (excluding options).

The RPU hardware and software supplied for the project should meet the following technical specifications. RPU software shall utilize a Linux based operating system, and be capable of multi-tasking operations to optimize data acquisition from all connected devices. The RPU shall gather data from all connected sensors and remote pavement sensors, and process, store and transmit this data to the RWIS server upon polled request.

h. Weather Sensors. Provide sensors that include all mounting accessories and connecting cables:
(1) Relative Humidity/Air Temperature Sensor
(2) Ultrasonic Wind Sensor
(3) Classifying Precipitation and Visibility Sensor
(4) Barometric Pressure Sensor

j. Radio Communications Equipment. Provide radio kits to include the power supply, antenna, and all mounting accessories and connecting cables required:

(1) Server radio kit as needed
(2) RPU radio kits

k. Concrete. Concrete shall conform to P-610.

l. Data Hosting and Display. The contractor shall provide a five year contract to host and display the data at no additional cost to the CBJ.

CONSTRUCTION REQUIREMENTS

130-3.1 Accomplish pavement grooving prior to installation of surface sensors.

Install surface sensors and equipment at the locations shown on the plans using epoxy bedding and encapsulating materials in accordance with the manufacturer's instructions. Identify sensors and calibration information by station and offset. Provide copy of installation instructions and calibration instructions to the Engineer.

130-3.2 TESTING. Run sensor lead-in and surface sensor extension cable to the hand-holes and the existing RPU locations as shown on the plans. Ensure that splicing and connecting the cables to the RPU unit and final testing is completed by a factory representative.

130-3.3 TRAINING. After installation is complete, provide a minimum of 4 hours of on-site training by a factory representative. Schedule training with airport maintenance personnel.

METHOD OF MEASUREMENT

130-4.1 Section 90.

BASIS OF PAYMENT

130-5.1 At the contract lump sum price for installation of new RPUs, system server, software, weather sensors, radio communication equipment, surface sensors, conduit, concrete, handholes, cables, and other components necessary to provide an operational system. Contractor shall provide copy of contract between vendor and CBJ for 5 years of data hosting by the vendor and no additional payment shall be made.

Asphalt cutting and filling of kerfs, all conduit, power cables, and splicing are subsidiary to this item and no additional payment will be made. The lump sum price is full compensation for furnishing all supplies, material and labor required to prepare the sites and to install all equipment and software to complete this item, including all installation, connections , testing, and commissioning by a factory representative.

Payment will be made under:

Item L-130a Surface Sensor System (Additive Alternate No. 1) – per lump sum

ITEM L-132 APPROACH LIGHTING AIDS

DESCRIPTION

132-1.1 Furnish and install all new foundations, new conduit, new handholes, mounting hardware, and install all FAA-furnished snow plow rings, light bases and other equipment to construct a runway 08 Medium-Intensity Approach Lighting System (MALS) infrastructure system as shown on the plans, reference drawings and pertinent specifications. The infrastructure system shall include all work required so the FAA can install the wiring, light fixtures, and other equipment needed for an operational runway 08 MALS system. The FAA shall not have to perform any trenching, place conduit or handholes, install any light bases, etc. in order to pull wiring and install lights, towers, etc.

This work also includes providing the handholes, conduit, light bases, and other work needed to provide a raceway system for the FAA PAPI, JAWS, and RVR systems as shown on the plans, reference drawings and pertinent specifications.

The work also includes all necessary coordination with the FAA.

Excavation and backfill required is included in this work. Final mounting, connecting, and energizing of components are included in this work. Prior to final testing, notify the Engineer and allow 2 weeks time for an FAA representative to check all system connections and verify that the system is ready for testing.

Wherever the words “this Contract” are found in the specifications attached, it is understood to denote “this work”.

This work is affected by access limitations set forth in Section 80-04.

MATERIALS AND EQUIPMENT

132-2.1 Light bases and junction boxes shall conform to the requirements specified in Item L-100.

132-2.2 Cable and wiring shall conform to the requirements and be installed as specified in Item L-108.

132-2.3 Conduits and electrical ducts shall be furnished and installed in accordance with the requirements of Item L-110.

132-2.4 Owner Furnished Material: Frangible coupling and lamp holders salvaged from existing light bars shall be re-used.

132-2.5 Electrical Equipment: All electrical equipment must be labeled by an approved independent electrical laboratory such as UL, ETL, CSA, etc.

CONSTRUCTION REQUIREMENTS

132-3.1 Install new foundations in the new locations. Provide the FAA vaults at the MALSR Building at runway 08. Provide the FAA vaults at the runway 08 RVR, VASI, and JAWS cable locations. Provide the FAA vaults at the runway 08 MALSR to feed the MALSR threshold, 200, 400, and 600 bars. Provide the conduit between these vaults. Provide the light bases, conduit, and foundations for the threshold, 200, 400, and 600 foot light bars for runway 08 MALSR. Provide the handholes and conduit for the runway 26 PAPI power, runway 26 JAWS power, runway 26 PAPI communications, and runway 26 JAWS communications in accordance with the Plans and Specifications attached.

The power conduit, handholes, vaults from the 26 MALSR building to the 26 threshold, 200, 400, and 600 foot light bars are not included.

132-3.2 Perform work in accordance with the International Building Code (IBC), National Electric Code (NEC), and International Fire Code (IFC) using the latest versions that have been adopted by the State of Alaska. Comply with other applicable codes and statutes. Secure and pay for all inspections, fees, permits, etc., required by local and state agencies.

Install materials and equipment in accordance with manufacturer's recommendations, instructions, and installation drawings, unless otherwise indicated, and in accordance with National Electrical Contractors Association's *Standard Practices for Good Workmanship in Electrical Contracting.* Seal penetrations with UL-listed fireproofing materials to maintain fireproofing integrity and watertightness.

Repair all damage to finish surfaces where caused by installation of electrical equipment.

Support all raceways on approved galvanized types of brackets, hangars or malleable iron straps.

Make trenches for placement of underground conduits as shown on the drawings.

The contractor shall provide all necessary labor, equipment and materials required for the salvage of the decommissioned systems.

METHOD OF MEASUREMENT

132-5.1 This item will not be measured for payment. All work shown on the plans and the referenced FAA plans in the appendix shall be included in the pay items for this item. All coordination with FAA during the project, and any work shown on the plans for FAA facilities or included in the referenced FAA plans that does not appear to be described in the pay items shall be considered incidental to these pay items and no other compensation shall be provided for this work.

L-132a Rwy 08 MALSR Light Bases, Conduit, & Handholes: Includes all work shown on the plans associated with the runway 08 MALSR and the conduit and vaults between the MALSR and the runway 08 MALSR Building location. Trenching, bedding, backfilling, concrete, cutting and patching asphalt, and all other work necessary to perform the work shown on the drawings is included in this pay item and no other payment will be made for this work.

L-132b Rwy 08 VASI, RVR, JAWS Conduit, Handholes: Includes all work shown on the plans associated with the runway 08 VASI, RVR, and JAWS and the conduit and vaults between these system cables and therunway 08 MALSR building location. . Trenching, bedding, backfilling, concrete, cutting and patching asphalt, and all other work necessary to perform the work shown on the drawings is included in this pay item and no other payment will be made for this work.

L-132d Rwy 26 FAA PAPI Conduit and Handholes: Includes all work shown on the referenced FAA plans associated with the runway 26 PAPI and mid field JAWS and the conduit and handholes between the PAPI and mid field JAWS locations. Also included is the conduit and handholes between the PAPI and the runway 26 MALSR building location. . Trenching, bedding, backfilling, concrete, cutting and patching asphalt, and all other work necessary to perform the work shown on the drawings is included in this pay item and no other payment will be made for this work.

L-132e Rwy 26 JAWS Conduit and Handholes: Includes all work shown on the referenced FAA plans associated with the runway 26 new east JAWS and the conduit and handholes between the new east JAWS and the existing east JAWS. Also included are the conduit and handholes between the new east JAWS and the runway 26 MALSR building location. . Trenching, bedding, backfilling, concrete, cutting and patching asphalt, and all other work necessary to perform the work shown on the drawings is included in this pay item and no other payment will be made for this work.

Refer to Item P-610 for requirements regarding all work and materials to place Portland cement concrete. Portland cement concrete is subsidiary to L-132 items requiring its use.

BASIS OF PAYMENT

132-6.1 Payment will be made at the contract price for the following bid items:

Payment will be made under:

Item L-132a	Rwy 08 MALSR Light Bases, Conduit, and Handholes – per lump sum
Item L-132b	Rwy 08 VASI, RVR, JAWS Conduit, Handholes – per lump sum
Item L-132d	Rwy 26 FAA PAPI Conduit and Handholes – per lump sum
Item L-132e	Rwy 26 JAWS Conduit and Handholes – per lump sum

ITEM L-145 STANDBY GENERATOR AND ENCLOSURE

DESCRIPTION

145-1.1 Provide a complete packaged standby generation system for automatic standby. Provide a diesel powered engine generator set housed in a walk-through enclosure, automatic transfer equipment, and connections to building service equipment.

Work includes utility service equipment and connections, generation equipment, automatic transfer equipment, fuel piping, connections to transformer vault and vault equipment, and all other materials, equipment, accessories and labor required to provide a complete, working system in accordance with the Plans and with the Specification.

MATERIALS

145-2.1 Provide wiring with copper conductors, type THHN insulation, in rigid steel conduit outdoors and EMT or IMC indoors except where specifically noted or specified otherwise.

2.1.1 Use solderless lug connections for conductors #6 and larger. Use insulated wire nut connections for conductors #8 and smaller.

2.1.2 Unless specifically described elsewhere, use standard commercial grade receptacles, wiring devices, boxes and other equipment that are suitable for the location installed. Provide stainless steel cover plates for devices.

145-2.2 GENERAL. Diesel fired, engine-generator sets for emergency power supply with a unit mounted cooling system.

2.2.1 Generator-Set Performance

a. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.

b. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.

c. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.

d. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

e. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.

f. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.

g. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.

h. Start Time: Comply with NFPA 110, Type 10, system requirements.

145-2.3 ENGINE

2.3.1 Fuel. Fuel oil, Grade DF-2

2.3.2 Rated Engine Speed. 1800 rpm.

2.3.3 Maximum Piston Speed for Four-Cycle Engines. 2250 fpm (11.4 m/s).

2.3.4 Lubrication System. The following items are mounted on engine or skid:

a. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.

b. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.

c. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

2.3.5 Engine Fuel System:

a. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.

b. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

2.3.6 Coolant Jacket Heater. Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

2.3.7 Governor. Adjustable isochronous, with speed sensing.

2.3.8 Cooling System. Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.

a. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

b. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.

c. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.

d. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

e. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

2.3.9 Muffler/Silencer. Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

a. Minimum sound attenuation of 25 dB at 500 Hz.

b. Sound level measured at a distance of 10 feet (3 m) from exhaust discharge after installation is complete shall be 85 dBA or less.

2.3.10 Air-Intake Filter. Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

2.3.11 Starting System. 24-V electric, with negative ground.

a. Components: Sized so they will not be damaged during a full engine-cranking cycle with maximum ambient.

b. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.

c. Cranking Cycle: As required by NFPA 110 for system level specified.

d. Battery: Adequate capacity to provide specified cranking cycle at least three times without recharging.

e. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.

f. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature. Include accessories required to support and fasten batteries in place.

g. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.

h. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:

(1) Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
(2) Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
(3) Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
(4) Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.

(5) First subparagraph below covers sensing for safety indications on control and monitoring panel. NFPA 110 requires sensing for Level 1 systems and makes sensing optional for Level 2 systems.

(6) Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.

(7) Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

145-2.4 FUEL STORAGE

2.4.1 Day Tank. Comply with UL 142, freestanding, factory-fabricated fuel tank assembly, with integral, float-controlled transfer pump and the following features:

a. Tank Capacity: 150 gallons.

b. Pump Capacity: Exceeds maximum flow of fuel drawn by engine-mounted fuel supply pump at 110 percent of rated capacity, including fuel returned from engine.

c. Low-Level Alarm Sensor: Liquid-level device operates alarm contacts at 25 percent of normal fuel level.

d. High-Level Alarm Sensor: Liquid-level device operates alarm and redundant fuel shutoff contacts at midpoint between overflow level and 100 percent of normal fuel level.

e. Piping Connections: Factory-installed fuel supply and return lines from tank to engine; local fuel fill, vent line, overflow line; and tank drain line with shutoff valve.

f. Redundant High-Level Fuel Shutoff: Actuated by high-level alarm sensor in day tank to operate a separate motor device that disconnects day-tank pump motor. Sensor shall signal solenoid valve, located in fuel suction line between fuel storage tank and day tank, to close. Both actions shall remain in shutoff state until manually reset. Shutoff action shall initiate an alarm signal to control panel but shall not shut down engine-generator set.

145-2.5 CONTROL AND MONITORING

2.5.1 Automatic Starting System Sequence of Operation. When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

2.5.2 Configuration. Operating and safety indications, protective devices, basic system controls, engine gages, instrument transformers, generator disconnect switch or circuit breaker, and other indicated components shall be grouped in a combination control and power panel. Control and monitoring section of panel shall be isolated from power sections by steel barriers. Panel features shall include the following:

a. Wall-Mounting Cabinet Construction: Rigid, self-supporting steel unit complying with NEMA ICS 6. Power bus shall be copper. Bus, bus supports, control wiring, and temperature rise shall comply with UL 891.

b. Current and Potential Transformers: Instrument accuracy class.

2.5.3 Indicating and Protective Devices and Controls. As required by NFPA 110 for Level [1] [2] system, and the following:

a. AC voltmeter.

b. AC ammeter.

c. AC frequency meter.

d. DC voltmeter (alternator battery charging).

e. Engine-coolant temperature gage.

f. Engine lubricating-oil pressure gage.

g. Running-time meter.

h. Ammeter-voltmeter, phase-selector switch(es).

i. Generator-voltage adjusting rheostat.

j. Fuel tank derangement alarm.

k. Fuel tank high-level shutdown of fuel supply alarm.

l. Generator overload.

2.5.4 Supporting Items. Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

2.5.5 Connection to Data Link. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals.

2.5.6 Common Remote Audible Alarm. Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.

a. Overcrank shutdown.

b. Coolant low-temperature alarm.

c. Control switch not in auto position.

d. Battery-charger malfunction alarm.

e. Battery low-voltage alarm.

2.5.7 Remote Emergency-Stop Switch; Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

145-2.6 GENERATOR OVERCURRENT AND FAULT PROTECTION

2.6.1 Generator Circuit Breaker. Molded-case, thermal-magnetic type; 100 percent rated; complying with NEMA AB 1 and UL 489.

a. Tripping Characteristic: Designed specifically for generator protection.

b. Trip Rating: Matched to generator rating.

c. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.

d. Mounting: Adjacent to or integrated with control and monitoring panel.

145-2.7 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

2.7.1 Comply with NEMA MG 1.

2.7.2 Drive. Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

2.7.3 Electrical Insulation. Class H or Class F.

2.7.4 Stator-Winding Leads. Brought out to terminal box to permit future reconnection for other voltages if required.

2.7.5 Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

2.7.6 Enclosure. Dripproof.

2.7.7 Instrument Transformers. Mounted within generator enclosure.

2.7.8 Voltage Regulator. Solid-state type, separate from exciter, providing performance as specified. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.

2.7.9 Windings. Two-thirds pitch stator winding and fully linked amortisseur winding.

145-2.8 OUTDOOR GENERATOR SET ENCLOSURE

2.8.1 Description. Prefabricated or preengineered walk-in enclosure with the following features:

a. Construction: Galvanized-steel, metal-clad, integral structural-steel-framed building erected on concrete foundation.

b. Structural Design and Anchorage: Comply with ASCE 7 for wind loads.

c. Space Heater: Thermostatically controlled and sized to prevent condensation.

d. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents.

e. Hinged Doors: With padlocking provisions.

f. Ventilation: Louvers equipped with bird screen and filter arranged to permit air circulation while excluding exterior dust, birds, and rodents.

g. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.

h. Muffler Location: Within enclosure.

2.8.2 Engine Cooling Airflow through Enclosure. Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.

a. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.

b. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.

2.8.2 Interior Lights with Switch. Factory-wired, vaporproof-type fixtures within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection. AC lighting system and connection point for operation when remote source is available.

2.8.3 Convenience Outlets. Factory wired. Arrange for external electrical connection.

145-2.9 VIBRATION ISOLATION DEVICES

2.9.1 Restrained Spring Isolators. Freestanding, steel, open-spring isolators with seismic restraint.

a. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.

b. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.

c. Minimum Additional Travel: 50 percent of required deflection at rated load.

d. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

e. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

145-2.10 TRANSFER SWITCH

2.10.1 General Transfer Switch Product Requirements

a. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

b. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

(1) Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

c. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

d. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

e. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

f. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

(1) Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
(2) Switch Action: Double throw; mechanically held in both directions.
(3) Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

g. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

2.10.2 Automatic Transfer Switches

a. Comply with Level 1 equipment according to NFPA 110.

b. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

c. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

d. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

e. Programmed Neutral Switch Position: Switch operator has a programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Pause is adjustable from 0.5 to 30 seconds

minimum and factory set for 0.5 second, unless otherwise indicated. Time delay occurs for both transfer directions. Pause is disabled unless both sources are live.

f. Automatic Transfer-Switch Features:

(1) Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.

(2) Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.

(3) Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.

(4) Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.

(5) Test Switch: Simulate normal-source failure.

(6) Switch-Position Pilot Lights: Indicate source to which load is connected.

(7) Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

* Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
* Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

(8) Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.

(9) Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.

(10) Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.

(11) Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.

(12) Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

* Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
* Push-button programming control with digital display of settings.
* Integral battery operation of time switch when normal control power is not available.

CONSTRUCTION REQUIREMENTS

145-3.1 Perform work in accordance with the International Building Code (IBC), National Electric Code (NEC), and International Fire Code (IFC) using the latest versions that have been adopted by the State of Alaska. Comply with other applicable codes and statutes. Meet requirements of the utility company furnishing services to the installation. Secure and pay for all inspections, fees, permits, etc., required by local and state agencies.

a. Install materials and equipment in accordance with manufacturer's recommendations, instructions and installation drawings, unless otherwise indicated, and in accordance with National Electrical Contractors Association's *Standards of Installation*. Seal penetrations with UL-listed fireproofing materials to maintain fireproofing integrity and watertightness.

b. Repair all damage to finished surfaces where caused by installation of electrical equipment.

c. Support interior and wall-mounted raceways on approved types of wall brackets, ceiling trapeze hangers or malleable iron straps.

d. Furnish all necessary labor, materials, equipment, appliances and power for conducting and performing operating tests on the completed installation. Include functional demonstrations of all installed equipment, in addition to specific tests described in the attached Specification sections.

e. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

145-3.2 INSTALLATION

a. Comply with packaged engine-generator and transfer switch manufacturers' written installation and alignment instructions and with NFPA 110.

b. Install Schedule 40, black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet. Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40, black steel pipe with welded joints.

c. Transfer switch:

(1) Verify time-delay settings.
(2) Verify pickup and dropout voltages by data readout or inspection of control settings.
(3) Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

145-3.3 QUALITY CONTROL

3.3.1 Prototype Testing. Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories. Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

3.3.2 Project-Specific Equipment Tests. Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

a. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.

b. Full load run.

c. Maximum power.

d. Voltage regulation.

e. Transient and steady-state governing.

f. Single-step load pickup.

g. Safety shutdown.

h. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.

i. Report factory test results within 10 days of completion of test.

3.3.3 Tests and Inspections.

a. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.

b. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.

c. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

(1) Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
(2) Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
(3) Verify acceptance of charge for each element of the battery after discharge.
(4) Verify that measurements are within manufacturer's specifications.

d. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.

e. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.

3.3.4 Operational Test. After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

3.3.5 Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.3.6 Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

METHOD OF MEASUREMENT

145-4.1 METHOD OF MEASUREMENT.

a. Lump Sum. No measurement of quantities will be made.

BASIS OF PAYMENT

145-5.1 Payment will be made at the contract price for provision of the standby generation system. Payment is for a complete, operating system.

Payment will be made under:

Item L-145a Standby Generator, Transfer Switch and Enclosure – per lump sum.

ITEM P-152 EXCAVATION AND EMBANKMENT

DESCRIPTION

152-1.1 This item consists of excavation, hauling, embankment (or waste disposal), placement, grading and compaction of all materials required to construct runway safety areas, taxiway safety areas, runways, taxiways, aprons, drainage, buildings, roadways, parking, and other work. Construct according to the specifications, and conform to the dimensions and typical sections shown on the Plans.

MATERIALS

152-2.1 MATERIAL DEFINITIONS. The Contract will designate material to be removed from within the project lines and grades as classified excavation (common, rock or muck) or as unclassified excavation. Material obtained from outside the project lines and grades is borrow.

All material shall be described as defined below, but no quantity of material shall be defined or paid in more than one category:

a. Unclassified Excavation. All material, regardless of its nature, which is not paid for under another contract item. May include common, rock or muck.

b. Common Excavation. Suitable material such as silt, sand, gravel, and granular material that does not require blasting or ripping. Not rock or muck.

c. Rock Excavation. Rock that cannot be excavated without blasting or ripping, and boulders containing a volume of more than 0.5 cubic yard.

d. Muck Excavation. Soil, organic matter, and other material not suitable for embankment or foundation material, including material that will decay or produce subsidence in the embankment such as stumps, roots, logs, humus, or peat.

e. Drainage Excavation. Excavation made for the primary purpose of controlling drainage including: intercepting, inlet or outlet ditches; temporary levee construction; or any other type as shown on the Plans.

f. Borrow. Suitable material that is required for the construction of embankment or for other portions of the work. Borrow material shall be obtained from sources within the limits of the airport property but outside the project lines and grades, or from sources outside the airport property.

g. Foundation Soil. In-situ soil or undisturbed ground.

152-2.2 UNSUITABLE MATERIAL. Material that doesn't meet the testing criteria for suitable material. Material containing vegetable or organic matter, such as muck, peat, organic silt, or sod is considered unsuitable for use in embankment construction. Material that is contaminated by hazardous substances, including fuel or oil, in greater quantity than state and federal standards allow is considered unsuitable for use.

152-2.3 SUITABLE MATERIAL. Suitable material may be obtained from classified excavation, unclassified excavation, or borrow. The Engineer will approve material as "suitable" for use in embankment when the material meets the following criteria:

a. Sand, rock, gravel, silt, concrete, asphalt pavement, and other inorganic material;

b. Gradation of 100% by weight passing 6 inch screen; and

c. Meets definition of Non-Frost Susceptible in Subsection GCP 10-03, except delete “6%” and replace with “10%” (passing No. 200 screen).

The Engineer may, in their discretion, approve oversize material as “suitable” for use in embankment when the material meets the following criteria:

a. Sand, rock, gravel, silt, concrete, asphalt pavement, and other inorganic material;

b. Gradation of 100% by weight passing 24 inch screen;

c. Meets definition of Non-Frost Susceptible in Subsection GCP 10-03, except delete “6%” and replace with “10%” (passing No. 200 screen); and

d. Rock is well graded with an even distribution of rock sizes, and can be compacted with a minimal amount of voids.

CONSTRUCTION METHODS

152-3.1 GENERAL. Perform all necessary clearing and grubbing in accordance with Item P-151, and construction surveying in accordance with Item G-135, including staking of lines and grades, prior to beginning excavation, grading, and embankment operations in any area.

The suitability of material to be placed in embankments shall be subject to approval by the Engineer. Material with organics, when approved by the Engineer as suitable to support vegetation, may be used on top of the embankment slope.

Unsuitable material shall be disposed of in waste areas shown on the Plans or in locations acceptable to the Engineer. Material contaminated by hazardous substances shall require special handling and disposal, performed according to Subsection GCP 70-11.d. and using methods acceptable to the Engineer.

a. Waste Areas. All waste areas shall be graded to allow positive drainage of the area and of adjacent areas. The surface elevation of waste areas shall not extend above the surface elevation of adjacent usable areas of the airport, unless specified on the Plans or approved by the Engineer. Unsuitable material shall not be left in windrows or piles, and shall not extend into the Obstacle-Free Zone (as defined in AC 150/5300-13, Subsection 306).

All waste areas shall be protected from erosion according to the SWPPP. Areas where seeding is called for, in which the top layer of soil material has become compacted, by hauling or other activities of the Contractor shall be scarified and disked to a depth of 4 inches, in order to loosen and pulverize the soil.

The Contractor shall obtain all permits required for placing waste in areas they choose, and which are not covered by CBJ obtained permits. When the Contractor is required to locate a disposal area outside the airport property limits at his/her own expense, he shall obtain and file with the Engineer, permission in writing from the property owner for the use of private property for this purpose.

b. Utility Work. Utility work shall be performed, and compensation claims for utility work made, according to Subsection GCP 50-06. If it is necessary to work thorough or around existing utilities or associated structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve the utilities or provide temporary services. When utilities not shown on the Plans are encountered, the Contractor shall immediately notify the Engineer, and the Engineer will determine the disposition of the utility. The Contractor shall, at no additional cost to the CBJ, satisfactorily repair or pay the cost of all damage to utilities or associated structures which may result from any of the Contractor's operations.

152-3.2 EXCAVATION. No excavation shall be started until the Contractor has construction surveyed the work, including staking the lines and grades, and the Engineer has reviewed stakes, elevations and measurements of the ground surface. As required in GCP 40-04, all Useable Excavation of suitable material shall be used in the formation of embankment or for other purposes shown on the Plans. All unsuitable material shall be disposed of in waste areas as shown on the Plans or as directed by the Engineer.

When the volume of the Useable Excavation exceeds that required to construct the embankments to the grades indicated, the excess material shall be used to grade the areas of ultimate development or disposed of as directed. When the volume of Useable Excavation is not sufficient for constructing the fill to the grades indicated, borrow shall be used to make up the deficiency.

The grade shall be maintained so that the surface is well drained at all times. When necessary, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the work. All temporary drains and drainage ditches shall be constructed and maintained according to the SWPPP.

In cuts, all loose or protruding rocks on the back slopes shall be scaled or otherwise removed to line of finished grade of slope. All cut-and-fill slopes shall be uniformly dressed to the slope, cross section, and alignment shown on the Plans or as directed by the Engineer.

a. Selective Grading. When selective grading is required, the more suitable material as designated by the Engineer shall be used in constructing the upper layers of the embankment or pavement structure. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas.

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for runways, taxiways, safety areas, subgrades, roads, shoulders, or any areas intended for turfing shall be excavated to a minimum depth of 12 inches, or to the depth directed by the Engineer, below the top of subgrade. Muck, peat, matted roots, or other yielding material that is unsatisfactory for foundation soil compaction, shall be removed to the depth specified. Unsuitable materials shall be disposed of at locations shown on the Plans. The excavated area shall be refilled with suitable material, obtained from the grading operations or borrow areas and thoroughly compacted as specified. Where rock cuts are made and refilled with suitable material, any pockets created in the rock surface shall be drained according to the details shown on the Plans. The material removed will be paid as Unclassified Excavation.

c. Overbreak. Overbreak, including slides, is that portion of any material displaced or loosened beyond the finished work, as planned or authorized by the Engineer. The Engineer shall determine if the displacement of such material was unavoidable and their decision shall be final. All overbreak shall be graded or removed by the Contractor and disposed of as directed; however, payment will not be made for the removal and disposal of overbreak which the Engineer determines as avoidable. Unavoidable overbreak that must be removed will be paid as Unclassified Excavation.

d. Removal of Structures and Utilities. The Contractor shall accomplish the removal of existing structures and utilities that are specified to be removed or demolished, except when another entity is identified in the Contract to accomplish the work. All existing structural foundations shall be excavated and removed to a depth at least 2 feet below the top of subgrade or as indicated on the Plans, and the material disposed of as directed. Holes left after removing foundations shall be backfilled with suitable material and compacted as specified. The material will be paid as Unclassified Excavation.

e. Foundation Soil Compaction Requirements. In areas of excavation**,** the top 6 inches of foundation soil under areas serving aircraft or vehicle traffic loadings shall be compacted to a density of not less than 95% of the maximum density as determined by WAQTC FOP for AASHTO T 99/T 180 or ATM 212. The in-place field density and moisture content shall be determined according to WAQTC FOP for AASHTO T 310.

Compaction of the foundation soil is a subsidiary cost to excavation.

The Engineer may direct the Contractor to over excavate foundation soil that is soft or compresses excessively, and to backfill excavation with compacted suitable material. The material will be paid as Unclassified Excavation.

Blasting. Blasting will not be permitted on airport property.

152-3.3 BORROW SOURCES. Borrow sources within the airport property are identified on the Plans. Excavation of borrow on airport property shall be made only at these identified locations and within the lines and grades staked.

Borrow sources outside of airport property may be identified in the Contract according to GCP 60-02. The Contractor shall furnish additional borrow sources if necessary.

Removal of overburden and waste material, permit costs, mineral royalties, and other costs of material source development are subsidiary and shall be included in the unit price for borrow.

152-3.4 DRAINAGE EXCAVATION. Drainage excavation for intercepting, inlet or outlet drains; for temporary levee construction; or for any other type as designed or as shown on the Plans. The work shall be performed in the proper sequence with the other construction and according to the SWPPP. All suitable material shall be placed in fills; unsuitable material shall be placed in waste areas or as directed. Intercepting ditches shall be constructed prior to starting adjacent excavation operations. All necessary work shall be performed to secure a finish true to line, elevation, and cross section.

The Contractor shall maintain ditches constructed on the project to the required cross section and shall keep them free of debris or obstructions until the project is accepted.

152-3.5 PREPARATION OF EMBANKMENT AREA. Where an embankment is to be constructed to a height of 4 feet or less, or where the embankment supports asphalt or concrete paving, all sod and vegetable matter shall be removed from the surface upon which the embankment is to be placed, and the cleared surface shall be completely broken up by plowing or scarifying to a minimum depth of 6 inches. Compact this area as indicated in Subsection 152-3.2.e.

When new embankment is placed against existing embankments or on slopes steeper than 4:1, the existing ground shall be continuously benched over the areas as the work is brought up in layers. Benching shall be of sufficient width to permit placing of material and compacting operations. Each horizontal cut shall begin at the intersection of the original ground and the vertical side of the previous bench. Material thus cut out and deemed suitable shall be blended and incorporated into the new embankment.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-3.6 FORMATION OF EMBANKMENTS. Embankments shall be formed in successive horizontal layers of not more than 8 inches in loose depth for the full width of the cross section, unless otherwise approved by the Engineer.

The grading and compaction operations shall be conducted, and the various soil strata shall be placed, to produce an embankment as shown on the typical cross section or as directed by the Engineer. Materials such as brush, hedge, roots, stumps, grass and other unsuitable material, shall not be incorporated or buried in the embankment.

a. Suspension of Operations. Operations on earthwork shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing, moisture content or other unsatisfactory conditions of the field. The Contractor shall drag, blade, or slope the embankment to provide proper surface drainage.

b. Soft Foundations. When embankments are to be constructed across wet or swampy ground, which will not support the weight of heavy hauling and spreading equipment, the Contractor shall use methods of embankment construction, and use hauling and spreading equipment, that will least disturb the soft foundation (defined as having a California Bearing Ratio less than 3). When soft foundations are encountered, and when approved by the Engineer, the lower part of the fill may be constructed by dumping and spreading successive vehicle loads in a uniformly distributed layer of a thickness not greater than that necessary to support the vehicle while placing subsequent layers, after which the remainder of the embankment shall be constructed in layers and compacted as specified. The Contractor shall not be required to compact the soft foundation, and at the Engineer's option, may not be required to clear and grub.

c. Moisture. The material in the layer being placed shall be within ±2% of optimum moisture content before rolling to obtain the prescribed compaction. In order to achieve a uniform moisture content throughout the layer, wetting or drying of the material and manipulation shall be performed when necessary. Should the material be too wet to permit proper compaction or rolling, all work on all of the affected portions of the embankment shall be delayed until the material has dried to the required moisture content. Watering of dry material to obtain the proper moisture content shall be done with approved equipment that will sufficiently distribute the water. Sufficient equipment to furnish the required water shall be available at all times.

d. Compaction. Rolling operations shall be continued until the embankment is compacted to not less than 95% of maximum density as determined by WAQTC FOP for AASHTO T 99/T 180 or ATM 212. Under all areas serving aircraft or vehicle traffic loadings, the embankment shall be compacted to a density of not less than 100% of the maximum density as determined by WAQTC FOP for AASHTO T 99/T 180 or ATM 212. The in-place field density and moisture content shall be determined according to WAQTC FOP for AASHTO T 310.

Keep dumping and rolling areas separate. Do not cover any layer by another until the proper density is obtained.

During construction of the embankment, the Contractor shall route their equipment at all times, both when loaded and when empty, over the layers as they are placed and shall distribute the travel evenly over the entire width of the embankment. The equipment shall be operated in such a manner that hardpan, cemented gravel, clay, or other chunky soil material will be broken up into small particles and become incorporated with the other material in the layer.

In the construction of embankments, layer placement shall begin in the deepest portion of the fill and progress in layers approximately parallel to the finished pavement grade line. Stones or fragmentary rock larger than 3 inches in their greatest dimensions will not be allowed in the top 6 inches of the embankment.

e. Oversize Material. At the Engineer's discretion and direction, the Contractor may use oversize material or rockfill, as defined in Subsection 152-2.3, in the embankment. Place material in layers up to 2 feet thick. Fill voids with finer material. Level and smooth each layer with suitable leveling equipment. Use compaction equipment and construction methods that can form a dense, well-compacted embankment. Do not use oversize material within 2 feet of the top of finished subgrade.

Rock or boulders larger than 2 feet in thickness shall either be disposed of outside the excavation or embankment areas, in places and in the manner designated by the Engineer; or they may be crushed to less than 2 feet thickness and used in the embankment.

f. Subsidiary Costs. Excavation and embankment is a single pay item; there will be no separate measurement or payment. The costs for material source development, blasting, excavation, hauling, placing in layers, compacting, disking, watering, mixing, sloping, grading, and other necessary operations for construction of embankments, are subsidiary and shall be included in the contract unit prices for excavation, borrow, or other pay items.

g. Frozen Material. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material, unless this construction method is identified in the special provisions, or is part of a Contractor's Progress Schedule that the Engineer has approved.

152-3.7 FINISHING AND PROTECTION OF SUBGRADE. After the subgrade has been substantially completed, the full width shall be conditioned by removing any soft or other unstable material that will not compact properly. The resulting areas and all other low areas, holes or depressions shall be brought to finish subgrade elevation with suitable material. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade, whose top is shaped to the lines and grades shown on the Plans.

Grading of the top of subgrade shall be performed so that it will drain readily. The Contractor shall take all precautions necessary to protect the subgrade from damage. The Contractor shall limit hauling over the finished subgrade to that which is essential for construction purposes.

All ruts, ponds or rough places that develop in a completed subgrade shall be repaired, smoothed and recompacted before another layer is placed on top of the subgrade.

No subbase, or surface course shall be placed on the subgrade until the subgrade has been approved by the Engineer. Erosion and sediment control shall be done according to the SWPPP. Work described in this subsection is subsidiary and shall be included in the contract unit prices.

152-3.8 RESERVED

152-3.9 TOLERANCES. In those areas upon which a subbase or base course is to be placed, the top of the subgrade shall be of such smoothness that, when tested with a 12-foot straightedge applied parallel and at right angles to the centerline, it shall not show any deviation in excess of 1/2 inch, or shall not be more than 0.05 foot from true grade as established by grade hubs or pins. Any deviation in excess of these amounts shall be corrected by loosening, adding, or removing materials; reshaping; and recompacting by watering and rolling.

On Runway Safety Areas, intermediate and other designated areas, the surface shall be of such smoothness that it will not vary more than 0.10 foot from true grade as established by grade hubs. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

METHOD OF MEASUREMENT

152-4.1 The quantity of unclassified excavation, common excavation, rock excavation, and muck excavation, will be measured in cubic yards of excavated material, measured in its original position. Pay quantities will be computed to the neat lines staked, by the method of average end areas of materials acceptably excavated. Measurement will not include the quantity of materials excavated without authorization beyond project lines and grades, or the quantity of material used for purposes other than those directed or approved by the Engineer.

With the Engineer's written approval, excavation may be measured by any method described in Subsection 152-4.2.

152-4.2 The quantity of Borrow material to be paid will be by calculated by one of the following methods of measurement, as described in the Bid Schedule.

If Borrow is paid by source volume, the quantity will be measured in cubic yards of material, measured in its original position at the borrow source, after stripping of overburden and waste. Pay quantities will be computed by the method of average end areas from cross sections taken before and after borrow excavation. No shrink or swell factor will be used.

If Borrow is paid by design volume, the quantity will be measured in cubic yards of material, measured in its final compacted position. Pay quantities will be computed by the method of average end areas, as determined from original ground cross sections before placement (after clearing and grubbing) and to the neat lines staked and verified by the Engineer after placement. No allowance will be made for subsidence of the subgrade or for material placed outside the staked neat line limits. The quantity to be paid for will be the cubic yards of material placed and accepted in the completed embankment. No shrink or swell factor will be used.

If Borrow is paid by weight, the quantity will be measured in tons, by weighing system or by barge displacement method.

BASIS OF PAYMENT

Excavation and embankment (or waste disposal) is a single pay item. The costs for material source development, blasting, excavation, hauling, placing in layers, compacting, disking, watering, mixing, sloping, grading, and other necessary operations for construction of embankments, or waste disposal, are subsidiary and shall be included in the contract unit prices.

152-5.1 For “Unclassified Excavation” payment will be made at the contract unit price per cubic yard.

152-5.2 For “Common Excavation” payment will be made at the contract unit price per cubic yard.

152-5.3 For “Rock Excavation” payment will be made at the contract unit price per cubic yard.

152-5.4 For “Muck Excavation” payment will be made at the contract unit price per cubic yard.

152-5.5 For “Drainage Excavation” payment will be made at the contract unit price per cubic yard.

152-5.6 For “Borrow” payment will be made at the contract unit price per cubic yard. If by weight, payment will be made at the contract unit price per ton.Payment will be made under:

(Base Bid and Additive Alternate No. 1)

Item P-152a	Unclassified Excavation - per cubic yard
Item P-152ag	Ditch Linear Grading – per linear foot
Item P-152aj	Mendenhall Thumb Removal – per lump sum

TESTING REQUIREMENTS

ATM 212	Standard Density of Coarse Granular Materials using the Vibratory Compactor
WAQTC FOP for AASHTO T 99/T 180	Moisture-Density Relations of Soils
WAQTC FOP for AASHTO T 255/T 265	Moisture Content of Aggregate and Soils
WAQTC FOP for AASHTO T 310	In-place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods

ITEM P-154 SUBBASE COURSE

DESCRIPTION

154-1.1 This item shall consist of a subbase course composed of granular materials constructed on a prepared subgrade or underlying course according to these Specifications, and in conformity with the dimensions and typical cross section shown on the Plans.

MATERIALS

154-2.1 MATERIALS. The subbase material shall consist of hard durable particles or fragments of granular aggregates. This material will be mixed or blended with fine sand, clay, stone dust, or other similar binding or filler materials produced from approved sources. This mixture must be uniform and shall comply with the requirements of these Specifications as to gradation, soil constants, and shall be capable of being compacted into a dense and stable subbase. The material shall be free from vegetable matter, lumps or excessive amounts of clay, and other objectionable or foreign substances. Pit-run material may be used, provided the material meets the requirements specified.

Aggregate gradation shall meet the requirements of Table 1, determined according to WAQTC FOP for AASHTO T 27/T11.

TABLE 1. AGGREGATE GRADATION REQUIREMENTS

Sieve designation (Square opening)	**Percentage by weight passing sieves**
3 inch	90-100
No. 4	20-55
No. 200	0-6

The percent passing the No. 200 sieve will be determined on minus 3-inch material.

The portion of the material passing the No. 40 sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than 6 when tested according to WAQTC FOP for AASHTO T 89 and T 90.

The gradations shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves, or vice versa.

CONSTRUCTION METHODS

154-3.1 GENERAL. The subbase course shall be placed where designated on the Plans or as directed by the Engineer. The material shall be shaped and thoroughly compacted within the tolerances specified.

Granular subbases which, due to grain sizes or shapes, are not sufficiently stable to support the movement of construction equipment, shall be mechanically stabilized to the depth necessary to provide such stability as directed by the Engineer. The mechanical stabilization shall principally include the addition of a fine-grained medium to bind the particles of the subbase material sufficiently to furnish a bearing strength, so that the course will not deform under the traffic of the construction equipment. The addition of the binding medium to the subbase material shall not increase the soil constants of that material above the limits specified.

154-3.2 PREPARING UNDERLYING COURSE. Before any subbase material is placed, the underlying course shall be prepared and conditioned as specified. The course shall be checked and accepted by the

Engineer before placing and spreading operations are started.

To protect the subgrade and to ensure proper drainage, the spreading of the subbase shall begin along the centerline of the pavement on a crowned section or on the high side of pavements with a one-way slope.

154-3.3 MATERIALS ACCEPTANCE IN EXISTING CONDITION. When the entire subbase material is secured in a uniform and satisfactory condition, such approved material may be moved directly to the spreading equipment for placing. The material may be obtained from gravel pits, stockpiles, or may be produced from a crushing and screening plant with the proper blending. The materials from these sources shall meet the requirements for gradation, quality, and consistency. The moisture content of the material shall be approximately that required to obtain maximum density. The final operation shall be blading or dragging, if necessary, to obtain a smooth uniform surface true to line and grade.

154-3.4 GENERAL METHODS FOR PLACING. When materials from several sources are to be blended and mixed, the subbase material, together with any blended material, shall be thoroughly mixed prior to placing on grade.

The subbase course shall be constructed in layers. Any layer shall be not less than 3 inches nor more than 8 inches of compacted thickness. The material, as spread, shall be of uniform gradation with no pockets of fine or coarse materials. No material shall be placed in snow or on a soft, muddy, or frozen course.

When more than one layer is required, the construction procedure described herein shall apply similarly to each layer.

During the placing and spreading, sufficient caution shall be exercised to prevent the incorporation of subgrade, shoulder, or foreign material in the subbase course mixture.

154-3.5 FINISHING AND COMPACTING. After spreading or mixing, the subbase material shall be thoroughly compacted. Sufficient compactors shall be furnished to adequately handle the rate of placing and spreading of the subbase course. The moisture content of the material shall be approximately that required to obtain maximum density.

The field density of the compacted material shall be not less than 100% of the maximum density, as determined according to WAQTC FOP for AASHTO T 99/T 180 or ATM 212. The in-place field density and moisture content shall be determined according to WAQTC FOP for AASHTO T 310.

The course shall not be rolled when the underlying course is soft or yielding or when the rolling causes undulation in the subbase. When the rolling develops irregularities that exceed 1/2 inch when tested with a 12-foot straightedge, the irregular surface shall be loosened and then refilled with the same kind of material as that used in constructing the course and again rolled as required above.

Along places inaccessible to rollers, the subbase material shall be tamped thoroughly with mechanical or hand tampers.

Watering during rolling, if necessary, shall be in the amount and by equipment approved by the Engineer. Water shall not be added in such a manner or quantity that free water will reach the underlying layer and cause it to become soft.

154-3.6 SURFACE TEST. After the course is completely compacted, the surface shall be tested for smoothness and accuracy of grade and crown; any portion found to lack the required smoothness or to fail in accuracy of grade or crown shall be scarified, reshaped, recompacted, and otherwise manipulated as the Engineer may direct until the required smoothness and accuracy is obtained. The finished surface shall not vary more than 1/2 inch when tested with a 12-foot straightedge applied parallel with, and at right angles to, the centerline.

154-3.7 PROTECTION. Work on subbase course shall not be conducted during freezing temperature nor when the subgrade is wet. When the subbase material contains frozen material or when the underlying course is frozen, the construction shall be stopped.

154-3.8 MAINTENANCE. Following the final shaping of the material, the subbase shall be maintained throughout its entire length by the use of standard motor graders and rollers until, in the judgment of the Engineer, the subbase meets all requirements and is acceptable for the construction of the next course.

METHOD OF MEASUREMENT

154-4.1 Subbase Course will be weighed by the ton according to Subsection GCP-90-02.

Subbase materials will not be included in any other excavation quantities.

BASIS OF PAYMENT

154-5.1 Subbase Course will be paid for at the contract price, per unit of measurement, accepted in place.

Hauling and placing of these materials is subsidiary.

Payment will be made under:

Item P-154b Subbase Course - per ton

TESTING REQUIREMENTS

ATM 212	Standard Density of Coarse Granular Materials using the Vibratory Compactor
WAQTC FOP for AASHTO T 27/T 11	Sieve Analysis of Aggregates & Soils
WAQTC FOP for AASHTO T 89	Liquid Limit of Soils
WAQTC FOP for AASHTO T 90	Plastic Limit and Plasticity Index of Soils
WAQTC FOP for AASHTO T 99/T 180	Moisture-Density Relations of Soils
WAQTC FOP for AASHTO T 310	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods

ITEM P-157 EROSION, SEDIMENT, AND POLLUTION CONTROL

157-1.1 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 Construction General Permit.

157-1.2 DEFINITIONS.

These definitions apply only to Item P-157.

Active Treatment System Operator. The Contractor's qualified representative who is responsible for maintaining and operating an active treatment system (as defined in the CGP) for storm water 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 CBJ and others). The CBJ recognizes AK-CESCLs as "qualified personnel" required by the CGP. An AK-CESCL must be recertified every three years.

Alaska Department of Environmental Conservation (ADEC). 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 ADEC that issues and tracks permits for storm water 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.).

Consent Decree. The decree entered by the United States District Court for the District of Alaska on September 21, 2010, regarding compliance with the CWA and implementation of the CGP, to which the United States and the CBJ are parties.

Construction Activity. Physical activity by the Contractor, Subcontractor or utility company that may result in erosion, sedimentation, or a discharge of pollutants into storm water. 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 storm water and are directly related to the construction process (e.g. concrete or asphalt batch plants).

Construction General Permit (CGP). The permit authorizing storm water discharges from Construction Activities, issued and enforced by ADEC. It authorizes stormwater discharges provided permit conditions and water quality standards are met.

Corp of Engineers Permit (COE Permit). A U.S. Army Corp 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 ADEC, to obtain coverage under the CGP.

Electronic Notice of Termination (eNOT). The electronic Notice of Termination submitted to ADEC, to end coverage under the CGP.

Environmental Protection Agency (EPA). A federal agency charged to protect human health and the environment.

Erosion and Sediment Control Plan (ESCP). The CBJ'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). The ESCP is available on line at http://www.juneau.org/engineering_ftp/contracts/Contracts.php.

Final Stabilization. Is defined in this section as it is defined in the CGP.

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 CBJ's stormwater inspector.

Municipal Separate Storm Sewer System (MS4) Permit. An ADEC storm water discharge permit issued to certain local governments and other public bodies for operation of storm water conveyances and drainage systems. See CGP for further definition.

Multi-Sector General Permit (MSGP). The Alaska Pollutant Discharge Elimination System General Permit for storm water 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 storm water 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, 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 CBJ 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 CBJ by the Contract and are directly related to 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.

Records. Any record, report, information, document or photograph required to be created or maintained pursuant to the requirements of the Consent Decree, the CGP, the CGP storm water 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 dry weather.

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.

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.

157-1.3 PLAN AND PERMIT SUBMITTALS.

For plans listed in Subsection GCP-80-03.f (SWPPP and HMCP) use the Contractor submission and CBJ review deadlines identified in Subsection 157-1.3.

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 157-2.1.b.

The CBJ 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 CBJ. 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 CBJ, the Contractor must sign and certify the approved SWPPP. See Item 4 for further SWPPP submittal requirements.

b. Hazardous Material Control Plan. 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 157-2.3, 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 CBJ 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 CBJ is not an operator. Use a SWPPP2 for Construction Activities outside the Project Zone.

After CBJ approval of the SWPPP and prior to beginning Construction Activity, submit an eNOI with the required fee to ADEC for coverage under the Construction General Permit (CGP). Submit a copy of the signed eNOI and ADEC'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 157-3.1.a are completed.

The CBJ will submit an eNOI to ADEC for Construction Activities inside the Project Zone. The Engineer will provide the Contractor with a copy of the CBJ's eNOI and ADEC'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, SWPPP Certifications, both permittee's signed eNOIs and ADEC's written acknowledgement.

e. Ending CGP Coverage. Submit an eNOT to ADEC within 30 days after the Engineer has determined the conditions listed in Subsection 157-3.1.f have been met. Submit a copy of the signed eNOT and ADEC's acknowledgement letter to the CBJ within three days of filing the eNOT or receiving a written response.

f. ADEC SWPPP Review. When CGP, Part 2.1.3 requires ADEC SWPPP review:

(1) Transmit a copy of the CBJ-approved SWPPP to ADEC using delivery receipt confirmation;

(2) Transmit a copy of the delivery receipt confirmation to the Engineer within seven 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 CBJ-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. Reasons for modification include a change in start or end dates, small 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, the original eNOI indicates disturbed area less than five acres and the project will disturb more than five acres, or a project over five disturbed acres grows by more than 50%.

157-1.4 PERSONNEL QUALIFICATIONS.

Provide documentation in the SWPPP that the individuals serving in these positions meet the personnel qualifications.

The SWPPP Preparer must meet at least one of the following qualifications:

- Current certification as a Certified Professional in Erosion and Sediment Control (CPESC);
- 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
- Professional Engineer registered in the State of Alaska with current certification as AK-CESCL.

For Projects disturbing more than 20 acres, the SWPPP Preparer must also have completed a SWPPP Preparation course.

The Superintendent must meet all the following qualifications:

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

The SWPPP Manager must have current certification as AK-CESCL and must meet the CGP experience, training, and authority requirements identified for the Storm Water Lead and Storm Water Inspector positions as defined in the CGP, Appendix C, Qualified Person.

The Active Treatment System (ATS) operator must have current certification as AK-CESCL, and be knowledgeable in the principals 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's certification course.

The CBJ 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:

- CPESC, Certified Professional in Erosion and Sediment Control; or
- CISEC, Certified Inspector in Sediment and Erosion Control

157-1.5 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 1.12.2. 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 F, 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.

c. Subcontractor Certification. Subcontractors must certify 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.

157-1.6 RESPONSIBILITY FOR STORM WATER PERMIT COVERAGE.

a. The CBJ 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 ADEC and other applicable federal, state, and local requirements, and for securing all necessary clearances, rights, and permits. Subsection GCP-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 Subsection GCP-80-01.c) 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. Subsection GCP-70-02 describes the requirement to obtain permits, and to provide permit documents to the Engineer.

d. The CBJ 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.

157-1.7 UTILITY. (Reserved for Regions)

157-2.1 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 CBJ at least seven days notice of the site visit, so that the CBJ 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 CBJ'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 the CGP.

Obtain the following forms after they have been completed by the CBJ and include them in the SWPPP:

- SWPPP Delegation of Signature Authority – DOT&PF (25D-107)
- SWPPP Certification for DOT&PF (25D-109)
- SWPPP Delayed Action Item Report (25D-113)

Use the following CBJ forms for recording information in the SWPPP:

- SWPPP Amendment Log (25D-114)
- SWPPP Certification for Contractor (25D-111)
- SWPPP Construction Site Inspection Report (25D-100)
- SWPPP Corrective Action Log (25D-112)
- SWPPP Daily Record of Rainfall (25D-115)
- SWPPP Delegation of Signature Authority – Contractor (25D-108)
- SWPPP Grading and Stabilization Activities Log (25D-110)
- SWPPP Pre-Construction Site Visit (25D-106)
- SWPPP Project Staff Tracking (25D-127)
- SWPPP Subcontractor Certification (25D-105)
- SWPPP Training Log (25D-125)

SWPPP Template and Forms 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.

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.

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 CBJ 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:

(1) Over which each operator has operational control; and
(2) Where the CBJ and Contractor are co-operators.

For work outside the Project Zone the SWPPP must identify the entity that has stormwater permit coverage, the operator, and the areas that are:

(1) Dedicated to the Project and where the CBJ is not an operator; and
(2) Not dedicated to the project, but used for the project.

Develop the SWPPP according to the requirements of the CGP and this specification. Account for the Contractor's construction methods and phasing. Identify the amount of mean annual precipitation
Comply with the CGP Part 1.4.2 Allowable Non-Storm Water Discharges. List locations where authorized non-storm water will be used, including the types of water that will be used on-site.

Include the CBJ's Anti-degradation Analysis in the SWPPP, if storm water 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 2.1.5.

There are special requirements in the CGP Part 3.2, for storm water discharges into an impaired water body, and they may include monitoring of storm water discharges. For Projects meeting the permit criteria, the CBJ will initiate a monitoring program for the storm water within the Project Zone, and will provide the required information and reports for inclusion in the SWPPP. The Contractor is responsible for monitoring and reporting outside the Project Zone.

Preserve natural topsoil unless infeasible. Delineate the site according to CGP Part 4.1. Use stakes, flags, or silt fence, etc. to identifying 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 4.1.2.

Comply with CGP Part 4.3, requirements for dewatering for trenches and excavations.

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.

Describe methods and time limits, to initiate temporary or permanent soil stabilization. For areas with mean annual precipitation of:

a. 40 inches or less, initiate stabilization as soon as practicable and within 14 days; or
b. Greater than 40 inches, initiate stabilization as soon as practicable and within seven days.

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

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.

Plans for Active Treatment Systems must be submitted to DEC for review at least 14 days prior to their use and the Operator of the ATS identified in the SWPPP. Any use of treatment chemicals must be identified on the NOI.

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.

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 permanent 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 title of the BMP Manual or publication, the author (individual or agency), and date of publication. 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.”

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.

Identify the inspection frequency in the SWPPP:

- For areas where the mean annual precipitation is 15 inches or less, inspect at least once every 14 days during construction and within 24 hours of the end of a storm event that resulted in a discharge from the site.
- For areas where the mean annual precipitation is between 15 to 40 inches, inspect either once seven days or according to item a:
- For areas where the mean annual precipitation is 40 inches or greater, inspect once every seven days, and at least twice every seven days during periods of relatively continuous precipitation or sequential storm events.

Linear Project Inspections, described in CGP Part 6.5. are applicable to this project.

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 which were not included in the CBJ’s permitting and consultation.

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 storm water pollution prevention activities and to satisfy the requirements of the Consent Decree, CGP and this specification. See Subsection 157-3.3 for more information.

d. Recording Personnel and Contact Information in the SWPPP.

Identify the SWPPP Manager as the Storm Water Lead and Storm Water Inspector positions in the SWPPP. Document the SWPPP Manager's responsibilities in Section 2.0 Storm Water 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, Records of the AK-CESCL cards or certificates 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, Records of the AK-CESCL cards or certificates of ATS operators. Record names of ATS operators and their beginning and ending dates, on Form 25D-127.

The CBJ will provide Records of AK-CESCL cards or certificates for the Project Engineer, Stormwater Inspectors, and Monitoring Person (if applicable), and names and dates they are acting in that position. Include the CBJ's Records in the SWPPP Appendix. Include the CBJ's Storm Water Inspector and Storm Water Monitoring Person (if applicable) in section 2.0 of the SWPPP.

157-2.2 HAZARDOUS MATERIAL CONTROL PLAN (HMCP) REQUIREMENTS.

Prepare the HMCP 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.

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.

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.

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.

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.

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.

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.

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.

157-2.3 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.

157-2.4 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 157-1.3.a, Inspection Reports, and other reports required by the CGP.

The Superintendent may assign certain duties to the SWPPP Manager, those duties may include:
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 P-157(g) 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-157, 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.

157-2.5 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 by special provision, or use annual rye grass if no temporary seed mix is specified.

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

Use silt fences as specified in Item P-680.

Use straw that is certified as free of noxious weed by the United States CBJ of Agriculture, Natural Resources Conservation Service, Local Soil and Water Conservative District. Alaska Weed Free Forage Certification Program must be used when available. Hay may not be substituted for straw.

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

157-2.6 CONTRACTOR REQUIREMENTS.

The Contractor must be familiar with the requirements of the CGP and Consent Decree because Contractor's employees will be conducting duties that relate to compliance with the CGP and the Consent Decree. A copy of the Consent Decree is available on the CBJ's Statewide Environmental Office web page.

157-3.1 CONSTRUCTION REQUIREMENTS.

Comply with the SWPPP and the requirements of the CGP.

a. Before Construction Activity may Begin.

The following actions must be completed before Construction Activity begins:

- The SWPPP Preparer must visit the Project, the visit must be documented in the SWPPP, and the SWPPP must be developed (or amended) with findings from the visit
- The SWPPP must be approved by the Engineer
- The Contractor must be authorized to begin by the Engineer
- The Project eNOIs for the CBJ and for the Contractor, as well as any other eNOIs if there are additional operators, must be listed as Active Status on the ADEC website
- The CBJ approved SWPPP must be submitted to ADEC and Local Government (when required); and
- The Contractor has transmitted to the Engineer an electronic copy of the approved SWPPP.

You may begin Winter Construction activity according to CGP Part 4.10.3, provided actions 1 through 3 above are completed before winter construction activity begins.

Post notices containing the following information:

- Copy of all eNOIs related to this project
- Name and 24 hour phone number of SWPPP Manager
- 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 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.

Install an outdoor rain gauge in per manufacturer's guidance in a readily accessible location on the Project.

Delineate the site for both land disturbing activities and areas that will be left undisturbed. 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 permanent stabilization are installed, maintained, and protected from damage.

Provide on-going training to employees and subcontractors, on control measures at the site and applicable storm water pollution prevention procedures. Training must be specific to the installation, maintenance, protection, and removal of control measures. 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 Subsection GCP-70-11 Protection and Restoration of Property and Landscape. Concrete washout must be fully contained.

Fuel in designated areas. 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 157-2.1.c, SWPPP Considerations and Contents)

c. Pollutant and Hazardous Materials Reporting Requirements.

If there has been an incident of non-compliance with the CGP that may endanger health or the environment, immediately report the incident to ADEC according to the CGP, Appendix A, Part 3.0. Notify the Engineer immediately and to the extent possible coordinate reports to ADEC with the Engineer. The report must include:

- A description of the noncompliance and its causes
- The exact dates and times of noncompliance
- If not yet corrected the anticipated time the project will be brought back into compliance
- The corrective action taken or planned to reduce, eliminate and prevent reoccurrence

If there has been an incident of non-compliance with COE Permits, then notify the Engineer immediately of the non-compliance.

Report spills of petroleum products or other hazardous materials to the Engineer and other agencies as required by law. Use the HMCP and SPCC Plan (if available) for contact information to report spills to regulatory agencies.

d. Corrective Action and Maintenance of BMPs.

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

Implement corrective action:

- If an incident of non-compliance with the SWPPP, or CGP is identified;
- 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;
- 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.
- 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.
- If a prohibited discharge of pollutants, as specified in CGP Part 4.6 is occurring or will occur, or
- If there is accumulation of sediment or other pollutants, that is in or near any storm water 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.

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

- 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.
- For all other conditions meet both requirements:
  (a) Corrective action is completed in time to protect water quality; and
  (b) Corrective action is completed no later than the Complete-by-Date that was entered in an Inspection Report (see Subsection 157-3.3.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.

e. Stabilization.

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:

- As soon as practicable
- As soon as necessary to avoid erosion, sedimentation, or the discharge of pollutants
- As identified in the SWPPP

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.

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, non-erodible cover, dust palliatives, or other approved methods.

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.

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.

Apply permanent seed according to Items T-901 and T-908, 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.

When installing a culvert or other drainage structure where stream bypass is not used, install temporary or permanent 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 and permanent stabilization:

- At the culvert or drainage structure inlet and outlet; and
- 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.

Before deactivating a stream bypass or stream diversion used for construction of a bridge, culvert, or drainage structure, install permanent stabilization:

(1) At the inlet and outlet of the culvert, drainage structure, or bridge;
(2) 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
(3) Under the bridge.

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

f. Ending CGP Coverage and BMP Maintenance.

The Engineer will determine the date that all the following conditions for ending CGP coverage have been met within the Project Zone:

- Land disturbing activities have ceased
- Final Stabilization has been achieved (including at CBJ furnished material sources, disposal sites, staging areas, equipment areas, etc.); and

- Temporary BMPs have been removed.

After the Engineer has determined the conditions for ending CGP coverage have been met, the CBJ will:

- Send written notice to the Contractor with the date that the conditions were met;
- Submit an eNOT to ADEC; and
- Provide a copy of the eNOT and ADEC's acknowledgement letter to the Contractor.

The Contractor is responsible for ending permit coverage within the Project Zone, by submitting an eNOT to ADEC 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 CBJ is not an Operator, the Contractor may not be able to file an eNOT at the same time as the CBJ. In this case, the Contractor must amend the SWPPP and separate SWPPP2(s), to indicate the CBJ's CGP coverage has ended, and the CBJ 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 ADEC, and insert copies of the CBJ's and the Contractor's eNOTs with ADEC's acknowledgement letters in the appendix of the SWPPP.

The Contractor must submit a copy of each signed eNOT and ADEC's acknowledgement letter to the CBJ 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 157-1.3.e for more information.

g. Transmit final SWPPP.

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

157-3.2 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 and the Consent Decree. 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 CBJ 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 ADEC 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 ADEC 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 CBJ and other regulatory agencies that request them. See CGP Parts 5.10, 6.6 and 9.4.

157-3.3 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, SWPPP Amendment Log, SWPPP Grading and Stabilization Activities Log, and SWPPP Daily Record of Rainfall forms. 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 CBJ's storm water inspector jointly, unless impracticable. For this paragraph, "impracticable" means when both inspectors must fly to a remote area in the winter or when one inspector is sick or unable to travel to the site due to weather. 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.

Unless otherwise directed by the Engineer, insert a Complete-by-Date for each corrective action listed that complies with:

. (1) In time to protect water quality;
(2) less than seven calendar days after the date the inspection was performed; and
(3) before the next scheduled inspection.

Provide a copy of the completed, unsigned Inspection Report to the Engineer by noon on the 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 addendum that addresses only the omitted or erroneous portions of the original Inspection Report. The Superintendent and the Engineer must both sign and certify the addendum.

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.

Inspection frequency may be reduced to at least one Inspection every 30 days, if approved by the Engineer and the entire site is temporarily stabilized;

When work is suspended due to freezing conditions, 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.

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 Seasonal Thaw.

Construction Activities within the Project Zone must be stabilized with appropriate BMPs prior to seasonal thaw. Seasonal thaw is the annual (first) recurrence of snow and ice melting after a prolonged period of freezing conditions.

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:

- 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;
- If an Inspection identifies that any portion of the SWPPP is ineffective in preventing erosion, sedimentation, or the discharge of pollutants;
- Whenever an Inspection identifies a problem that requires additional or modified BMPs
- Whenever a BMP is modified during construction, or a BMP not shown in the original SWPPP is added;
- If the Inspection frequency is modified (note beginning and ending dates); or
- When there is a change in personnel who are named in the SWPPP, according to Subsection 157-2.1.d.

Do not record removal of BMPs as amendments to the SWPPP. See Subsection 157-3.3.i for documenting removal of BMPs.

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 157-2.1.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 CBJ'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, or overdue maintenance (after sediment accumulated in sediment basins (including sediment traps and ponds) exceeds 50% of design capacity; or after sediment accumulates to more than half the above ground height on silt fences, check dams, or berms) is a corrective action and must be documented on the Corrective Action Log. Do not record removal of BMPs on the Corrective Action Log.

Within 24 hours of discovery, update the Corrective Action Log 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.

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 4.4.

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.

157-3.4 FAILURE TO PERFORM WORK.

The Engineer has authority to suspend work and withhold monies, for an incident of non-compliance with the CGP, Consent Decree or SWPPP, that may endanger health or the environment or for failure to perform work related to this Section. If the suspension is to protect workers, the public, or the environment from imminent harm, the Engineer may orally order the suspension of work. Following an oral order of suspension, the Engineer will promptly give written notice of suspension. In other circumstances, the Engineer will give the Contractor written notice of suspension before suspension of work. A notice of suspension will state the defects or reasons for a suspension, the corrective actions required to stop suspension, and the time allowed to complete corrective actions. If the Contractor fails to take the corrective action within the specified time, the Engineer may:

a. Suspend the work until corrective action is completed;
b. Withhold monies due the Contractor until corrective action is completed;
c. Assess damages or equitable adjustments against the Contract Amount; and
d. Employ others to perform the corrective action and deduct the cost from the Contract amount.

Reasons for the Engineer to take action under this section include, but are not limited to, the Contractor's failure to:

- Obtain appropriate permits before Construction Activities occur;
- Perform SWPPP Administration;
- Perform timely Inspections;
- Update the SWPPP;
- Transmit updated SWPPP, Inspection Reports, and other updated SWPPP forms to the Engineer;
- Maintain effective BMPs to control erosion, sedimentation, and pollution in accordance with the SWPPP, the CGP, and applicable local, state, and federal requirements;

- Perform duties according to the requirements of this Section P-157; or
- Meet requirements of the CGP, SWPPP, or other permits, laws, and regulations related to erosion, sediment, or pollution control.

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

157-3.5 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 CBJ and other regulatory agencies. See CGP Part 6.6.

157-4.1 METHOD OF MEASUREMENT.

Section 90, Item T-901, Item T-908, Item P-680, Item P-682, and as follows:

Items P-157a, P-157c and P-157g, are lump sum.

Items P-157b, P-157d and P-157e, will be measured on a contingent sum basis as specified in the Directive authorizing the work.

Item P-157f will be measured on a contingent sum basis with withholding determined by the CBJ.

TABLE 157-1 BMP VALUES - RESERVED

Liquidated Damages assessed according to Table 157-2 are not an adjustment to the Contract amount. These damages charges are related to Contract performance but are billed by the CBJ 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 157-2 Version B
EROSION, SEDIMENT AND POLLUTION CONTROL – LIQUIDATED DAMAGES

Code	Specification Subsection Number and Description	Deductable Amount in Dollars	Cumulative Deductable Amounts in Dollars
a	157-1.4 Failure to have a qualified (AK-CESCL or equivalent) Superintendent or SWPPP Manager	Calculated in Code B or F	
b	Failure to meet SWPPP requirements of: (1) 157-2.1.a Name of SWPPP Preparer and Date of Pre-Construction Inspection (2) Not Applicable (3) 157-3.3.h Sign and Date SWPPP amendments with qualified person. 157-2.1.d SWPPP Include approving person's name and AK-CESCL	$750 per omission	

	expiration date. (4) 157-3.2 Records maintained at project and made available for review		
c	157-2.1.c and 157-3.3.h Failure to either reference a BMP manual or publication, or state that no BMP manual or publication was used	$250 per omission	
d	157-3.3.e Failure to stabilize a Project prior to Seasonal Thaw	$5,000 per Project per year	
e	157-2.1.a Failure to conduct pre-construction inspections before Construction Activities	$2,000 per Project	
f	157-3.3 Failure to conduct and record CGP Inspections 157-3.3.a Personnel conducting Inspections and Frequency 157-3.3.b Inspection Reports, use Form 25D-100, completed with all required information according to the Consent Decree paragraph 7.c, parts (1) through (11)	$750 per Inspection	
g	157-3.1.d Failure to timely accomplish BMP maintenance and/or repairs, In effect until BMP maintenance and/or repairs is completed.	$500 per Project per day	Not to exceed $250,000 per year for all projects
h	157-3.1.c Failure to provide to the Engineer and ADEC a timely oral endangerment report of violations or for a deficient oral endangerment report	$750 for the first day the report is late or deficient	Additional $750 for every 14 day period without the required information
i	157-3.1.c Failure to provide to the Engineer and ADEC a timely written endangerment report of violations or for a deficient written endangerment report	$750 for the first day the report is late or deficient	Additional $750 for every 14 day period without the required information

157-5.1 BASIS OF PAYMENT. See Subsection 157-3.4 Failure to Perform Work, for additional work and payment requirements.

Item P-157a 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 P-157b 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 P-157c 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 P-157d 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. 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 P-157e 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 by time and materials according to Subsection GCP-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 P-157f Withholding. The Engineer may withhold an amount equal to Liquidated Damages, assessed according to Item P-157, from payment due the Contractor. Liquidated Damages for violations of the Contract, CWA, CGP, or Consent Decree are determined by the Engineer according to Table 157-2. The Engineer may withhold payment due the Contractors until the Contractor pays the Liquidated Damages to the CBJ.

The CBJ will not release performance bonds until Liquidated Damages assessed according to Item P-157 are paid to the CBJ, and all requirements according to Subsection GCP-30-05 are satisfied.

Item P-157g SWPPP Manager. At the Contract lump sum price for a SWPPP Manager that conforms to this specification. When Item P-157g 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 described in Subsection 157-2.4. When Item P-157g does not appear in the Bid Schedule, the SWPPP Manager is subsidiary to Item P-157a.

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 P-157a 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 Section 157. This work includes but is not limited to:

- Dewatering
- Shoring
- Bailing
- Permanent seeding
- Installation and removal of temporary work pads
- Temporary accesses
- Temporary drainage pipes and structures
- Diversion channels
- Settling impoundment
- 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:

PAY ITEM		**PAY UNIT**
P-157a	Erosion, Sediment and Pollution Control Administration	Lump Sum
P-157c	Temporary Erosion, Sediment and Pollution Control	Lump Sum
P-157e	Temporary Erosion Sediment and Pollution Control Adjustment	Contingent Sum

ITEM P-160 EXCAVATION OF PAVEMENT

DESCRIPTION

160-1.1 Excavate, haul, and dispose of existing asphalt cement concrete (AC) pavement and portland cement concrete (PCC) pavement.

CONSTRUCTION REQUIREMENTS

160-2.1 Perform the work for this item according to the following instructions.

a. Excavation. Excavate to the minimum depth necessary for removal of existing pavement where shown on the Plans. Saw cut where shown on the Plans.

b. Disposal. Excavated pavement material becomes the property of the Owner. Remove excavated material to a designated site on airport property in accordance with applicable Federal and State regulations.

c. Drainage. Maintain drainage at all times. Install temporary drains and drainage ditches to intercept or divert surface water that may affect the prosecution or condition of the work.

METHOD OF MEASUREMENT

160-3.1 Section 90. Where portland cement concrete pavement is overlain by asphalt concrete pavement, the Portland cement concrete pavement will not be measured separately and will be considered asphalt concrete pavement for payment purposes.

BASIS OF PAYMENT

160-4.1 At the contract unit price for excavation and disposal of pavement materials for either AC or PCC pavement.

Payment will be made under:

Item P-160a Excavation of Pavement (AC) – per square yard

SECTION P-161 RECYCLED ASPHALT PAVEMENT

DESCRIPTION

161-1.1 Excavate and process existing asphalt cement concrete (AC) pavement for use as Recycled Asphalt Pavement (RAP). Haul and place RAP on a prepared foundation, to the lines, grades, and depths shown on the plans or as directed by the Engineer.

MATERIAL AND CONSTRUCTION REQUIREMENTS

161-2.1 PROCESSING. Crush or pulverize existing pavement to meet the requirements of Table 161-1 for use as Recycled Asphalt Pavement (RAP). Process RAP to provide an asphalt content of 2.5 – 5.5 percent by weight.

Saw cut and process the full depth of existing pavement in areas shown on the plans or as directed by the Engineer. Excavate to the minimum depth necessary for removal of all existing pavement. Up to one inch of underlying base course material may be excavated along with the AC pavement.

TABLE 161-1

RAP GRADATION REQUIREMENTS

Sieve Size	Percent Passing
2 in.	100
1 in.	90-100

161-2.2 PLACEMENT AND SPREADING. Place RAP in 4-inch thick maximum lifts on the approved surface as required to achieve the depth shown on the plans after compaction.

Excess RAP is the property of the Owner. Place excess RAP in stockpiles located and shaped as shown on the plans, or as directed by the Engineer.

161-2.3 COMPACTION. Thoroughly compact the RAP layer by rolling. Density acceptance will be based on the use of a control strip in accordance with ATM 412 to determine a density standard. Compact to a density not less than 98% of the density standard. After rolling and with the RAP thoroughly set, reduce interstitial spaces to a minimum. Blade and roll alternately as required or directed to obtain a smooth, even and uniformly compacted surface. Do not roll the RAP course when the underlying course is soft or yielding or when the rolling causes undulation of the surface. In areas inaccessible to rollers, tamp RAP material thoroughly with hand held mechanical tampers.

161-2.4 RAP PROTECTION. Do not perform work on the RAP course during freezing temperatures, when the subgrade is wet, or when rain is expected. Hauling equipment may be routed over the finished RAP course, provided no damage results and provided that equipment is routed over the full width of the RAP surface to avoid rutting or uneven compaction. The Engineer has authority to stop all hauling over completed or partially completed RAP when, in his opinion, such hauling is causing damage. Repair at contractor expense, any damage to the RAP course resulting from the routing of equipment over RAP surfaces.

161-2.5 PROTECTION OF EXISTING STRUCTURES. Take all precautions necessary to ensure that existing structures within pavement removal areas are not damaged. If damage to any structure occurs, repair the damage at no cost to the Owner.

161-2.6 DRAINAGE. Maintain drainage at all times. Install temporary drains and drainage ditches, when directed, to intercept or divert surface water that may affect the prosecution or condition of the work.

METHOD OF MEASUREMENT

161-3.1 Section 90. If RAP by unit area appears in the bid schedule, the item will be measured in original position before excavation. If RAP by unit volume appears in the bid schedule, the item will be measured in final position after processing and placement. Underlying base course material excavated along with the AC pavement will not be included in the measurement for payment of RAP measured by unit volume.

BASIS OF PAYMENT

161-4.1 At the contract unit price for recycled asphalt pavement accepted in place.

Payment will be made under:

Item P-161b Recycled Asphalt Pavement (Additive Alternate No. 1) – per cubic yard

TESTING REQUIREMENTS

ATM 412 Relative Standard Density by the Control Strip Method

ITEM P-165 REMOVAL OF STRUCTURES

DESCRIPTION

165-1.1 Remove and dispose of, abandon in place, or salvage existing structures as specified, as shown on the Plans, and as necessary to accomplish the project work elements. Backfill the resulting holes, abandoned structures, and pits in accordance with this Item.

MATERIALS

165-2.1 GENERAL. Sand slurry shall consist of a mixture of water and sand with an approximate ratio of seven (7) gallons of water per cubic foot of sand. Sand may consist of native material with a particle size distribution such that one hundred percent (100%) of the material passes the No. 4 U.S. Standard Sieve and contains no lumps, frozen material, organic matter, or other deleterious material.

CONSTRUCTION REQUIREMENTS

165-2.1 GENERAL. Obtain utility locates in the vicinity of the designated items. Work around and preserve any facilities within the work limits. Backfill all excavations with approved embankment or suitable excavated materials,and compact in accordance with item P-152. Fill all abandoned in place structures with sand slurry.

a. Removed Structures Designated for Disposal. Removed structures designated for disposal become your property. Excavate, load, and haul structures to an approved disposal site off of airport property in accordance with applicable Federal and State regulations.

Before demolition or renovation of a contaminated structure a survey shall be done which complies with the National Emission Standards for Hazardous Air Pollutants (NESHAP), 40 CFR Part 61 Subpart M.

Obtain qualified consultant services to develop and implement a plan to identify hazardous materials and to oversee and conduct removal of Hazardous Materials from the building as needed. Submit five copies of the building removal plan to the Engineer for approval.

Pre approve the qualified consultant with the Engineer by submitting their qualifications. The qualified consultant must be approved by the Environmental Protection Agency (EPA) as a building inspector, 40 CFR Part 763.

All Hazardous Materials must be disposed of in an approved site.

Removed Structures Designated for Salvage. Removed structures designated for salvage remain the property of the CBJ.All removed signs shall be delivered to Airport Maintenance.

See summary table in the Plans for a list of structure designated for salvage.

b. Abandoned In Place Structures. Wherever an existing structure is to be abandoned in place, The Contractor shall empty the structure of all water, fill the structure full with sand slurry, and plug the ends. Placement of the sand slurry shall be by means of a tremie pipe or other method that shall enable uniform placement of the sand slurry throughout the length of the structure being abandoned. The Contractor shall demonstrate the entire structure to be abandoned has been filled prior to the installation of end caps. Validation shall include placement of a predetermined volume of sand slurry into the structure to be abandoned.

In the event a pipeline to be abandoned is cracked or crushed, the Contractor shall excavate to the next joint of pipe and install the plug. Crushed pipe sections or portions thereof shall be removed and disposed of by the Contractor.

METHOD OF MEASUREMENT

165-3.1 This item will not be measured for payment. The Engineer's acceptance constitutes measurement.

BASIS OF PAYMENT

165-4.1 Payment will be made at the contract price for work acceptably completed. No separate payment will be made for hauling or transportation. All work associated with removal of specified items, including but not limited to labor, equipment, tools, hauling, transportation, and incidentals will be included in the contract price for removal of structures.

Payment will be made under:

Item P-165a Removal of Structures - per lump sum

ITEM P-185 ARMOR STONE

DESCRIPTION

185-1.1 Furnish all plant, labor, equipment and materials and perform the work necessary to manufacture and place stone protection as shown on the plans or as directed by the Engineer.

MATERIAL

185-2.1 GENERAL. Conform to the following quality and gradation requirements. Submit a quarrying, blasting and processing plan to the Engineer for required materials. Do not place materials prior to acceptance.

Provide primary and underlayer armor stone with breadth and thickness equal to or greater than one-third of the stone's length. Provide stone that conforms to the specified size requirements after processing. Conduct loading, placement or stockpiling operations in a manner that eliminates breakage. Comply with the following requirements for armor stone:

a. **Primary Armor Stone.** Provide smoothly graded primary armor stone that falls within the limits shown in the following gradations, based on class:

Primary Armor Stone - Class A

Maximum Stone Weight	Approximate Diameter/Volume	Allowable % Smaller by Stone Count
26,000 lb	6.4 ft / 152.9 cu ft	100%
13,000 lb	5.1 ft / 76.5 cu ft	0-50%
6,000 lb	3.9 ft / 35.3 cu ft	0%

Primary Armor Stone - Class B

Maximum Stone Weight	Approximate Diameter/Volume	Allowable % Smaller by Stone Count
12,000 lb	5.0 ft / 70.6 cu ft	100%
7,000 lb	4.1 ft / 41.2 cu ft	0-50%
3,500 lb	3.3 ft / 20.6 cu ft	0%

Primary Armor Stone - Class B/C

Maximum Stone Weight	Approximate Diameter/Volume	Allowable % Smaller by Stone Count
4,500 lb	3.5 ft / 25.0 cu ft	100%
3,000 lb	2.9 ft / 14.1 cu ft	0-50%
1,500 lb	2.4 ft / 7.2 cu ft	0%

Primary Armor Stone - Class C

Maximum Stone Weight	Approximate Diameter/Volume	Allowable % Smaller by Stone Count
4,000 lb	3.4 ft / 23.5 cu ft	100%
2,100 lb	2.8 ft / 12.4 cu ft	0-50%
1,000 lb	2.2 ft / 5.9 cu ft	0%

b. **Underlayer Stone.** Provide smoothly graded underlayer stone that falls within the limits shown in the following gradations, based on class:

Underlayer Stone - Class A

Maximum Stone Weight	Approximate Diameter/Volume	Allowable % Smaller by Stone Count
2,600 lb	3.0 ft / 15.3 cu ft	100%
1,300 lb	2.4 ft / 7.6 cu ft	0-50%
600 lb	1.8 ft / 3.5 cu ft	0%

Underlayer Stone - Class B

Maximum Stone Weight	Approximate Diameter/Volume	Allowable % Smaller by Stone Count
1,200 lb	2.3 ft / 7.1 cu ft	100%
700 lb	1.9 ft / 4.1 cu ft	0-50%
350 lb	1.5 ft / 2.1 cu ft	0%

Underlayer Stone - Class B/C

Maximum Stone Weight	Approximate Diameter/Volume	Allowable % Smaller by Stone Count
450 lb	1.6 ft / 2.1 cu ft	100%
300 lb	1.4 ft / 1.4 cu ft	0-50%
150 lb	1.1 ft / 0.7 cu ft	0%

Underlayer Stone - Class C

Maximum Stone Weight	Approximate Diameter/Volume	Allowable % Smaller by Stone Count
400 lb	1.6 ft / 2.4 cu ft	100%
210 lb	1.3 ft / 1.2 cu ft	0-50%
100 lb	1.0 ft / 0.6 cu ft	0%

CONSTRUCTION METHODS

185-3.1 General. Stockpile material in lifts not exceeding 7.5 feet with the final height of the stockpile not exceeding 15 feet. Any method of stockpiling that causes segregation within the stockpile or excessive breakage is not permitted. Do not stockpile material in wetlands either on or off airport property, unless approved under the Corps of Engineers Section 404 permit.

Place primary armor and underlayer stones on prepared slopes within the limits shown on the plans or as directed by the Engineer. Construct a uniform and regular surface with slopes no steeper than those shown on the plans. Maintain the armor stone until final acceptance, and replace any displaced material to the design slopes, lines, and grades at your expense.

Place materials in a manner that produces a well-keyed mass of stone, with individual stones in tight contact and with the least practical amount of void spaces. Ensure that finished surfaces of all layers are free from pockets of single size stone. Placement of small stone in primary armor and underlayer stone layers to choke the spaces between large stones or for leveling the surface is not permitted. Breaking of individual pieces in place by blasting or mechanical methods is not permitted. Place underlayer stone to the full course thickness at one operation and in a manner that avoids displacing underlying materials. Placement by methods likely to cause segregation, such as end dumping, side dumping or pushing into position with earth-moving equipment, are not permitted. Obtain the desired distribution of various sizes of armor stones throughout the mass by selective loading and by controlled placement of successive loads during placement. Materials that do not meet the specified requirements for size, quality or distribution of sizes will not be allowed for use.

Orient each stone individually so that the long axis of the stone is perpendicular to the structure's sloped surface. Rearrange individual stones as required to the extent necessary to correct deficiencies and to provide a uniform, well-keyed slope.

Place each class of stone to the full thickness and depth shown on the drawings. No minus tolerance is permitted. A greater thickness is permitted provided the outside slopes present a uniform appearance with a minimum of pieces projecting outside the plane of the finished slope surface. A greater depth is permitted in the toe apron provided uniform appearance and finished depths are maintained.

Stone of a certain weight classification that is rejected because of cracks or seam defects, as described in the Quality Control subsection of this specification, may be used for a lower weight classification if other quality and shape requirements are met.

185-3.2 CONSTRUCTION SEQUENCING. Schedule construction activities in general conformance with the following sequencing plan.

a. Clearly delineate the limits of use of each type of stone, both in the field and on as-built drawings.

b. Construct the embankment and slope protection in conformance with the plans and specifications.

185-3.3 QUALITY CONTROL. Establish and maintain quality control for stone to assure compliance with contract requirements and to maintain records of its quality control for all operations, including but not limited to the following:

a. Produce stone of the size specified, verifying sizes by selected samples when requested by the Engineer.

Acceptability of stone quality determined by visual inspection. The Engineer may reject materials not found to meet the specified requirements at any time during the performance of the contract, at the source or project site.

a. Test stone material for weight, gradation, and shape to assure compliance with the specifications. Conduct tests at the production site before transporting materials to the project site. Place materials that do not meet the specified requirements in a separate area to assure they do not get mixed in with acceptable materials. Perform tests at uniform intervals throughout the project to meet testing frequency requirements.

b. Before delivery of materials to the project site, meet with the Engineer at the production site and select stones that meet the required weight and shape. Set aside stones at the production site as reference samples. Select reference samples representing each size in the stone gradation and clearly mark and retain until completion of the project.

c. Testing frequency for this project is shown below:

STONE	TYPE OF TEST	NO. OF TESTS
Primary Armor	Visual Inspection/Measurement	10% of Stones
	Weight	10% of Stones
Underlayer	Measurement	1% of Material Produced
	Weight	1% of Stones

Tests, other than weight, are on individual stones. Failing tests do not count toward the number of tests required. Increase testing frequency as necessary to maintain quality control during production.

1. **Visual Inspections**: Make a visual check of the stones at the production site for elongation, cracks, deterioration, and other defects visible to the naked eye, on at least $^{2}/_{3}$ of the surface area of the stone. Wet five percent of the stones checked for cracks and re-inspected for minute

cracks to determine if they are detrimental to the stone quality and if additional inspections are necessary on all stone. Do not transport stones with cracks that are detrimental to stone longevity to the placement site.

2. **Measurement**: Measure stones on three mutually perpendicular axes and compute weight using the specific gravity of 2.72. Record computed weights and measurements daily and provide signed copies to the Engineer before the start of the next work shift. Select stones for measurement that represent all sizes specified in order to verify conformance with specified shape and grading limits.

3. **Weight**: In addition to weighing for payment purposes, weigh primary armor in order to verify conformance with the gradation limits specified. Accomplish by placing stones of similar size into a truck or loader, weighing the stones, and calculating an average individual stone weight (i.e., three stones placed in a truck weigh 21,000 pounds; this is equivalent to three stones with an individual weight of 21,000/3 = 7,000 pounds). Use other methods of weighing stones for grading purposes only if approved by the Engineer.

Provide quality test results meeting the following requirements as performed by a certified lab:

PROPERTY	TEST METHOD	LIMITS
Specific gravity (SSD)	AASHTO T-85	2.65 min.
Absorption	ASTM C 97	2% max.
Soundness (Sodium Sulfate)	ASTM C-88	5% max. loss
Solubility & Durability (Ethylene Glycol)	COE CRD-C-148	2% max. loss after 15 days
LA Abrasion	ASTM C-535	10% max. loss after 200 revs. and 50% max. loss after 1000 revs.
Degradation	ATM T-13	40 min.

185-3.4 Placement. Before placing armor materials, establish clear and understandable construction control for the workers. Establish minimum control to delineate the horizontal limits of all stone classes, both toe and shoulder lines. Unless specified in writing, follow the slope lines and grades indicated on the drawings for the limits of the in-place stone.

Survey each layer to document material placement. Make periodic checks as the work progresses to verify line and grade of the armor placement. Provide a copy of the check surveys to the Engineer and obtain approval before placing the next layer of material. Approval of cross-sections does not constitute final acceptance. Take cross-sections at 25-foot intervals and at the ends of each typical section range. Take horizontal cross-section at 5-foot intervals and at grade breaks along the survey grades.

Submit a plan detailing how the check surveys will be completed, including the methodology and equipment proposed. Do not place stones until the Engineer approves the method for performing check surveys.

METHOD OF MEASUREMENT

185-4.1 Primary armor stone and underlayer stone will be measured by the tons of material placed, based on project weight records, and in accordance with the dimensions shown on the plans, or as directed by the Engineer. No payment will be made for material placed in excess of these dimensions.

BASIS OF PAYMENT

185-5.1 Payment for primary armor and underlayer stone will be made at the contract unit price and includes all labor, materials, tools, equipment, testing, and incidentals required to construct shore protection.

Payment will be made under:

Item P-185a(4) Primary Armor Stone - Class C (1.05 ton) - per ton

ITEM P-208 AGGREGATE SURFACE COURSE

DESCRIPTION

208-1.1 This item consists of an aggregate surface course composed of crushed coarse aggregate bonded with either soil or fine aggregate or both. It shall be constructed on a prepared course according to these Specifications and to the dimensions and typical cross section shown on the Plans.

MATERIALS

208-2.1 GENERAL. Aggregates shall consist of hard, durable particles or fragments of stone or gravel mixed or blended with sand, stone dust, or other similar binding or filler materials produced from approved sources. The aggregate shall be free from vegetation, lumps, or excessive amounts of clay and other objectionable substances. The coarse aggregate shall have a minimum degradation value of 45 when tested according to ATM 313. The aggregate shall have a percent of wear not more than 50 at 500 revolutions as determined by AASHTO T 96 and shall not show evidence of disintegration nor show loss greater than 12% when subjected to 5 cycles of sodium sulfate accelerated soundness test using AASHTO T 104.

208-2.2 CRUSHED AGGREGATE SURFACE COURSE. The aggregates shall consist of both fine and coarse fragments of crushed stone or crushed gravel mixed or blended with sand, screenings, or other similar approved materials. The material shall consist of hard, durable particles or fragments of stone and shall be free from excess soft or disintegrated pieces, dirt, or other objectionable matter.

The fractured particles in the finished product shall be as uniform as practicable. At least 75% by weight of material retained on the No. 4 sieve shall have one or more fractured faces, when tested according to WAQTC FOP for AASHTO T 335.

If necessary to meet this requirement, or to eliminate an excess of fine, uncrushed particles, the gravel shall be screened before crushing.

208-2.4 GRADATION. The gradation of the uncrushed or crushed material shall meet the requirements of the gradations indicated in Table 1, when tested according to WAQTC FOP for AASHTO T 27/T 11.

TABLE 1. AGGREGATE GRADATION REQUIREMENTS

Sieve Designation(Square Openings)	Percentage by weight passing sieves For E-1
1.0 in.	100
3/4 in.	70-100
3/8 in.	50-85
No. 4	35-65
No. 8	20-50
No. 50	15-30
No. 200	8-15

The specified gradations represent the limits of suitability of aggregate for use from the sources of supply. The final gradations decided on, within the specified limits, shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves, or vice versa.

The portion of the material passing the No. 40 sieve shall have a liquid limit not more than 25 and a plasticity index not more than 6, when tested according to WAQTC FOP for AASHTO T 89 and T 90.

208-2.5 FINES FOR BLENDING. If additional fine material is necessary, it shall be obtained from approved sources and uniformly blended with the aggregate at the crushing plant, the mixing plant, or as approved by the Engineer. Silt, stone dust, or other similar fine material may be used as binder.

CONSTRUCTION METHODS

208-3.1 (Not Used)

208-3.2 PREPARING UNDERLYING COURSE. The underlying course will be checked and accepted by the Engineer before placing and spreading operations are started. Any ruts or soft areas shall be corrected and compacted to the required density before placing aggregate surface course.

To protect the underlying course and to ensure proper drainage, the spreading of the aggregate surface course shall begin along the centerline on a crowned section or on the high side of sections with a one-way slope.

208-3.3 METHODS OF PRODUCTION.

a. Plant Mix. When selected by the Contractor and approved by the Engineer, the material shall be uniformly mixed in an approved plant.

b. Travel Plant. When the use of a traveling plant is approved by the Engineer, the plant shall mix the materials in a single pass. If needed to achieve optimum moisture, water shall be thoroughly mixed with the aggregates during this operation.

If using a windrow-type of travel plant, the windrows shall be placed parallel to the embankment centerline. The windrow volume shall be sufficient to cover exact areas as planned. The windrow contents shall produce a mixture of the required gradation and bonding qualities.

If using a travel plant that mixes previously spread aggregates in-place, the material shall have been spread in such thickness and proportions as may be handled by the machine to develop a course of the thickness of each layer and of the gradation required.

c. Materials of Proper Gradation. Material which meets the requirements for quality, gradation, and consistency, and which contains approximately the proper moisture for compaction, may be placed directly on the grade, without further mixing.

Any minor deficiency or excess of moisture may be corrected by surface watering or by aeration. Some mixing or manipulation may be required immediately preceding compacting to obtain the required moisture content.

208-3.4 PLACING. The surface course shall be constructed without segregation of the aggregate. The material shall be placed in uniform, equal-depth layers, each not exceeding 6 inches of compacted depth. No material shall be placed in snow or on a soft uncompacted, muddy, or frozen course.

During the mixing and spreading process, sufficient caution shall be exercised to prevent the incorporation of subgrade, subbase, or shoulder material in the surface course mixture.

208-3.5 COMPACTION. Immediately upon completion of the spreading operations, the aggregate shall be thoroughly compacted to the required density. The moisture content of the material shall be approximately that required to obtain maximum density.

208-3.6 ACCEPTANCE SAMPLING AND TESTING FOR DENSITY. The surface course will be accepted for density when the field density is not less than 95% of the maximum density, as determined according to WAQTC FOP for AASHTO T99/T 180 or ATM 212. The in-place field density and moisture content will be

determined according to WAQTC FOP for AASHTO T 310. If the specified density is not attained, the material shall be reworked and/or recompacted until the specified density is reached.

208-3.7 FINISHING. The surface of the aggregate surface course shall be finished by blading or with automated equipment specifically designed for this purpose.

In no case shall thin layers of material be added to the top of surface course to meet grade. If the compacted elevation of the top layer is 0.05 foot or more below grade, it shall be scarified to a depth of at least 3 inches, new material added, and the layer shall be blended and compacted to bring it to grade. If the finished surface is above plan grade, it shall be cut back to grade and recompacted.

208-3.8 SURFACE TEST. After the course has been completely compacted, the surface will be tested by the Engineer for smoothness and accuracy of grade and crown. The finished grade elevation shall not vary more than 0.05 foot from the design elevation. The finished surface shall not vary more than 3/8 inch from a 12-foot straightedge when applied to the surface parallel with, and at right angles to, the centerline. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be corrected to within the specified tolerances.

208-3.9 PROTECTION. Work on the surface course shall not be accomplished during freezing temperatures or when the subgrade is wet. When the aggregates contain frozen materials or when the underlying course is frozen, the construction shall be stopped.

Hauling equipment may be routed over completed portions of the surface course, provided no damage results and provided that such equipment is routed over the full width of the surface course to avoid rutting or uneven compaction. However, the Engineer in charge will have full and specific authority to stop all hauling over completed or partially completed surface course when, in their opinion, such hauling is causing damage. Any damage resulting to the surface course from routing equipment over the surface course shall be repaired by the Contractor at their own expense.

208-3.10 MAINTENANCE. Following the completion of the aggregate surface course, the Contractor shall satisfactorily remove all blue tops, fill and compact the voids, and perform all maintenance work on this surface until final acceptance unless otherwise stated in the Specifications. The surface course shall be properly drained at all times.

METHOD OF MEASUREMENT

208-4.1 Aggregate Surface Course will be weighed by the ton or measured by the cubic yard in final position according to Subsection GCP-90-02.

BASIS OF PAYMENT

208-5.1 Aggregate Surface Course will be paid for at the contract price, per unit of measurement, accepted in place.

Payment will be made under:

Item P-208c Crushed Aggregate Surface Course (Additive Alternate No. 1) - per ton

TESTING REQUIREMENTS

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

ATM 212	The Standard Density of Coarse Granular Materials Using the Vibratory Compactor
ATM 313	The Degradation Value of Aggregates
WAQTC FOP for AASHTO T 27/T 11	Sieve Analysis of Aggregates & Soils
WAQTC FOP for AASHTO T 89	Liquid Limit of Soils
WAQTC FOP for AASHTO T 90	Plastic Limit and Plasticity Index of Soils
WAQTC FOP for AASHTO T 99/T 180	Moisture-Density Relations of Soils
WAQTC FOP for AASHTO T 310	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods
WAQTC FOP for AASHTO T 335	Percentage of Fracture in Coarse Aggregate

ITEM P-209 CRUSHED AGGREGATE BASE COURSE

DESCRIPTION

209-1.1 This item consists of a base course composed of crushed aggregates constructed on a prepared course according to these Specifications and to the dimensions and typical cross section shown on the Plans.

MATERIALS

209-2.1 AGGREGATE. Aggregates shall consist of clean, sound, durable particles of crushed stone or crushed gravel and shall be free from vegetable matter, excess coatings of clay, silt, and other objectionable materials and shall contain no clay balls.

Fine aggregate passing the No. 4 sieve shall consist of fines from the operation of crushing the coarse aggregate. If necessary, fine aggregate may be added to produce the correct gradation. The fine aggregate shall be produced by crushing stone and gravel that meet the requirements for wear and soundness specified for coarse aggregate.

The crushed aggregate portion which is retained on the No. 4 sieve shall have at least 75% by weight with 2 fractured faces as determined by WAQTC FOP for AASHTO T 335.

The percentage of wear shall not be greater than 45% when tested according to AASHTO T 96. The sodium sulfate soundness loss shall not exceed 12%, after 5 cycles, when tested according to AASHTO T 104. Aggregates shall have a minimum degradation value of 45 when tested according to ATM 313.

The fraction passing the No. 40 sieve shall have a liquid limit no greater than 25 and a plasticity index of not more than 4 when tested according to WAQTC FOP for AASHTO T 89 and T 90. The fine aggregate shall have a minimum sand equivalent value of 35 when tested according to WAQTC FOP for AASHTO T 176.

a. Sampling and Testing. The Engineer will sample aggregates for quality testing before the start of production. The Engineer, at no expense to the Contractor, will make all tests necessary to determine whether aggregate quality is in compliance with the specifications.

The Engineer will sample aggregates for acceptance according to WAQTC FOP for AASHTO T 2, and test aggregates for acceptance according to WAQTC FOP for AASHTO T 27/T 11.

b. Gradation Requirements. The gradation of the final mixture shall fall within the range indicated in Table 1, when tested according to WAQTC FOP for AASHTO T 27/T 11. The final gradation shall be continuously well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on an adjacent sieve or vice versa.

TABLE 1. REQUIREMENTS FOR GRADATION OF AGGREGATE

Sieve Designation (Square Openings)	Percentage by weight passing sieves		
	C-1	D-1	2" Minus Shot Rock
2.00 in			100
1-1/2 in	100	--	
1.00 in	70-100	100	0-15
3/4 in	60-90	70-100	
3/8 in	45-75	50-80	
No.4	30-60	35-50	
No. 8	22-52	20-35	
No. 40	8-30	8-20	
No. 200	0-6	0-6	3 Max

Note: Unless otherwise specified, Gradation D-1 shall be used.

209-2.2 2-INCH MINUS SHOT ROCK. The 2-inch minus shot rock shall not contain mulch, frozen material, roots, sod or other deleterious matter. The shot rock shall be obtained from a rock quarry, unless otherwise approved by the Engineer.

The shot rock shall have a plasticity index not greater than 6, as determined by AASHTO T 90. It shall consist of not more than 3% by weight of particles that pass the No. 200 sieve, as determined by ATM T-7.

At least 50% by weight of the particles retained on the 3/8-inch sieve shall have at least two fractured faces as determined by ATM T-7.

At least 85% by weight of particles shall be retained on the 1-inch sieve.

Elongation Specifications: The length of the crushed stone backfill shall not be more than twice the designated screen dimensions.

Sodium Sulfate Loss: Aggregate shall pass the percent sodium sulfate loss per AASHTO T 104 with 9% maximum.

LA Abrasion: Percent of wear per AASHTO T 96 shall be 45% maximum.

The 2-inch minus shot rock used for this project shall have a maximum Nordic Abrasion value of 22. Test procedure for Nordic Abrasion is Alaska Test Method 312. This is available at the CBJ Engineering Department and State of Alaska Department of Transportation and Public Facilities Southwest Region Materials Laboratory.

CONSTRUCTION METHODS

209-3.1 PREPARING UNDERLYING COURSE. Placing and spreading operations shall not commence until the underlying course has been accepted, in writing, by the Engineer. Any ruts or soft areas shall be corrected and compacted to the required density before placing the base course. Crushed aggregate base course shall not be placed on frozen material.

209-3.2 MIXING. The aggregate shall be uniformly blended during crushing operations or mixed in a plant. The plant shall blend and mix the materials to meet the Specifications.

209-3.3 PLACING. The crushed aggregate base material shall be placed on the approved subgrade in uniform, equal-depth layers, each not exceeding 6 inches of compacted depth.

The previously constructed layer shall be cleaned of loose and foreign material prior to placing the next layer. The surface of the compacted material shall be kept moist until covered with the next layer.

209-3.4 COMPACTION. Immediately upon completion of the spreading operations, the aggregate shall be thoroughly compacted to the required density. The moisture content of the material shall be approximately that required to obtain maximum density.

209-3.5 ACCEPTANCE SAMPLING AND TESTING FOR DENSITY. Base course will be accepted for density when the field density is not less than 100% of the maximum density, as determined according to WAQTC FOP for AASHTO T 99/T 180 or ATM 212. The in-place field density and moisture content will be determined according to WAQTC FOP for AASHTO T 310. If the specified density is not attained, the material shall be reworked and/or recompacted until the specified density is reached.

209-3.6 FINISHING. The surface of the aggregate base course shall be finished by blading or with automated equipment specifically designed for this purpose.

In no case shall thin layers of material be added to the top of base course to meet grade. If the compacted elevation of the top layer is 0.05 foot or more below grade, it shall be scarified to a depth of at least 3 inches,

new material added, and the layer shall be blended and compacted to bring it to grade. If the finished surface is above plan grade, it shall be cut back to grade and recompacted.

209-3.7 SURFACE TEST. After the course has been completely compacted, the surface will be tested by the Engineer for smoothness and accuracy of grade and crown. The finished surface shall not vary more than 3/8 inch from a 10-foot straightedge when applied to the surface parallel with, and at right angles to, the centerline. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be corrected to within the specified tolerances.

209-3.8 THICKNESS CONTROL. The thickness of the finished base course will be determined by the Engineer by taking before and after elevation measurements, or by depth tests, at random locations. The completed thickness of the base course shall be within 1/2 inch of the design thickness. Where the thickness is deficient by more than 1/2 inch, it shall be corrected to within the specified tolerances.

209-3.9 MAINTENANCE. The base course shall be maintained in a condition that will meet all specification requirements until the work is accepted. Equipment used in the construction of an adjoining section may be routed over completed portions of the base course, provided no damage results and provided that the equipment is routed over the full width of the base course to avoid rutting or uneven compaction.

209-3.10 2-INCH MINUS SHOT ROCK WITH BASE COURSE. The 2-inch minus shot rock shall be graded to a uniform surface and compacted with a vibratory roller per these Specifications and the Plans. The finished shot rock surface layer shall be approved by the Engineer prior to placing the Grading D-1 base course top layer.

2-Inch Minus Shot Rock will be placed and compacted into a layer 4- inches to 5-inches thick, and covered with Base Course, to a total thickness of 6-inches for the area between curb lines. The thickness of these materials under the sidewalk shall be 2-inches to 3-inches of 2-Inch Minus Shot Rock and covered with Base Course to a total thickness of 4-inches. Both of these materials will be measured for payment under this Pay Item. 2-Inch Minus Shot Rock shall meet the requirements previously stated.

The crushed aggregate base material shall be placed on the approved subgrade in uniform, equal-depth layers, each not exceeding 6 inches of compacted depth.

The previously constructed layer shall be cleaned of loose and foreign material prior to placing the next layer. The surface of the compacted material shall be kept moist until covered with the next layer.

If base course, Grading D-1, is used as a leveling course for the curb and gutter, all of this base course material shall be removed from the 2-inch minus shot rock to the front face of the concrete gutter, and the additional 2-inch minus shot rock required to bring the street area to its required full depth be placed, graded and compacted prior to placing the top layer of base course, Grading D-1.

METHOD OF MEASUREMENT

209-4.1 Crushed Aggregate Base Course will be weighed by the ton or measured by the cubic yard in final position according to Subsection GCP-90-02.

209-4.2 2-Inch Minus Shot Rock with Base Course will be measured by the number of cubic yards of material in place as determined by the average end area method, and will be determined on a neatline basis. Where impractical to measure by the average end area method, the Engineer may approve other acceptable methods involving three-dimensional measurements. Material outside of the lines, grades and cross sections indicated in the Plans, or as directed by the Engineer, will be deducted from 2-Inch Minus Shot Rock with Base Course quantities for pay purposes.

Water needed for compaction and added to the base material on the grade will be considered incidental.

209-4.3 2-Inch Minus Shot Rock will be measured by the number of cubic yards of material in place as determined by the average end area method, and will be determined on a neatline basis. Where impractical to measure by the average end area method, the Engineer may approve other acceptable methods involving

three-dimensional measurements. Material outside of the lines, grades and cross sections indicated in the Plans, or as directed by the Engineer, will be deducted from 2-Inch Minus Shot Rock quantities for pay purposes.

BASIS OF PAYMENT

209-5.1 Crushed Aggregate Base Course will be paid for at the contract price, per unit of measurement, accepted in place.

209-5.2 2-Inch Minus Shot Rock with Base Course, will be paid under Item P-209c, at the contract price, per unit of measurement and accepted in place. Payment will constitute full compensation for the Work described in this section, as shown on the Plans and as approved by the Engineer.

209-5.3 2-Inch Minus Shot Rock will be paid under Item P-209d, at the contract price, per unit of measurement and accepted in place. Payment will constitute full compensation for the Work described in this section, as shown on the Plans and as approved by the Engineer.

Payment will be made under:

Item P-209a	Crushed Aggregate Base Course - per cubic yard
Item P-209c	2-inch Minus Shot Rock with Base Course – per cubic yard
Item P-209d	2-inch Minus Shot Rock – per cubic yard

TESTING REQUIREMENTS

ATM 212	Determining the Standard Density of Coarse Granular Materials Using the Vibratory Compactor
ATM 313	Degradation Value of Aggregates
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
WAQTC FOP for AASHTO T 2	Sampling Aggregates
WAQTC FOP for AASHTO T 27/T 11	Sieve Analysis of Aggregates & Soils
WAQTC FOP for AASHTO T 89	Liquid Limit of Soils
WAQTC FOP for AASHTO T 90	Plastic Limit and Plasticity Index of Soils
WAQTC FOP for AASHTO T 99/T 180	Moisture-Density Relations of Soils
WAQTC FOP for AASHTO T 176	Sand Equivalent
WAQTC FOP for AASHTO T 310	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods
WAQTC FOP for AASHTO T 335	Percentage of Fracture in Coarse Aggregate

ITEM P-401 PLANT HOT MIX ASPHALT

DESCRIPTION

401-1.1 This item shall consist of mineral aggregate and asphalt cement, mixed in a central mixing plant and placed on a prepared surface according to these Specifications; and shall conform to the lines, grades, thicknesses, and typical cross sections shown on the Plans. Each layer shall be constructed to the depth, typical section, or elevation required by the Plans and shall be rolled, finished, and approved before the placement of the next layer.

401-1.2 ACRONYMS.

AASHTO	American Association of State Highway and Transportation Officials
ATM	Alaska Test Method
CPF	Composite Pay Factor
DPF	Density Pay Factor
HMA	Hot Mix Asphalt
JMD	Job Mix Design
MSG	Theoretical Maximum Specific Gravity
PAB	Price Adjustment Base
PRF	Pay Reduction Factor
RAP	Reclaimed Asphalt Pavement
TV	Target Value
WAQTC	Western Alliance for Quality in Transportation Construction

401-1.3 DEFINITIONS. These definitions apply only to Section P-401.

1. **Panel.** The paving pass between joints or between a joint and an edge.

MATERIALS

401-2.1 AGGREGATE. Aggregates shall consist of crushed stone or crushed gravel with or without sand or other inert finely divided mineral aggregate. The portion of materials retained on the No. 4 sieve is coarse aggregate. The portion passing the No. 4 sieve and retained on the No. 200 sieve is fine aggregate, and the portion passing the No. 200 sieve is mineral filler. Remove all natural fine aggregates passing the No. 4 sieve before crushing aggregates for hot mix asphalt. Separate the crushed aggregate into a minimum of three stockpiles, blend mineral filler or natural sand if necessary to produce the Job Mix Design gradation for hot mix asphalt.

a. Coarse Aggregate. Coarse aggregate shall consist of sound, tough, durable particles, free from adherent films of matter that would prevent thorough coating and bonding with the asphalt cement and be free from organic matter and other deleterious substances. The percentage of wear shall not be greater than 40% when tested according to AASHTO T 96. The sodium sulfate soundness loss shall not exceed 10%, or the magnesium sulfate soundness loss shall not exceed 13%, after 5 cycles, when tested according to AASHTO T 104. The aggregate shall have a minimum degradation value of 30 when tested according to ATM 313.

The blended coarse aggregate shall have at least 90% by weight 2 fractured faces as determined by WAQTC FOP for AASHTO T 335 and contain not more than 8%, by weight, of flat and elongated particles, when tested according to ATM 306. The ratio of the calipers used to determine flat and elongated particles will be set to 1:5.

The blended coarse aggregate for hot mix asphalt, Type V, shall have at least 98% by weight 2 fractured faces as determined by WAQTC FOP for AASHTO T 335 and contain not more than 8% and 20%, by weight, of flat and elongated particles with the ratio of the calipers set to 1:5 and 1:3 respectively as determined by ATM 306.

b. Fine Aggregate. Fine aggregate shall consist of clean, sound, durable, angular shaped particles produced by crushing stone, slag, or gravel that meets the requirements for wear and soundness specified for coarse aggregate. The aggregate particles shall be free from coatings of clay, silt, or other objectionable matter and shall contain no clay balls.

Natural (nonmanufactured) sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the hot mix asphalt. The amount of sand to be added shall be adjusted to produce hot mix asphalt conforming to requirements of this specification. The fine aggregate shall not contain more than 20% natural sand by weight of total aggregates. The fine aggregate for hot mix asphalt, Type V, shall not contain more 10% natural sand by weight of total aggregates.

The blended fine aggregate shall have a liquid limit of not more than 25 and a plasticity index of not more than 6 when tested according to WAQTC FOPs for AASHTO T 89 and AASHTO T 90, and sand equivalent values of 35 or greater when tested according to WAQTC FOP for AASHTO T 176.

c. Sampling. The Engineer will sample according to WAQTC FOP for AASHTO T 2 for coarse and fine aggregate, and according to AASHTO T 127 for mineral filler.

401-2.2 MINERAL FILLER. If filler, in addition to that naturally present in the aggregate, is necessary, it shall meet the requirements of AASHTO M 17.

401-2.3 ASPHALT CEMENT. Asphalt cement shall meet the following property requirements:

TABLE 1. ASPHALT CEMENT PROPERTY REQUIREMENTS

Performance Grade AASHTO M 320	Mix Design Class	Softening Point AASHTO T 53	Toughness ASTM D 5801	Tenacity ASTM D 5801
PG 52-28	A, B	N/A	N/A	N/A
PG 58-28	C, D	120° F, min.	110 in lbs, min.	75 in lbs, min.
PG 64-34	E, F, S	125° F, min.	110 in lbs, min.	75 in lbs, min.

The Contractor shall furnish a vendor's certificate of compliance and certified test reports for each lot of asphalt cement shipped to the project. The test reports shall also note the storage tanks used for each lot. Anti-strip additives required by the job mix design shall be added during load out for delivery to the project and a printed weight ticket for anti-strip shall be included with the asphalt cement weight ticket. The location where anti-strip is added may be changed with the written approval of 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 quantity of asphalt cement loaded.
f. Type and percent of anti-strip added.

All excess asphalt cement shall remain the property of the Contractor. Removal of excess asphalt cement from the project area is subsidiary to the contract and no separate payment will be made.

401-2.4 PRELIMINARY MATERIAL ACCEPTANCE. Prior to delivery of materials to the job site, the Contractor shall submit certified test reports to the Engineer for the following materials:

a. Coarse Aggregate.
- **(1)** Percent of wear.
- **(2)** Soundness.
- **(3)** Degradation.
- **(4)** Percent of fracture.
- **(5)** Percent of flat and elongated particles.

b. Fine Aggregate.
- **(1)** Liquid limit.
- **(2)** Plastic index.
- **(3)** Sand equivalent.
- **(4)** Uncompacted void content for hot mix asphalt, Type V.

c. Mineral Filler.
- **(1)** Gradation
- **(2)** Plastic Index
- **(3)** Organic content

d. Asphalt Cement. The certification(s) shall show the appropriate test(s) for each material, the test results, and a statement that the material meets the specification requirement.

The Engineer will collect samples for testing, prior to and during hot mix asphalt production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

COMPOSITION

401-3.1 COMPOSITION OF HOT MIX ASPHALT. The hot mix asphalt shall be composed of a mixture of well-graded aggregate, mineral filler if required, and asphalt cement. The several aggregate fractions shall be sized, handled in a minimum of three separate size stockpiles (coarse, intermediate, fine), and combined in such proportions that the resulting mixture meets the grading requirements of the job mix design.

401-3.2 JOB MIX DESIGN. No hot mix asphalt for payment shall be produced until a job mix design (JMD) has been approved by the Engineer. The hot mix asphalt (HMA) shall be designed using procedures contained in ATM 417, "Chapter 5, *Marshall Method of Mix Design*, of the Asphalt Institute's Manual Series No. 2 (MS-2), *Mix Design Methods for Asphalt Concrete*", and shall meet the requirements of Tables 2 and 3.

The hot mix asphalt, Type V, shall be designed using procedures contained in AASHTO R-35 and shall meet the requirements of Table 4. Upon completion of the JMD, determine the Marshall stability and Marshall air voids at the design asphalt cement content using a 75-Blow Marshall from procedures contained in ATM 417.

Anti-stripping agent shall be added to the asphalt cement in the amount determined by ATM 414. Anti-stripping agent is subsidiary to the asphalt cement pay item.

Contractor Furnished Job Mix Design. The Contractor may elect to furnish JMDs for each Type and Class of HMA specified. The Owner will furnish all JMDs for hot mix asphalt, Type V. The JMDs shall be submitted in writing by the Contractor to the Engineer at least 15 calendar days prior to the start of paving operations and shall include as a minimum:

- **a.** Target gradation – percent passing each sieve size.
- **b.** Optimum asphalt cement content.
- **c.** Asphalt cement performance grade.
- **d.** Number of blows of hammer compaction per side of molded specimen.

e. Mixing temperature range – from temperature-viscosity relationship, or manufacturers recommendations.
f. Compaction temperature range.
g. Plot of the combined gradation on the Federal Highway Administration (FHWA) 45 power gradation curve.
h. Graphical plots of stability, flow, air voids, voids in the mineral aggregate, and unit weight versus asphalt cement content.
i. Percent natural sand.
j. Percent fractured faces.
k. Percent flat and elongated.
l. Brand and percentage of antistrip agent (if required).
m. Theoretical Maximum Specific Gravity (MSG).
n. Signature of a Professional Engineer registered in the State Of Alaska.

The Engineer has authority to review submitted JMDs and to reject JMDs that do not meet specifications. The Contractor shall submit samples to the Engineer, upon request, for JMD verification testing.

Owner Designed Job Mix Design. The JMD may be designed by the Owner. The Contractor shall submit representative samples of all materials at least 15 calendar days prior to the start of paving operations along with the hot mix asphalt target gradation and aggregate blend ratio.

The Contractor shall:
a. Furnish representative samples from each aggregate size group in the proportions required for the proposed JMD gradation for a total of 500 pounds. Include gradations for the individual aggregate stockpiles and supporting process control information.
b. Furnish 5 separate 1-gallon samples of the asphalt cement proposed for use in the JMD with conformance test reports, a Manufacturer's certificate of compliance, current Material Safety Data Sheet (MSDS), and a temperature-viscosity relationship or Manufacturer's recommended mixing and compaction temperatures.
c. Furnish a minimum of one-half pint of the anti-strip additive proposed for use in the JMD with Manufacturer's data sheet and current MSDS.

The Owner will furnish one JMD, that meets specifications, for each Type and Class of HMA specified. If additional JMDs are required, the Engineer will assess a fee of $2,500.00 under Contract Item P-401b, Hot Mix Asphalt Price Adjustment, for each additional JMD furnished.

Job Mix Design Requirements.

TABLE 2. MIX DESIGN REQUIREMENTS

Test Property	Class A, C, E Pavements Designed for Aircraft Gross Weights of 60,000 Lbs. or More or Tire Pressures of 100 Psi or More	Class B, D, F Pavements Designed for Aircraft Gross Weight Less Than 60,000 Lbs. or Tire Pressure Less Than 100 Psi
Number of blows	75	50
Stability, pounds	2150	1350
Flow, 0.01 inch	10-14	10-18
Air voids %	2.8-4.2	2.8-4.2
Voids in mineral aggregate, %, min.	See Table 3	See Table 3
Asphalt Cement Content, %, min. @ 4% Air voids	5.0	5.0

TABLE 3. MINIMUM PERCENT VOIDS IN MINERAL AGGREGATE

Maximum Particle Size Inch	Voids in Mineral Aggregate, %, Minimum
1/2	14.0
3/4	13.0
1	12.0

TABLE 4 HOT MIX ASPHALT TYPE V MIX DESIGN REQUIREMENTS

Mix Design Class S Pavements for gross aircraft weights of 60,000 pounds or more.	
Test Property	**Design Criteria** **¾" Nominal Maximum Aggregate Size**
Initial Number of Gyrations (N_{ini})	8
Design Number of Gyrations (N_{des})	75
Maximum Number of Gyrations (N_{max})	130
Air voids @ N_{des}	4
Voids in Mineral Aggregate @ N_{des}, %	13.0 min.
Voids filled with Asphalt @ N_{des}, %	65-78
Dust to effective asphalt ratio	0.6 -1.2
Uncompacted Void Content	45 min
% G_{mm} @ N_{ini}	≤ 90.50
% G_{mm} @ N_{max}	≤ 98.00
Asphalt Cement Content, %, min. @ 4.0% VTM	5.0
Marshall Stability 75 blow (average of 3 specimens)	Report
Marshall Air Voids – 75 blow (average of 3 specimens)	Report
Rut Index, Max., ATM 419	3

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory screens, will conform to the gradation or gradations specified in Table 5 when tested according to WAQTC FOP for AASHTO T 27/T 11.

The gradations in Table 5 represent the limits that shall determine the suitability of aggregate for use from the sources of supply. The aggregate, as selected (and used in the JMD), shall have a gradation within the limits designated in Table 5 and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa, but shall be well graded from coarse to fine when tested according to WAQTC FOP for AASHTO T 27/T 11.

For acceptance testing, the asphalt cement content and aggregate gradation from the JMD will have the full tolerance limits for individual measurements as specified in Table 7 applied. Except for the No. 200 sieve, the limits apply even if they fall outside the master grading band in Table 5. The limits for the No. 200 sieve will be confined by the master grading band in Table 5. Tolerance limits will not be applied to the largest sieve specified.

The maximum size aggregate used shall not be more than one-half of the thickness of the layer being constructed.

TABLE 5. HOT MIX ASPHALT AGGREGATE

Sieve Size	Percentage by Weight Passing Sieves			
	Type I 1.00 inch max	**Type II 0.75 inch max**	**Type III 0.50 inch max**	**Type V 0.75 inch max**
1 in.	100	--	--	--
3/4 in.	80-90	100	--	100
1/2 in.	60-84	75-90	100	65-90
3/8 in.	48-78	60-84	80-90	55-80
No. 4	28-63	33-70	44-81	40-60
No. 8	14-55	19-56	26-70	≤45
No.16	9-44	10-44	16-59	≤ 35
No.30	6-34	7-34	9-49	≤ 25
No.50	5-24	5-24	6-36	≤ 20
No.100	4-16	4-16	4-22	≤ 12
No.200	3-8	3-8	3-8	3-8

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute Manual Series No. 2 (MS-2), Appendix A.

Changing the Job Mix Design. If the HMA fails to conform to Table 2 and 3, or if there are changes in the source of asphalt cement, source of aggregates, aggregate quality, aggregate gradation, or blend ratio, then a new JMD may be required by the Engineer. The Contractor shall submit changes and new samples, when required or directed, in the same manner as the original submittal.

No payment for material for which a new JMD is required, will be made until the new JMD is approved. Approved changes apply only to asphalt mixture produced after the submittal of the changes.

401-3.3 RECYCLED HOT MIX ASPHALT. Recycled hot mix asphalt shall consist of reclaimed asphalt pavement (RAP), aggregate, mineral filler if necessary, asphalt cement, and recycling agent if necessary. Recycled hot mix asphalt may be used for all layers except the top layer.

The RAP shall be of a consistent gradation and asphalt content. The Contractor may obtain the RAP from the job site or from a Contractor supplied source.

All new aggregates used in the recycled hot mix asphalt shall meet the requirements of Subsection 401-2.1. New asphalt cement shall meet the requirements of Subsection 401-2.3. Recycling agents shall meet the requirements of AASHTO R 14.

The recycled hot mix asphalt shall be designed using procedures contained in the Asphalt Institute's Manual Series Number 20 (MS-20), *Asphalt Hot-Mix Recycling*, in conjunction with MS-2 and ATM 417. The JMD shall meet the requirements of Subsection 401-3.2. In addition to the requirements of Subsection 401-3.2, the JMD shall indicate the percent of RAP, the percent and performance grade of new asphalt cement, the percent and grade of recycling agent (if used), and the properties (including the performance grade) of the asphalt cement blend.

The Contractor shall submit documentation to the Engineer, indicating that the mixing equipment proposed for use is adequate to mix the percent of RAP shown in the JMD and meet all local and national environmental regulations.

The recycled hot mix asphalt will be evaluated separately but will be sampled, tested, and paid for the same as hot mix asphalt.

401-3.4 TEST SECTION. Prior to full production, the Contractor shall prepare and place a test section consisting of a quantity of hot mix asphalt that conforms to the JMD. The location of the test section will be shown on the Plans, or as directed by the Engineer. The test section shall be 300 feet long, 20 to 40 feet wide, placed in two lanes, with a longitudinal cold joint. The test section shall be of the same thickness specified for the construction of the layer that it represents. The underlying surface or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the project represented by the test section. The equipment used in construction of the test section shall be the same type and weight to be used on the remainder of the project represented by the test section.

Three random samples of the hot mix asphalt will be taken by the Engineer and tested by the Owner for aggregate gradation and asphalt cement content according to Subsection 401-5.1. The three samples will be evaluated according to Subsection 401-8.1.a., except a determination for outliers will not be performed. If the Composite Pay Factor is less than 1.00, the test section is unacceptable.

Three 6-inch diameter core samples shall be cut from the finished hot mix asphalt by the Contractor, at the locations marked by the Engineer. The core samples will be tested by the Owner for density according to Subsection 401-5.1. The Target Value for mat density is 94% of the theoretical maximum specific gravity (MSG) of the JMD. The three samples will be evaluated according to Subsection 401-8.1.a., except a determination for outliers will not be performed. If the Density Pay Factor is less than 1.00, the test section is unacceptable.

Three longitudinal joint cores centered on the longitudinal joint shall be cut by the Contractor, at the locations marked by the Engineer. The core samples will be tested by the Owner according to Subsection 401-5.1. The Target Value for joint density is 92% of the JMD MSG. If the average density of the three joint cores is below 91%, the test section is unacceptable.

If the initial test section is unacceptable, the Contractor shall make necessary adjustments to the JMD, plant operation, placing procedures, or compaction efforts. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. All sections that are not acceptable shall be removed at the Contractor's expense.

Full production shall not begin until an acceptable test section has been constructed and approved by the Engineer.

The Owner will not pay for hot mix asphalt and asphalt cement, in test sections that are not acceptable, except the initial test section. The initial test section whether acceptable or unacceptable, and any subsequent test section that is acceptable, will be paid for at the contract unit prices for hot mix asphalt and asphalt cement. Test sections will be evaluated separately and not as part of a lot.

Hot mix asphalt quality control testing shall be performed by the Contractor at the start of plant production and in conjunction with the calibration of the plant for the JMD. If aggregates produced by the plant do not satisfy the gradation requirements or produce hot mix asphalt that meets the JMD, then it will be necessary to reevaluate and redesign the JMD using plant-produced aggregates. Specimens should be prepared and the optimum asphalt cement content determined in the same manner as for the original design tests. If the Owner redesigns the JMD the Contractor will be assessed a fee according to Subsection 401-3.2.

401-3.5 TESTING LABORATORY. The laboratory used to develop the JMD shall meet the requirements of ASTM D 3666. A certification signed by the manager of the laboratory stating that it meets these requirements shall be submitted to the Engineer prior to the start of construction. The certification shall contain as a minimum:

- **a.** Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.
- **b.** A listing of equipment to be used in developing the job mix design.
- **c.** A copy of the laboratory's quality control system.
- **d.** Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program

CONSTRUCTION METHODS

401-4.1 WEATHER LIMITATIONS. Hot mix asphalt shall not be placed upon a wet surface, when the base material is frozen, or when the surface temperature of the underlying layer is less than specified in Table 6. The top layer of hot mix asphalt must be placed before September 15th unless approved in writing by the Engineer.

TABLE 6. BASE TEMPERATURE LIMITATIONS

Mat Thickness	Base Temperature (Minimum)
Greater than 1 inch	40 °F
1 inch or less	50 °F

401-4.2 HOT MIX ASPHALT PLANT. Plants may not be placed on airport property. Plants used for the preparation of hot mix asphalt shall conform to the requirements of AASHTO M 156 with the following changes:

a. Truck Scales. The hot mix asphalt shall be weighed on approved certified scales furnished by the Contractor, or on certified public scales at the Contractor's expense. Scales shall be inspected and sealed as often as the Engineer deems necessary to assure their accuracy. Scales shall conform to the requirements of Subsection G-130-2.5.

b. Testing Facilities. The Contractor shall provide laboratory facilities at the plant or job site for the Contractor's quality control testing, according to Subsection 401-6.2.

c. Inspection of Plant. The Engineer shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the hot mix asphalt.

d. Storage Bins and Surge Bins. Delete provision 5 of AASHTO M 156. Use of surge bins or storage bins for temporary storage of hot mix asphalt will be permitted as follows:

(1) The hot mix asphalt may be stored in surge bins for not longer than 3 hours.

(2) The hot mix asphalt may be stored in insulated storage bins for not longer than 24 hours.

The bins shall be such that hot mix asphalt drawn from them meets the same requirements as hot mix asphalt loaded directly into trucks.

If the Engineer determines that there is an excessive amount of heat loss, segregation or oxidation of the hot mix asphalt, no storage will be allowed.

e. Sampling Locations. Provide a tap on the asphalt cement supply line just before it enters the plant (after the 3-way valve) for sampling asphalt cement. Aggregate and asphalt cement sampling locations shall meet OSHA safety requirements.

f. Scalping Screen. A scalping screen shall be provided on the hot mix asphalt plant to prevent oversize material or debris from being incorporated into the hot mix asphalt.

401-4.3 HAULING EQUIPMENT. Trucks used for hauling hot mix asphalt shall have tight, clean, and smooth metal beds. To prevent the hot mix asphalt from adhering to them, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other approved material. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the

mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened, as directed by the Engineer.

401-4.4 HOT MIX ASPHALT PAVERS. Hot mix asphalt pavers shall be self-propelled, with an activated screed, heated as necessary, and shall be capable of spreading and finishing layers of hot mix asphalt which will meet the specified thickness, width, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the hot mix asphalt uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the hot mix asphalt layer.

If an automatic grade control device is used, the paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or devices that will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1%.

The controls shall be capable of working in conjunction with any of the following attachments:

- **a.** Ski-type device of not less than 30 feet in length.
- **b.** Taut stringline (wire) set to grade.
- **c.** Short ski or shoe.
- **d.** Laser control.

401-4.5 ROLLERS. The Contractor shall use rollers of the vibratory, steel wheel, and pneumatic-tired type. Pneumatic-tired rollers shall be fully skirted. Rollers shall be in good condition, capable of operating at slow speeds to avoid displacement of the hot mix asphalt. The number, type, and weight of rollers shall be sufficient to compact the hot mix asphalt to the required density while it is still in a workable condition.

The use of equipment that causes excessive crushing of the aggregate, pickup of the mix, washboard, uneven compaction, or other undesirable results, will not be permitted.

401-4.6 PREPARATION OF ASPHALT CEMENT. The asphalt cement shall be heated in a manner that will avoid local overheating and provide a continuous supply of the asphalt cement to the mixer at a uniform temperature. The temperature of the asphalt cement delivered to the mixer shall be sufficient to provide for adequate coating of the aggregate particles, but shall not exceed 335 °F or exceed manufacturers' recommendations.

401-4.7 PREPARATION OF MINERAL AGGREGATE. The aggregate for the hot mix asphalt shall be heated and dried prior to introduction into the mixer. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350 °F when the asphalt cement is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide hot mix asphalt of satisfactory workability.

401-4.8 PREPARATION OF HOT MIX ASPHALT. The aggregates and the asphalt cement shall be weighed or metered and introduced into the mixer in the amount specified by the JMD.

The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt cement and is thoroughly distributed throughout the hot mix asphalt. For batch plants, the wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds. For continuous

mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the hot plant. The mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in AASHTO T 195, for each individual plant and for each type of aggregate used. The mixing time will be set to achieve a minimum of 98% coated particles. The moisture content of all hot mix asphalt upon discharge shall not exceed 0.5% of the total weight of hot mix asphalt, as determined by WAQTC FOP for AASHTO T 329.

401-4.9 PREPARATION OF THE UNDERLYING SURFACE. Immediately before placing the hot mix asphalt, the underlying layer shall be cleaned of all dust and debris. A prime coat or tack coat shall be applied according to Sections P-602 or P-603, if required by the contract Specifications.

401-4.10 TRANSPORTING, PLACING, AND FINISHING. The hot mix asphalt shall be transported from the mixing plant to the site in vehicles conforming to the requirements of Subsection 401-4.3. Deliveries shall be scheduled so that placing and compacting of hot mix asphalt is uniform with minimum stopping and starting of the paver. Adequate artificial lighting shall be provided for night placements. Hauling over freshly placed hot mix asphalt will not be permitted until it has been compacted, as specified, and allowed to cool to ambient temperature. The Contractor may elect to use a material transfer vehicle to deliver hot mix asphalt to the paver.

Upon arrival, the hot mix asphalt shall be placed to the full width by a hot mix asphalt paver. It shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate pulling and tearing of the hot mix asphalt mat. Unless otherwise permitted, placement of the hot mix asphalt shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The hot mix asphalt shall be placed in consecutive adjacent strips having a minimum width of 20 feet except where edge lanes require less width to complete the area.

The hot mix asphalt shall be placed and initial breakdown compaction started at a surface temperature greater than 235 °F. Compaction shall be finished before the surface temperature reaches 160 °F.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the hot mix asphalt may be spread by hand tools.

401-4.11 COMPACTION OF MIXTURE. After placing, the hot mix asphalt shall be thoroughly and uniformly compacted by rolling. The surface shall be compacted as soon as possible when the hot mix asphalt has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations shall be at the discretion of the Contractor. The speed of the rollers shall, at all times, be sufficiently slow to avoid displacement of the hot mix asphalt and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained.

To prevent adhesion of the hot mix asphalt to the roller, the wheels shall be kept properly moistened (and scrapers used), but excessive water will not be permitted.

In areas not accessible to the roller, the hot mix asphalt shall be thoroughly compacted with hand operated compaction equipment.

401-4.12 JOINTS. The formation of all joints shall be made in such a manner as to ensure a continuous bond and obtain the required density. All joints shall have the same texture as other sections of the layer and meet the requirements for smoothness and grade.

The longitudinal joint in one layer shall offset the longitudinal joint in the layer immediately below by at least 12 inches; however, the joint in the top layer shall be at the centerline of the pavement. Transverse joints in one layer shall be offset by at least 10 feet from transverse joints in the previous layer. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet.

The roller shall not pass over the unprotected end of the freshly laid hot mix asphalt except when necessary to form a transverse joint. When forming a transverse joint, it shall be made by means of placing a bulkhead or by tapering the layer. The tapered end shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing additional hot mix asphalt. When forming a transverse joint in the final lift, apply Crafco Pavement Joint Adhesive No. 34524, or Deery Cold Joint Adhesive, or approved equal, to the joint surface before placing any fresh hot mix asphalt against the joint.

All longitudinal joints in the final lift shall be formed in such a manner that the joint meets density requirements of this specification. Joints that are irregular, damaged, uncompacted or otherwise defective shall be cut back to expose a clean, sound surface. When forming a longitudinal joint in the final lift, apply Crafco Pavement Joint Adhesive No. 34524, or Deery Cold Joint Adhesive, or approved equal, to the joint surface before to placing any fresh hot mix asphalt against the joint. Joint edge preparation, and joint adhesive application temperature, thickness, and method shall be per the manufacturer's recommendations.

Joint sealant shall be applied over joints in the final lift of hot mix asphalt according to Subsection 401-5.2.f.(2). Joint sealant shall be applied over joints in the final lift formed by two panels of hot mix asphalt composed of different type or class of mix; or of new against existing hot mix asphalt pavement. Joint surface preparation, joint sealant application temperature, thickness, and method shall be per the manufacturer's recommendations.

All costs associated with joint preparation, applying joint sealant, and applying joint adhesive are subsidiary to the hot mix asphalt pay item.

401-4.13 SURFACE REQUIREMENTS AND TOLERANCE. The finished surfaces of the hot mix asphalt shall not vary more than the requirements of Subsection 401-5.2.f.(4).

The finished surface of asphalt concrete paving shall match dimensions shown on the Plans for horizontal alignment and width, profile grade and elevation, crown slope, and paving thickness. Water shall drain without puddles, across the pavement surface. The surface shall be of uniform texture and without ridges, humps, depressions, and roller marks. The surface shall be free of raveling, cracking, tearing, rutting, asphalt cement bleeding, and aggregate segregation. The asphalt concrete mixture shall be free of foreign material, uncoated aggregate and oversize aggregate.

Any finished surface area that does not meet the requirements of this Subsection is deemed unacceptable according to Subsection GCP 50-11. The Engineer will determine whether the unacceptable asphalt concrete mixture shall either be corrected, or removed and replaced. Submit correction methods to the Engineer for approval prior to correction work commencing. Skin patching shall not be allowed. This work is subsidiary and shall be done at the Contractor's expense.

MATERIAL ACCEPTANCE

401-5.1 ACCEPTANCE SAMPLING AND TESTING. All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the Engineer at no cost to the Contractor. Testing organizations performing these tests will meet the requirements of ASTM D 3666.

Hot Mix Asphalt lots. The quantity of each type of hot mix asphalt produced and placed will be divided into lots and the lots evaluated individually for acceptance. The Owner has the exclusive right and

responsibility for determining the acceptability of all materials incorporated into the project. The results of the acceptance testing performed by the Engineer will be made available to the Contractor.

5,000 ton lot size. A lot of hot mix asphalt will be 5,000 tons, except as noted below. The lot will be divided into 10 equal sublots of 500 tons, each randomly sampled and tested for asphalt cement content, density and gradation according to this subsection.

If the project has more than 1 lot, and if less than 8 additional sublots have been sampled at the time a lot is terminated, either due to completion of paving operations or the end of the construction season (winter shutdown), the material in the shortened lot will be included as part of the prior lot and the price adjustment computed for the prior lot will include the samples from the shortened lot.

If 8 or 9 samples have been obtained at the time a lot is terminated, they will be considered as a lot and the price adjustment will be based on the actual number of test results (excluding outliers) in the shortened lot.

1,500 to 4,999 ton lot size. If the total Contract quantity of hot mix asphalt is between 1,500 tons and 4,999 tons, the total Contract quantity will be considered one lot. The lot will be divided into sublots of 500 tons and randomly sampled for asphalt cement content, density and gradation according to this subsection except a determination for outliers will not be performed. The lot will be evaluated for price adjustment according to Subsection 401-5.2 except as noted.

Hot mix asphalt quantities of less than 300 tons remaining after dividing the last lot into sublots will be included in the last sublot. Hot mix asphalt quantities of 300 tons or greater will be treated as an individual sublot.

Under 1,500 ton lot size. If the total Contract quantity of hot mix asphalt is less than 1,500 tons, or for approaches, pathways, and temporary pavement, the hot mix asphalt will be accepted for payment based on: the Engineer's approval of a JMD, placement and compaction of the hot mix asphalt to the specified thickness and density, meeting finished surface requirements and tolerances, and material testing.

The Engineer reserves the right to perform any testing required in order to determine acceptance. Hot mix asphalt that does not conform to the approved JMD shall be removed and replaced, or at the Engineer's discretion a pay adjustment will be made according to Subsection GCP 50-03. Removal and replacement of defective hot mix asphalt shall be at no additional cost to the Owner.

Joint lot size. The lot size for longitudinal joint density in the final lift of hot mix asphalt will be the total length of longitudinal joint constructed by a lot of hot mix asphalt.

Asphalt Cement Property lot size. The normal lot size for Asphalt Cement property will be 200 tons. If the project has more than one lot and the quantity remaining is less than 150 tons, that quantity of asphalt cement will be added to the prior lot and the total quantity will be evaluated for price adjustment as one lot. If the remaining quantity is 150 tons or greater, it will be sampled, tested and evaluated as a separate lot.

If the contract quantity of asphalt cement property is between 85 – 199 tons, the contract quantity will be considered as one lot and sampled and tested according to this subsection. Quantities of asphalt cement less than 85 tons will be accepted based on manufacturer's certified test reports and certification of compliance.

a. Sampling. Samples collected at the plant from dry batched aggregates, the conveyor system, or the asphalt cement supply line shall be taken by the Contractor in the presence of the Engineer. The Engineer will take immediate possession of the samples.

(1) Asphalt Cement Content. Hot mix asphalt samples taken for the determination of the asphalt cement content will be taken randomly from behind the screed prior to initial

compaction, or from the windrow, as directed by the Engineer, according to WAQTC FOP for AASHTO T 168 and ATM 403.

Two separate samples will be taken, one for acceptance testing and one held in reserve for retesting if applicable.

(2) Aggregate Gradation. Samples for the determination of aggregate gradation will be taken randomly, as directed by the Engineer, according to WAQTC FOP for AASHTO T 2. Two separate samples will be taken, one for acceptance testing and one held in reserve for retesting if applicable. The samples will be taken from one of the following locations:

(a) The same location as specified for the determination of asphalt cement content;

(b) For hot mix asphalt drum plants from the combined aggregate cold feed conveyor via a diverter device, a sampling device, or from the stopped conveyor belt. Diverter devices shall divert aggregate from the full width of the conveyor system and shall be maintained to provide a representative sample of aggregate incorporated into the hot mix asphalt; or

(c) For hot mix asphalt batch plants from the dry batched aggregates in a manner that provides a representative sample of aggregate incorporated into the hot mix asphalt.

(3) Density. A separate set of random numbers, different from those used for mix acceptance, will be used to determine acceptance density locations. The Contractor shall cut full depth core samples from the finished HMA within 24 hours of final rolling. Neatly cut one 6-inch-diameter core sample with a core drill at each location marked by the Engineer. Use a core extractor to prevent damage to the core. Backfill and compact voids left by coring with new HMA within 24 hours. Densities will not be measured at milled edge of existing pavement. Failure to cut core samples or backfill the holes left by sampling within the specified period will result in a deduction of $100.00 per sample/hole per day. The accrued amount will be subtracted under Item P-401b, Hot Mix Asphalt Price Adjustment.

Core samples for mat density shall not be taken closer than one foot from a transverse or longitudinal joint.

(4) Core samples for longitudinal joint density shall be centered on the intersection at the top surface of the two new hot mix asphalt panels, at the same station where the panel completing the joint is cored for mat density acceptance testing. Cores shall be taken by the Contractor in the presence of the Engineer. The Engineer will take immediate possession of the samples.**Asphalt Cement Property.** Asphalt cement will be randomly sampled for acceptance testing according to WAQTC FOP for AASHTO T 40. Three separate samples from each lot will be taken, one for acceptance testing, one for Contractor retesting, and one held by the Engineer in reserve for referee testing if applicable.

b. Testing.

(1) Asphalt Cement Content. At the direction of the Engineer, the asphalt cement content will be determined according to ATM 405 or WAQTC FOP for AASHTO T 308. The method selected will be used for the duration of the project, including retests if applicable.

(2) Aggregate Gradation. Cold feed or dry batched aggregate gradations will be tested according to WAQTC FOP for AASHTO T 27/T 11. Hot mix asphalt gradations will be determined according to WAQTC FOP for AASHTO T 30 from aggregate remaining after the ignition oven (WAQTC FOP for AASHTO T 308) has burned off the asphalt cement.

(3) Density. The Target Value for mat density will be 95% of the MSG for all mixes except Type V, Class S which will have a target value of 96% of the MSG as determined by WAQTC FOP

Core samples will be tested according to WAQTC FOP for AASHTO T 166/T 275.

(4) Asphalt Cement Property. Asphalt cement will be tested for conformance to the requirements specified in Subsection 401-2.3 and evaluated for acceptance according to Subsection 401-8.2.

401-5.2 ACCEPTANCE CRITERIA.

a. General. Acceptance will be based on the following characteristics of the hot mix asphalt as well as the implementation of the Contractor's Quality Control plan:

(1) Aggregate gradation
(2) Asphalt cement content
(3) Mat density
(4) Longitudinal Joint density
(5) Thickness
(6) Smoothness
(7) Asphalt Cement Property

Aggregate gradation, asphalt cement content, and mat density will be evaluated for acceptance on a lot basis using the method of estimating percentage of material within specification limits (PWL). Acceptance using PWL considers the variability (standard deviation) of the material and the testing procedures, as well as the average (mean) value of the test results to calculate the percentage of material that is above the lower specification tolerance limit (L) or below the upper specification tolerance limit (U).

Thickness will be evaluated by the Engineer for compliance according to Subsection 401-5.2.f.(3). Acceptance for smoothness will be based on the criteria contained in Subsection 401-5.2.f.(4).

The Engineer may at any time reject and require the Contractor to dispose of any batch of hot mix asphalt which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or improper mix temperature. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may request that a representative sample of the rejected hot mix asphalt be tested. If all test results are within tolerance limits, payment will be made for the hot mix asphalt at the contract unit price. If any of the test results fall outside of the tolerance limits, no payment will be made on the batch of rejected hot mix asphalt, and the cost of the testing will be subtracted under Contract Item P-401b, Hot Mix Asphalt Price Adjustment. The batch of rejected hot mix asphalt will be evaluated separately and not as part of a lot. All costs associated with disposal of rejected hot mix asphalt are the responsibility of the Contractor.

b. Aggregate Gradation, Asphalt Cement Content. Evaluation for acceptance of each lot of plant-produced hot mix asphalt for aggregate gradation and asphalt cement content will be based on PWL.

c. Mat Density. Evaluation for acceptance of each lot of in-place hot mix asphalt for mat density will be based on PWL.

d. Longitudinal Joint Density. Evaluation for acceptance of each lot of in-place final lift hot mix asphalt for longitudinal joint density will be based on the average of the longitudinal joint densities within the lot.

e. Percentage of Material Within Specification Limits (PWL). The PWL will be determined according to procedures specified in Section 110 of the General Provisions. The sample average (X) is rounded to the nearest tenth for density and all sieves except the No. 200, and to the nearest hundredth for asphalt cement content and the No. 200 sieve. The sample standard deviation (S_n) is rounded to the nearest hundredth for density and all sieve sizes except the No. 200 sieve. The sample standard deviation (S_n) is rounded to the nearest .001 for asphalt content and the No. 200 sieve. The specification tolerance limits (L) and (U) are contained in Table 7.

f. Acceptance Criteria.

(1) Mat Density, Aggregate Gradation, and Asphalt Cement Content. Acceptance and payment for the lot will be determined according to Subsection 401-8.1.

(2) Longitudinal Joint Density. For the final lift of hot mix asphalt, the longitudinal joint shall be sealed with Asphalt Systems GSB-78, or approved equal, while the hot mix asphalt is still clean, free of moisture, and before striping. All costs associated with sealing the joints are subsidiary to the hot mix asphalt pay item. Longitudinal joint lots will be evaluated for payment according to Subsection 401-8.3.

Longitudinal joint sealing shall be per the sealant manufacturer's recommendations. The sealant application shall be at least 6 inches wide and centered on the longitudinal joint.

(3) Thickness. Thickness will be evaluated for compliance by the Engineer to the requirements shown on the Plans. Measurements of thickness will be made by the Engineer using the cores extracted from the mat for each sublot for density measurement.

(4) Smoothness. The finished surfaces of the hot mix asphalt shall not vary more than 1/4 inch for the surface layer when tested with a 10-foot straightedge. High points may be ground off, but skin patching will not be allowed.

(5) Asphalt Cement Property. Acceptance and payment for asphalt cement will be determined according to Subsection 401-8.2.

g. Outliers. All individual tests for asphalt cement content, aggregate gradation, and mat density will be checked for outliers (test criterion) according to ATM SP-7 except as noted in Subsection 401-5.1. Outliers will be discarded, and the PWL will be determined using the remaining test values.

When gradation and asphalt cement content are determined from the same sample, if any sieve size on the gradation test or the asphalt cement content is an outlier, then the gradation test results and the asphalt cement content results for that sample will not be included in the price adjustment. The density test result for that sublot will be included in the price adjustment provided it is not an outlier also. If the density test result is an outlier, the density test result will not be included in the price adjustment, however, the gradation and asphalt cement content results for the sublot will be included provided neither is an outlier.

When gradation and asphalt cement content are determined from separate samples, if any sieve size on the gradation test is an outlier, then the gradation test results for that sample will not be included in the price adjustment. The asphalt cement content and density test results for that sublot will be included in the price adjustment provided neither is an outlier. If the asphalt cement content test result is an outlier, it will not be included in the price adjustment but the gradation and density test results for the sublot will be included provided neither is an outlier. If the density test

result is an outlier, it will not be included in the price adjustment but the gradation and asphalt cement content test results will be included provided neither is an outlier.

TABLE 7. LOWER SPECIFICATION TOLERANCE LIMIT (L) AND UPPER SPECIFICATION TOLERANCE LIMIT (U)

Measured Characteristics	L	U
3/4 in. sieve	TV -6.0	TV +6.0
1/2 in. sieve	TV -6.0	TV +6.0
3/8 in. sieve	TV -6.0	TV +6.0
No. 4 sieve	TV -6.0	TV +6.0
No. 8 sieve	TV -6.0	TV +6.0
No. 16 sieve	TV -5.0	TV +5.0
No. 30 sieve	TV -4.0	TV +4.0
No. 50 sieve	TV -4.0	TV +4.0
No. 100 sieve	TV-3.0	TV +3.0
No. 200 sieve	TV-2.0	TV +2.0
Asphalt Cement %	TV-0.4	TV+0.4
Mat Density *	92%	98%
Joint Density	91%	98%

TV (Target Value) = Job Mix Design value for gradation and asphalt cement content.
* Mat Density for Type V, Class S: change values to L=93 and U=99

401-5.3 RETESTS.

a. General. Retesting of a sample which is outside the limits specified in Table 7, will be allowed if requested by the Contractor, in writing, within 7 days of receipt of the final test of the lot. Only one retest per sample will be permitted. The Engineer will mark the sample location for the density retest within a two-foot radius of the original core. The original test result will be discarded and the retest result will be used in the price adjustment calculation regardless of whether the retest result gives a higher or lower pay factor.

Except for the first lot, when gradation and asphalt cement content are determined from the same sample, retesting for gradation or asphalt cement content from the first sublot of a lot will include retesting for the MSG; when separate samples are used, retesting for asphalt cement content will include retesting for the MSG.

(1) A redefined PWL will be calculated for the lot.
(2) The cost for resampling shall be borne by the Contractor.

b. Payment for Resampled Lots. The redefined PWL for a lot will be used to calculate the payment for that lot according to Table 8.

401-5.4 LEVELING COURSE. Any layer identified in the Plans as a leveling course, or any base layer approved by the Engineer for truing and leveling, shall meet the requirements of Subsections 401-3.2 and 401-5.2b, but will not be subject to the density requirements of Subsections 401-5.2.c and 401-5.2.d. The leveling layer shall be compacted with the same effort used to achieve density of the test section. The truing and leveling layer shall not exceed a nominal thickness of 1-1/2 inches.

CONTRACTOR QUALITY CONTROL

401-6.1 GENERAL. The Contractor shall develop a Quality Control Program according to the General Contract Provisions Section GCP-100, except that Subsection GCP-100-03 will not apply when Hot Mix

Asphalt Contract quantities are less than 5,000 tons. The program shall address all elements that affect the quality of the hot mix asphalt including, but not limited to:

a. Mix Design	**f.** Mixing and Transportation
b. Aggregate Grading	**g.** Placing and Finishing
c. Quality of Materials	**h.** Joints
d. Stockpile Management	**i.** Compaction
e. Proportioning	**j.** Surface smoothness

The Contractor shall submit a paving and plant control plan at the pre-paving meeting scheduled by the Engineer a minimum of 5 working days before paving operations begin. The plan shall specifically address the sequence of operations and joint construction. In addition, steps to ensure product consistency, to minimize segregation, and to prevent premature cooling of the hot mix asphalt shall be addressed.

401-6.2 TESTING LABORATORY. The Contractor shall provide a fully equipped hot mix asphalt laboratory located at the plant or job site.

The effective working area of the laboratory shall be a minimum of 150 ft^2 with a ceiling height of not less than 7.5 feet. Lighting shall be adequate to illuminate all working areas. It shall be equipped with heating and air conditioning units to maintain a temperature of 70 °F ± 5 °F.

Laboratory facilities shall be kept clean and all equipment shall be maintained in proper working condition. The Engineer shall be permitted unrestricted access to inspect the Contractor's laboratory facility and witness quality control activities. The Engineer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting test results, the incorporation of the materials into the work will be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

401-6.3 QUALITY CONTROL TESTING. The Contractor shall perform all quality control tests necessary to control the production and construction processes applicable to these Specifications and as set forth in the Quality Control Program. The testing program shall include, but not necessarily limited to, tests for the control of asphalt cement content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. All testing shall be according to the standard procedures specified in the contract and the options selected by the Engineer. A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

a. Asphalt Cement Content. A minimum of four asphalt cement content tests shall be performed per lot according to Subsection 401-5.1b(1).

b. Gradation. Aggregate gradations shall be determined a minimum of four times per lot according to WAQTC FOP for AASHTO T 30 or WAQTC FOP for AASHTO T 27/T 11.

c. Moisture Content of Aggregate. The moisture content of aggregate used for production shall be determined a minimum of twice per lot according to WAQTC FOP for AASHTO T 255/T 265.

d. Moisture Content of Hot Mix Asphalt. The moisture content of the hot mix asphalt shall be determined a minimum of twice per lot according to WAQTC FOP for AASHTO T 329.

e. Temperatures. Temperatures shall be checked, at least four times per lot, at necessary locations to determine the temperatures of the dryer, the asphalt cement in the storage tank, the hot mix asphalt at the plant, and the hot mix asphalt at the job site.

f. In-Place Density Monitoring. The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the hot mix asphalt density according to WAQTC TM 8.

g. Additional Testing. Any additional testing that the Contractor deems necessary to control the process may be performed at the Contractor's option.

h. Monitoring. The Engineer reserves the right to monitor any or all of the above testing.

401-6.4 SAMPLING. When directed by the Engineer, the Contractor shall sample and test any hot mix asphalt that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be according to standard procedures specified.

401-6.5 CONTROL CHARTS. The Contractor shall maintain linear control charts both for individual measurements and range (i.e., difference between highest and lowest measurements) for aggregate gradation and asphalt cement content.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the Engineer may suspend production or acceptance of the material.

a. Individual Measurements. Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation and asphalt cement content. The control charts shall use the JMD target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

CONTROL CHART LIMITS FOR INDIVIDUAL MEASUREMENTS

Sieve	Action Limit	Suspension Limit
3/4 in.	0%	0%
1/2 in.	+/-6%	+/-9%
3/8 in.	+/-6%	+/-9%
No. 4	+/-6%	+/-9%
No. 16	+/-5%	+/-7.5%
No. 50	+/-3%	+/-4.5%
No. 200	+/-2%	+/-3%
Asphalt Cement Content	+/-0.45%	+/-0.70%

The action and suspension limits for the largest sieve specified are 0%.

b. Range. Control charts for range shall be established to control process variability for the test parameters and Suspension Limits listed below. The range shall be computed for each lot as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of n = 4.

CONTROL CHART LIMITS BASED ON RANGE
(Based on n = 4)

Sieve	Suspension Limit
1/2 in.	14%
3/8 in.	14%
No. 4	14%
No. 16	11%
No. 50	8%
No. 200	4.5%
Asphalt Cement Content	1%

c. Corrective Action. The Quality Control Plan shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain sets of rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

(1) One point falls outside the Suspension Limit line for individual measurements or range; or
(2) Two points in a row fall outside the Action Limit line for individual measurements.

METHOD OF MEASUREMENT

401-7.1 Hot Mix Asphalt. The quantity of hot mix asphalt will be measured by the number of tons used in the accepted work, based on recorded truck scale weights. No deduction will be made for the weight of asphalt cement in the hot mix asphalt.

401-7.2 Asphalt Cement. The quantity of asphalt cement will be measured by the number of tons used in the accepted hot mix asphalt, determined as follows:

a. Supplier's invoices minus waste, diversion and excess left over. This method may be used on projects where deliveries are made in sealed tankers and the plant is producing material for one project only. Method b. will be used to compute left over. Waste and diversion will be computed in a manner determined by the Engineer.

b. Volume measure (tank stickings) of actual daily uses. It is the Contractor's responsibility to notify the Engineer whenever material is to be added to the calibrated volume measure or whenever material from the volume measure is to be used for work other than that specified in this contract.

c. Percent of asphalt cement for each sublot as determined by ATM 405 or WAQTC FOP for AASHTO T 308 multiplied by the weight represented by that sublot. The same tests used for acceptance testing of asphalt cement content will be used for calculation of the asphalt cement quantity. If retesting of a sample for asphalt cement content is performed, the retest result will be used for calculating the asphalt cement quantity.

Method c. will be used for determining asphalt cement quantity unless otherwise directed in writing by the Engineer. No payment will be made for a portion of asphalt cement that is more than 0.4% above the optimum asphalt cement content specified in the JMD. When acceptance testing is not required because of the small quantity of hot mix asphalt used, the percent of asphalt cement used in the calculation will be the optimum asphalt cement content specified in the JMD.

The method initially used will be used for the duration of the project.

401-7.3 Longitudinal Joint. The quantity of joint will be measured by the lineal foot of longitudinal joint in the accepted top layer. A joint is defined as the vertical intersection of two new hot mix asphalt panels.

Transverse joints in any layer, and longitudinal joints in underlying layers, are not included. Joints next to buildings, sidewalks, existing asphalt pavement, or curb and gutter are not included.

BASIS OF PAYMENT

401-8.1 HOT MIX ASPHALT. Payment for an accepted lot of hot mix asphalt will be made at the contract unit price per ton for hot mix asphalt. The quantity of hot mix asphalt paid for will not exceed 105 percent of the weight determined on the basis of average core density, the specified neat line thickness, and the completed area of hot mix asphalt.

The Engineer will adjust Contract Item P-401b Hot Mix Asphalt Price Adjustment according to Subsection 401-8.1.a.

The price will be compensation for furnishing all materials, for all preparation, mixing, placing, and compaction of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

a. Basis of Adjusted Payment for Hot Mix Asphalt. The total hot mix asphalt price adjustment is the sum of the individual lot price adjustments, and will be added or deducted under Item P-401b, Hot Mix Asphalt Price Adjustment.

The lot Pay Factors for density, gradation and asphalt cement content are determined from Table 8 using Percent Within Limits (PWL) calculated from Section 110 of the General Provisions. The tolerance limits for the largest sieve specified will be plus 0 and minus 1 when performing PWL calculations. The maximum pay factor for the largest sieve size for gradation will be 1.00. The price adjustment will be based on the Composite Pay Factor (CPF) for asphalt cement content and aggregate gradation or the Density Pay Factor (DPF), whichever is the lowest value. CPF and DPF is rounded to the nearest hundredth. Table 9 is used to determine the weight factor (*f*) for each sieve size and asphalt cement content.

The hot mix asphalt Composite Pay Factor (CPF) is computed for asphalt cement content and all sieves using the following formula:

$$\text{CPF} = \frac{\left[f_{3/4in}(PF_{3/4in}) + f_{1/2in}(PF_{1/2in}) + \ldots\ldots f_{ac}(PF_{ac})\right]}{\Sigma f}$$

TABLE 8. PRICE ADJUSTMENT SCHEDULE

Percentage of Material Within the Specification Limit (PWL)	Pay Factor (PF)
96-100	1.05
90-95	0.01 PWL + 0.10
75-89	0.005 PWL + 0.55
55-74	0.014 PWL - 0.12
Below 55	0*

* If the Composite Pay Factor or the Density Pay Factor falls below 0.65, the lot shall be removed and replaced. If the Engineer decides that the lot can be left in place, the Pay Factor for the lot will be 0.50.

TABLE 9. WEIGHT FACTORS

Sieve Size	Type I	Type II and Type V	Type III
	Factor "f"	Factor "f"	Factor "f"
1 in.	4		
¾ in.	4	4	
½ in.	4	5	4
3/8 in.	4	5	5
No. 4	4	4	5
No. 8	4	4	5
No. 16	4	4	5
No. 30	4	5	6
No. 50	4	5	6
No. 100	4	4	4
No. 200	20	20	20
Asphalt %	40	40	40

The price adjustment for each individual lot will be calculated as follows:

Price Adjustment = [(CPF or DPF)* -1] x (tons in lot) x (PAB)

PAB = Price Adjustment Base per ton (for mix including asphalt cement)

PAB = Price Adjustment Base =45.00 per ton Hot Mix Asphalt Type _II_, Class _B_

* Composite Pay Factor (CPF) or Density Pay Factor (DPF), whichever is lower value.

401-8.2 ASPHALT CEMENT. Payment for an accepted lot of asphalt cement will be made at the contract unit price per ton for asphalt cement.

The Engineer will adjust Contract Item P-401b for asphalt cement property according to Subsection 401-8.2.a. The Engineer will adjust Contract Item P-401b for asphalt cement content according to Subsection 401-8.1.a.

The price will be compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

a. Basis of Adjusted Payment for Asphalt Cement Property. Asphalt cement property pay reduction factors for each lot will be determined from Table 10. The total asphalt cement price adjustment is the sum of the individual lot price adjustments, and will be deducted under Item P-401b, Hot Mix Asphalt Price Adjustment.

TABLE 10. ASPHALT CEMENT PROPERTY PAY REDUCTION FACTORS
(Use the single, highest pay reduction factor)

	Spec	Pay Reduction Factor (PRF)								
		0	**0.04**	**0.05**	**0.06**	**0.07**	**0.08**	**0.10**	**0.25**	**Reject or Engr Eval**
Tests On Original Binder										
Viscosity	≤3 Pa-s	≤3		>3						
Dynamic Shear	≥1.00 kPa	≥1.00		0.88-0.99				0.71-0.87	0.50-0.70	<0.50
Toughness	≥110 in-lbs	≥93.5	90.0-93.4	85.0-89.9	80.0-84.9	75.0-79.9	70.0-74.9			<70.0
Tenacity	≥75 in-lbs	≥63.8	61.0-63.7	58.0-60.9	55.0-57.9	52.0-54.9	48.0-51.9			<48.0
Tests On RTFO										
Mass Loss	≤1.00 %	≤1.00		1.001-1.092				1.093-1.184	1.185-1.276	>1.276
Dynamic Shear	≥2.20 kPa	≥2.20		1.816-2.199				1.432-1.815	1.048-1.431	<1.048
Test On PAV										
Dynamic Shear	≤5000 kPa	≤5000		5001-5289				5290-5578	5579-5867	>5867
Creep Stiffness, S	≤300 Mpa	≤300		301-338				339-388	389-450	>450
Creep Stiffness, m-value	≥0.300	≥0.300		0.287-0.299				0.274-0.286	0.261-0.273	<0.261

Asphalt Cement Property Price Adjustment for each lot = 5 x PAB x Qty X PRF (Always a deduct.)

PAB = Price Adjustment Base (See Subsection 401-8.1.a.)
Qty = Quantity of asphalt cement represented by lot
PRF = Pay Reduction Factor from Table 10

Asphalt Cement Appeal Procedure. Once notified of a failing test result of an asphalt cement sample, you may elect to submit a written appeal within 21 days. The appeal must be accompanied by all contractor quality control test results and a test result of your sample of this lot tested by an asphalt laboratory that is AASHTO accredited in the test procedure in question. All costs associated with this testing are subsidiary to the Hot Mix Asphalt pay item. The Engineer will review these test results and use ASTM D 3244 to determine a test value upon which to base a price reduction. If you challenge this value, then the referee sample held by the Engineer will be sent to a mutually agreed upon independent AASHTO accredited laboratory for testing. This test result will be incorporated into the ASTM D 3244 procedure to determine a test value upon which to base a price reduction. If this final value incurs a price adjustment, the results are binding and you will pay for the cost of testing the referee sample as a deduction under item P-401b Hot Mix Asphalt Price Adjustment.

401-8.3 LONGITUDINAL JOINT. The cost for all joints is subsidiary to hot mix asphalt, no payment will be made.

The Engineer will adjust Contract Item P-401b for longitudinal joint density according to Subsection 401-8.3.a.

The subsidiary cost includes furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

a. Basis of Adjusted Payment for Longitudinal Joints. Longitudinal joint density lots in the top layer that average less than 91% of MSG will be assessed a price adjustment of $5.00 per foot. The accrued amount will be deducted under Item P-401b, Hot Mix Asphalt Price Adjustment.

Longitudinal joint density lots in the top layer that average greater than 91% of MSG will have an incentive of $1.00 per foot applied. The accrued amount will be added under Item P-401b, Hot Mix Asphalt Price Adjustment.

401-8.4 PAYMENT. Payment will be made under:

Item P-401a	Hot Mix Asphalt Type _II_, Class _B_ - per ton
Item P-401b	Hot Mix Asphalt Price Adjustment - contingent sum
Item P-401c	Asphalt Cement [Performance Grade] - per ton

401-9.1 ASPHALT MATERIAL PRICE ADJUSTMENT. This subsection provides a price adjustment for asphalt material by: (1) additional compensation to the contractor or (2) a deduction from the contract amount. The terms “asphalt material” and “asphalt cement” are used interchangeably as they apply to the asphalt material price adjustment.

1. This provision shall apply to asphalt material meeting the criteria of Section 401-2.3, and is included in items listed in the bid schedule of Sections P-310, P-602, P-603, P-609, and P-626.

2. This provision shall only apply to cost changes in asphalt material that occur between the first Friday of the month of which the bid opening occurs and the date the asphalt material is incorporated into the project.

3. The asphalt material price adjustment will only apply when:

   a. There is more than 500 tons of asphalt material in the bid schedule of Sections described in Item 1; and

   b. There is more than a seven and one half percent (7.5%) increase or decrease in the Alaska Asphalt Material Price Index, AAMPI, from the date of bid opening to the date the asphalt material is incorporated into the project.

4. The AAMPI is calculated bi-monthly on the first and third Friday of each month, and is in effect from the day of calculation until the next bi-monthly calculation. The AAMPI is posted on the Owner’s Statewide Materials website and is calculated according to the formula posted there. Posting of new AAMPI values after the first and third Friday of each month is typically delayed one to several days. Any delay in the Owner’s posting of an updated AAMPI value shall not constitute grounds for using any value other than the value in effect as described in this specification.

5. Price adjustment will be cumulative and calculated with each progress payment.

   For projects where asphalt material is purchased from a commercial plant serving multiple customers, use the AAMPI in effect on the last day of the pay period to calculate price adjustment for asphalt material incorporated into the project during that pay period. For projects where the asphalt material is purchased in advance of incorporating it into the project, use the AAMPI in effect on the last day of the pay period when the asphalt material was purchased. Submit the asphalt material purchase invoice, showing the date purchased, to the Engineer to identify the pay period when the asphalt material was purchased. The Owner will increase or decrease payment under this contract by the amount determined with the following asphalt material price adjustment formula:

   For an increase exceeding 7.5%, additional compensation = [(IPP – IB) – (0.075 x IB)] x Q
   For a decrease exceeding 7.5%, deduction from contract = [(IB – IPP) – (0.075 x IB)] x Q

Where:

Q = Quantity of Asphalt Material incorporated into project during the pay period, in tons
IB = Index at Bid: the Bi-monthly AAMPI in effect on date of bid, in dollars per ton
IPP = Index at Pay Period: the Bi-monthly AAMPI in effect on the last day of the pay period, in dollars per ton

6. Method of measurement for determining Q (quantity) is the weight of asphalt material that meets the criteria of this subsection and is incorporated into the project. The quantity does not include aggregate, mineral filler, blotter material, thinning agents added after material qualification, or water for emulsified asphalt.

7. Basis of payment is:

Item P-401a	Hot Mix Asphalt Type II, Class B – per ton
Item P-401b	Hot Mix Asphalt Price Adjustment – per contingent sum
Item P-401c	Asphalt Cement, PG 52-28 – per ton

TESTING REQUIREMENTS

WAQTC FOP for AASHTO T 2	Sampling Aggregates
WAQTC FOP for AASHTO T 27/T 11	Sieve Analysis of Aggregate and Soils
WAQTC FOP for AASHTO T 30	Mechanical Analysis of Extracted Aggregate
WAQTC FOP for AASHTO T 40	Sampling Bituminous Materials
WAQTC FOP for AASHTO T 335	Percentage of Fracture in Coarse Aggregate
WAQTC FOP for AASHTO T 89	Liquid Limit of Soils
WAQTC FOP for AASHTO T 90	Plastic Limit and Plasticity Index of Soils
WAQTC FOP for AASHTO T 166/T 275	Bulk Specific Gravity and Percent Compaction of Bituminous Mixes
WAQTC FOP for AASHTO T 168	Sampling Bituminous Mixes
WAQTC FOP for AASHTO T 176	Sand Equivalent
WAQTC FOP for AASHTO T 209	Maximum Specific Gravity of Bituminous Mixes
WAQTC FOP for AASHTO T 255/T 265	Moisture Content of Aggregate and Soils
WAQTC FOP for AASHTO T 308	Asphalt Binder Content of Bituminous Mixes by Ignition Method
WAQTC FOP for AASHTO T 329	Moisture Content of Hot-Mix Asphalt (HMA) by Oven Method
WAQTC TM 8	In-Place Density of Bituminous Mixes using the Nuclear Moisture-Density Gauge.
ATM 306	Flat and Elongated
ATM 313	Degradation Value of Aggregate

ATM 405	Asphalt Cement Content of Asphalt Concrete Mixtures by the Nuclear Method
ATM 414	Anti-Strip Requirements of Hot Mix Asphalt
ATM 417	Hot Mix Asphalt Design by the Marshall Method
ATM SP-7	Determination of Outlier Test Results
AASHTO T 53	Softening Point of Bitumen (Ring-and-Ball Apparatus)
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 127	Sampling and Amount of Testing of Hydraulic Cement
AASHTO M 156	Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures
AASHTO T 195	Determining Degree of Particle Coating of Bituminous-Aggregate Mixtures
AASHTO M 320	Performance-Graded Asphalt Binder
ASTM D 3244	Utilization of Test Data to Determine Conformance with Specifications
ASTM D 5801	Test Method for Toughness and Tenacity of Bituminous Materials
The Asphalt Institute	*Mix Design Methods for Asphalt Concrete Manual No. 2 (MS-2)*
The Asphalt Institute	*Hot-Mix Recycling Manual No. 20 (MS-20)*

MATERIAL REQUIREMENTS

AASHTO R 14 Classifying Hot-Mix Recycling Agents

AASHTO M 17 Mineral Filler for Bituminous Paving Mixtures

ITEM P-602 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 MATERIALS. The types, grades, controlling specifications, and application temperatures for the prime coat are given in Table 1. The Engineer shall designate the specific material to be used.

TABLE 1. MATERIAL

Type and Grade	Specification	Application Temperatures \1\ °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	AAASHTO 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 D 2028	80+	0.27 to 0.53
RC-70	ASTM D 2028	120+	0.27 to 0.53
RC-250	ASTM D 2028	165+	0.27 to 0.53
MC-30	ASTM D 2027	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, Sabolt 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 D 5. Ductility of 40 cm minimum at 77 °F when tested under ASTM D 113. Solubility in trichloroethylene of 97.5% minimum.

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, 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 10%. 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 1, depending on the base course surface texture. The type of material and application rate shall be approved by the Engineer prior to application.

Following the application, the primed surface shall be allowed to dry 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 and spreading any sand necessary to blot up excess prime coat.

602-3.4 CONTRACTOR'S RESPONSIBILITY. Samples of the prime coat materials that the Contractor proposes to use, together with a statement as to their source and character, must be submitted and approved before use of such material begins. The Contractor shall require the manufacturer or producer of the materials to furnish material subject to this and all other pertinent requirements of the contract. Only satisfactory materials, so demonstrated by certified tests, shall be acceptable.

The Contractor shall furnish vendor's certified test reports for each carload, or equivalent, of prime coat material shipped to the project. The report shall be delivered to the Engineer before permission is granted for use of the material. The furnishing of the vendor's certified test report for the material shall not be interpreted as basis for final acceptance. All such test reports shall be subject to verification by testing samples of materials received for use on the project.

602-3.5 FREIGHT AND WEIGH BILLS. Before the final estimate is allowed, the Contractor shall file with the Engineer receipted bills when railroad shipments are made, and certified weigh bills 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 weigh bills 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.

BASIS OF PAYMENT

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

TESTING REQUIREMENTS

AASHTO T 59	Testing Emulsified Asphalts
ASTM D 5	Penetration of Bituminous Materials
ASTM D 113	Ductility of Bituminous Materials

MATERIAL REQUIREMENTS

AASHTO M 140	Emulsified Asphalt
AASHTO M 208	Cationic Emulsified Asphalt
ASTM D 2027	Standard Specification for Cutback Asphalt (Medium-Curing Type)
ASTM D 2028	Asphalt, Cutback (Rapid Curing Grade)

ITEM P-603 TACK COAT

DESCRIPTION

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

MATERIALS

603-2.1 MATERIALS. Tack coat material shall be either cutback asphalt, emulsified asphalt, or tar and shall conform to the requirements of Table 1. The type, grade, controlling specification, and application temperature of tack coat to be used shall be specified by the Engineer.

TABLE 1. MATERIAL

Type and Grade	Specification	Application Temperature °F	Application Rate gal/yd^2
Emulsified Asphalt			
SS-1, SS-1h	AASHTO M 140	75-130	0.05 to 0.16
CSS-1, CSS-1h	AASHTO M 208	75-130	0.05 to 0.16
STE-1	\1\	68-140	0.08 to 0.10
Cutback Asphalt			
RC-70	ASTM D 2028	120-160	0.05 to 0.16
Tar			
RTCB 5, RTCB 6	AASHTO M 52	60-120	0.05 to 0.16

\1\ STE-1 shall meet the following specifications: Viscosity, Sabolt Furol at 77 °F of 30 max., when tested under AASHTO T 59. Particle charge test of Positive when tested under AASHTO T 59 (If particle charge test is inconclusive, material having a max. pH value of 6.7 will be acceptable). Storage Stability, 1 day 1% max when tested under AASHTO T 59. Demulsibility, 35 mil 0.8% Dioctyl Sodium Sulfosuccinate Solution 25 minimum 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 5% maximum when tested under AASHTO T 59. Residue of 45% minimum when tested under AASHTO T 59. Penetration at 77 °F, 100 gm, 5 sec. of 100 minimum, 200 maximum when tested under ASTM D 5. Ductility at 77 °F of 40 cm minimum when tested under ASTM D 113. Solubility in trichloroethylene of 97.5% minimum

CONSTRUCTION METHODS

603-3.1 WEATHER LIMITATIONS. The tack coat shall be applied only when the existing surface is dry and the surface temperature is above 40 °F. The temperature requirements may be waived, but only when so directed by the Engineer.

603-3.2 EQUIPMENT. The Contractor shall provide equipment for heating and applying the tack coat.

The distributor shall be designed, equipped, maintained, and operated so that tack 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 10%. 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.

603-3.3 APPLICATION OF TACK COAT. Immediately before applying the tack coat, the full width of surface to be treated shall be swept with a power broom and/or airblast to remove all loose dirt and other objectionable material.

Emulsified asphalt shall be applied a sufficient time in advance of the paver to ensure that all water has evaporated before any of the overlying mixture is placed on the tacked surface.

The tack coat material including vehicle or solvent shall be uniformly applied with an asphalt distributor at the rate specified in Table 1, depending on the condition of the existing surface. The type of material and application rate shall be approved by the Engineer prior to application.

Following the application, the surface shall be allowed to cure without being disturbed for such period of time as may be necessary to permit drying out and setting of the tack coat. This period shall be determined by the Engineer. The surface shall then be maintained by the Contractor until the next course has been placed. Suitable precautions shall be taken by the Contractor to protect the surface against damage during this interval.

603-3.4 CONTRACTOR'S RESPONSIBILITY. Samples of the tack coat material that the Contractor proposes to use, together with a statement as to its source and character, must be submitted and approved before use of such material begins. The Contractor shall require the manufacturer or producer of the tack coat to furnish material subject to this and all other pertinent requirements of the contract. Only satisfactory materials so demonstrated by certified tests, shall be acceptable.

The Contractor shall furnish the vendor's certified test reports for each carload, or equivalent, of tack coat shipped to the project. The report shall be delivered to the Engineer before permission is granted for use of the material. The furnishing of the vendor's certified test report for the material shall not be interpreted as a basis for final acceptance. All such test reports shall be subject to verification by testing samples of material received for use on the project.

603-3.5 FREIGHT AND WEIGH BILLS. Before the final estimate is allowed, the Contractor shall file with the Engineer receipted bills when railroad shipments are made, and certified weigh bills when materials are received in any other manner, of the tack coat actually used in the construction covered by the contract. The Contractor shall not remove tack 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 weigh bills shall be furnished to the Engineer during the progress of the work.

METHOD OF MEASUREMENT

603-4.1 Tack coat will be measured by the ton according to Subsection GCP-90-02.

BASIS OF PAYMENT

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

Payment will be made under:

Item P-603a Tack Coat STE-1 - per ton

TESTING REQUIREMENTS

AASHTO T 59	Testing Emulsified Asphalts
ASTM D 5	Penetration of Bituminous Materials
ASTM D 113	Ductility of Bituminous Materials

MATERIAL REQUIREMENTS

AASHTO M 52	Tar for Use in Road Construction
AASHTO M 140	Emulsified Asphalt
AASHTO M 208	Cationic Emulsified Asphalt
ASTM D 633	Volume Correction Table for Road Tar
ASTM D 2028	Liquid Asphalt (Rapid-Curing Type)

ITEM P-610 STRUCTURAL PORTLAND CEMENT CONCRETE

DESCRIPTION

610-1.1 This item shall consist of plain or reinforced structural portland cement concrete, prepared and constructed according to these Specifications, at the locations and of the form and dimensions shown on the Plans.

MATERIALS

610-2.1 GENERAL. Only approved materials, conforming to the requirements of these Specifications, shall be used in the work. They may be subjected to inspection and tests at any time during the progress of their preparation or use. The source of supply of each of the materials shall be approved by the Engineer before delivery or use is started. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be scored and handled to insure the 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 therein.

In no case shall the use of pit-run or naturally mixed aggregates be permitted. Naturally mixed aggregate shall be screened and washed, and all fine and coarse aggregates shall be stored separately and kept clean. The mixing of different kinds of aggregates from different sources in one storage pile or alternating batches of different aggregates will not be permitted.

610-2.2 COARSE AGGREGATE. The coarse aggregate 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 WAQTC FOP for AASHTO T 27/T 11.

610-2.3 FINE AGGREGATE. The fine aggregate shall meet the requirements of AASHTO M 6..

The fine aggregate shall be well graded from fine to coarse, and shall meet the requirements of AASHTO M 6, Table 1, when tested according to WAQTC FOP for AASHTO T 27/T 11.

Blending will be permitted, if necessary, in order to meet the gradation requirements for fine aggregate. Fine aggregate deficient in the percentage of material passing the No. 50 sieve may be accepted, provided that such deficiency does not exceed 5% and is remedied by the addition of pozzolanic or cementitious materials other than portland cement, as specified in 610-2.6 on admixtures, in sufficient quantity to produce the required workability as approved by the Engineer.

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

The Contractor shall furnish manufacturer's certified test reports for each carload, or equivalent, of cement shipped to the project. The report shall be delivered to the Engineer before permission to use the cement is granted. All such test reports shall be subject to verification by testing sample materials received for use on the project.

610-2.5 WATER. The water used in concrete shall be potable and free from sewage, oil, acid, strong alkalies, vegetable matter, and clay and loam. If the water is of questionable quality, it shall be tested according to AASHTO T 26.

610-2.6 ADMIXTURES. The use of any material added to the concrete mix shall be indicated on the mix design approved by the Engineer. Before approval of any material, the Contractor shall be required to submit

the results of complete physical and chemical analyses made by an acceptable testing laboratory. Subsequent tests shall 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.

Pozzolanic admixtures shall be fly ash or raw or calcined natural pozzolans meeting the requirements of AASHTO M 295.

Air-entraining admixtures shall meet the requirements of AASHTO M 154. Air-entraining admixtures shall be added at the mixer in the amount necessary to produce the specified air content.

Water-reducing, set-controlling admixtures shall meet the requirements of AASHTO M 194, Type A water-reducing, or Type D water-reducing and retarding. Water-reducing admixtures shall be added at the mixer separately from air-entraining admixtures according to the manufacturer's printed instructions.

610-2.7 PREMOLDED JOINT MATERIAL. Premolded joint material for expansion joints shall meet the requirements of AASHTO M 213.

610-2.8 JOINT FILLER. The filler for joints shall meet the requirements of Item P-605.

610-2.9 STEEL REINFORCEMENT. Reinforcing shall consist of Deformed and Plain Billet-Steel Bars conforming to the requirements of AASHTO M 31, Welded Steel Wire Fabric conforming to the requirements of AASHTO M 55, Welded Deformed Steel Fabric conforming to the requirements of AASHTO M 221, or Bar Mats conforming to the requirements of AASHTO M 54, as shown on the Plans.

610-2.10 COVER MATERIALS FOR CURING. Curing materials shall conform to one of the following specifications:

AASHTO M 171	Sheet Materials for Curing Concrete
AASHTO M 148, Type 1 or 2	Liquid Membrane-Forming Compounds for Curing Concrete

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 herein. All machinery and equipment owned or controlled by the Contractor, which they propose to use on the work, shall be of sufficient size to meet the requirements of the work, and shall be such as to produce satisfactory work; all work shall be subject to the inspection and approval of the Engineer.

610-3.2 CONCRETE COMPOSITION. The concrete shall develop a minimum compressive strength of 3,600 psi in 28 days as determined by test cylinders made according to WAQTC FOP for AASHTO T 23 and tested according to AASHTO T 22. The concrete shall contain not less than 564 pounds of cement per cubic yard. The concrete shall contain 5% of entrained air, plus or minus 1%, as determined by WAQTC FOP for AASHTO T 152 and shall have a slump of not more than 4 inches as determined by WAQTC FOP for AASHTO T 119.

610-3.3 ACCEPTANCE SAMPLING AND TESTING. Concrete for each structure will be accepted on the basis of the compressive strength specified in Subsection 610-3.2. The concrete will be sampled according to WAQTC TM 2. Compressive strength specimens will be made according to WAQTC FOP for AASHTO T 23 and tested according to AASHTO T 22.

The Engineer will make the actual tests on the specimens at no expense to the Contractor.

610-3.4 PROPORTIONING AND MEASURING DEVICES. When package cement is used, the quantity for each batch shall be equal to one or more whole sacks of cement. The aggregates shall be measured separately by weight. If aggregates are delivered to the mixer in batch trucks, the exact amount for each

mixer charge shall be contained in each batch compartment. Weighing boxes or hoppers shall be approved by the Engineer and shall provide means of regulating the flow of aggregates into the batch box so that the required and exact weight of aggregates can be readily obtained.

610-3.5 CONSISTENCY. The consistency of the concrete shall be checked by the slump test specified in WAQTC FOP for AASHTO T 119.

610-3.6 MIXING. Concrete may be mixed at the construction site, at a central point, or in truck mixers. The concrete shall be mixed and delivered according to the requirements of AASHTO M 157.

610-3.7 MIXING CONDITIONS. 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 permission of the Engineer. If permission 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 their expense.

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

The delivery of concrete to the job shall be in such a manner that batches of concrete will be deposited at uninterrupted intervals.

610-3.8 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 designed 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 Contractor shall bear responsibility for their adequacy. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes.

The internal ties shall be arranged so that, when the forms are removed, no metal will show in the concrete surface or discolor the surface when exposed to weathering. All forms shall be wetted with water or with a nonstaining mineral oil which shall be applied shortly before the concrete is placed. Forms shall be constructed so that they can be removed without injuring the concrete or concrete surface. The forms shall not be removed before the expiration of at least 30 hours from vertical faces, walls, slender columns, and similar structures; forms supported by falsework under slabs, beams, girders, arches, and similar construction shall not be removed until tests indicate that at least 80% of the design strength of the concrete has developed.

610-3.9 PLACING REINFORCEMENT. All reinforcement shall be accurately placed, as shown on the Plans, and shall be firmly held in position during concreting. 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.

610-3.10 EMBEDDED ITEMS. Before placing concrete, any items that are to be embedded shall be firmly and securely fastened in place as indicated. All such items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The embedding of wood shall be avoided. The concrete shall be spaded and consolidated around and against embedded items.

610-3.11 PLACING CONCRETE. All concrete shall be placed during daylight, unless otherwise approved. The concrete shall not be placed until the depth and character of foundation, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved. Concrete shall be placed as soon as practical after mixing and in no case later than 1 hour after water has been added to the mix. The method and manner of placing shall be such to avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. Dropping the concrete a distance of more than 5 feet, or depositing a large quantity at one point, will not be permitted. Concrete shall be placed upon clean, damp surfaces, free from running water, or upon properly consolidated soil.

The concrete shall be compacted with suitable mechanical vibrators operating within the concrete. When necessary, vibrating shall be supplemented by hand spading with suitable tools to assure proper and adequate compaction. Vibrators shall be manipulated so as to work the concrete thoroughly around the reinforcement and embedded fixtures and into corners and angles of the forms. The vibration at any joint shall be of sufficient duration to accomplish compaction but shall not be prolonged to the point where segregation occurs. Concrete deposited under water shall be carefully placed in a compact mass in its final position by means of a tremie, a closed bottom dump bucket, or other approved method and shall not be disturbed after being deposited.

610-3.12 CONSTRUCTION JOINTS. When the placing of concrete is suspended, necessary provisions shall be made for joining future work before the placed concrete takes its initial set. For the proper bonding of old and new concrete, such provisions shall be made for grooves, steps, keys, dovetails, reinforcing bars or other devices as may be prescribed. The work shall be arranged so that a section begun on any day shall be finished during daylight of the same day. Before depositing new concrete on or against concrete which has hardened, the surface of the hardened concrete shall be cleaned by a heavy steel broom, roughened slightly, wetted, and covered with a neat coating of cement paste or grout.

610-3.13 EXPANSION JOINTS. Expansion joints shall be constructed at such points and of such dimensions as may be indicated on the drawings. The premolded filler shall be cut to the same shape as that of the surfaces being joined. The filler shall be fixed firmly against the surface of the concrete already in place in such manner that it will not be displaced when concrete is deposited against it.

610-3.14 DEFECTIVE WORK. Any defective work disclosed after the forms have been removed shall be immediately removed and replaced. If any dimensions are deficient, or if the surface of the concrete is bulged, uneven, or shows honeycomb, which in the opinion of the Engineer cannot be repaired satisfactorily, the entire section shall be removed and replaced at the expense of the Contractor.

610-3.15 SURFACE FINISH. All exposed concrete surfaces shall be true, smooth, free from open or rough spaces, depressions, or projections. The concrete in horizontal plane surfaces shall be brought flush with the finished top surface at the proper elevation and shall be struck-off with a straightedge and floated. Mortar finishing shall not be permitted, nor shall dry cement or sand-cement mortar be spread over the concrete during the finishing of horizontal plane surfaces.

When directed, the surface finish of exposed concrete shall be a rubbed finish. If forms can be removed while the concrete is still green, the surface shall be pointed and wetted and then rubbed with a wooden float until all irregularities are removed. If the concrete has hardened before being rubbed, a carborundum stone shall be used to finish the surface. When approved, the finishing can be done with a rubbing machine.

610-3.16 CURING AND PROTECTION. All concrete shall be properly cured and protected by the Contractor. The work shall be protected from the elements, flowing water, and from defacement of any nature during the building operations. The concrete shall be cured as soon as it has sufficiently hardened by covering with an approved material. Water-absorptive coverings shall be thoroughly saturated when placed and kept saturated for a period of at least 3 days for Type III Portland Cement and at least 7 days for Type I or Type II Portland Cement Concrete. All curing mats or blankets shall be sufficiently weighted or tied down to keep the concrete surface covered and to prevent the surface from being exposed to currents of air. Where wooden forms are used, they shall be kept wet at all times until removed to prevent the opening of joints and drying out of the concrete. Traffic shall not be allowed on concrete surfaces for 7 days after the concrete has been placed.

610-3.17 DRAINS OR DUCTS. Drainage pipes, conduits, and ducts that are to be encased in concrete shall be installed by the Contractor before the concrete is placed. The pipe shall be held rigidly so that it will not be displaced or moved during the placing of the concrete.

610-3.18 COLD WEATHER PROTECTION. When concrete is placed at temperatures below 40 °F, the Contractor shall provide satisfactory methods and means to protect the mix from injury by freezing. The aggregates, or water, or both, shall be heated in order to place the concrete at temperatures between 50 and 100 °F.

610-3.19 FILLING JOINTS. All joints which require filling shall be thoroughly cleaned, and any excess mortar or concrete shall be cut out with proper tools. Joint filling shall not be started until after final curing and shall be done only when the concrete is completely dry. The cleaning and filling shall be carefully done with proper equipment and in a manner to obtain a neat looking joint free from excess filler.

METHOD OF MEASUREMENT

610-4.1 Portland cement concrete will be measured by the number of cubic yards of concrete complete in place and accepted. In computing the volume of concrete for payment, the dimensions used will be those shown on the Plans or ordered by the Engineer. No measurements or other allowances will be made for forms, falsework, cofferdams, pumping, bracing, expansion joints, or finishing of the concrete. No deductions will be made for the volumes of reinforcing steel or embedded items. When the pay items shown below are absent from the bid schedule, no measurement for payment will be made.

610-4.2 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.

BASIS OF PAYMENT

610-5.1 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. All work, materials, and equipment required to complete the work will be subsidiary to those items referencing item P-610.

TESTING REQUIREMENTS

AASHTO T 22	Compressive Strength of Cylindrical Concrete Specimens
AASHTO T 26	Quality of Water to be used in Concrete
WAQTC FOP for AASHTO T 23	Making & Curing Concrete Test Specimens in the Field
WAQTC FOP for AASHTO T 27/T 11	Sieve Analysis of Aggregates & Soils

WAQTC FOP for AASHTO T 119	Slump of Freshly Mixed Concrete
WAQTC FOP for AASHTO T 152	Air Content of Freshly Mixed Concrete by the Pressure Method
WAQTC TM 2	Sampling Freshly Mixed Concrete

MATERIAL REQUIREMENTS

AASHTO M 6	Fine Aggregate for Portland Cement Concrete
AASHTO M 31	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
AASHTO M 43	Sizes of Aggregate for Road and Bridge Construction
AASHTO M 54	Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
AASHTO M 55	Steel Welded Wire Reinforcement, Plain, for Concrete
AASHTO M 80	Coarse Aggregate for Portland Cement Concrete
AASHTO M 85	Portland Cement
AASHTO M 148	Liquid Membrane-Forming Compounds for Curing Concrete
AASHTO M 154	Air-Entraining Admixtures for Concrete
AASHTO M 157	Ready-Mixed Concrete
AASHTO M 171	Sheet Materials for Curing Concrete
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 221	Steel Welded Wire Reinforcement, Deformed, for Concrete
AASHTO M 295	Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
AWS D12.1	Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction

ITEM P-620 RUNWAY AND TAXIWAY PAINTING

DESCRIPTION

620-1.1 This item shall consist of the painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, according to these Specifications and at the locations shown on the Plans, or as directed by the Engineer. 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 safety and phasing plans.

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. 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. Provide manufacturer certification 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 PAINT. Paint shall be waterborne or solvent base according to the requirements of Subsection 620-2.2, a. or b. Paint shall be furnished in white (37925) and yellow (33538 or 33655) according to Federal Standard No 595. Paint shall be furnished in Type II (fast drying time for no-pick-up) when tested according to ASTM D 711.

a. Waterborne. Paint shall meet the requirements of Federal Specification TT-P-1952E, Type II.

b. Solvent Base. Paint shall meet the requirements of Federal Specification A-A-2886B, Type II, or the State of Alaska DOT&PF maintenance specification for "Traffic Paint - No-Heat Instant Dry Pavement Marking Material".

620-2.3 REFLECTIVE MEDIA. Glass beads shall meet the requirements of Fed. Spec. TT-B-1325, Type I, gradation A. Glass beads shall be treated with adhesion promoting and/or flotation coatings as specified by the manufacturer of the paint.

620-2.4 STENCILS. Use 1/10-inch orthopedic grade plastic stencils.

CONSTRUCTION METHODS

620-3.1 WEATHER LIMITATIONS. The painting shall be performed only when the surface is dry and when the surface temperature is at least 40 °F and rising and the pavement surface temperature is at least 5 °F above the dew point.

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 marking machine suitable for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall apply markings of uniform cross sections and clear-cut edges without running or spattering and without over spray.

The equipment used for painted marking removal shall meet the following minimum requirements:

- Mounted on a self-propelled chassis.
- Have a 1.25 hour water supply.

- UHP Pump – an ultra-high-pressure pump that produces 40,000 psi at 6 gallons per minute.
- Vacuum – volumetric flow rate of 700 CFM at 2850 RPM. Simultaneous vacuum recovery protects the environment and allows for application of new markings in 15-20 minutes on an average weather day.
- Disposal Tank – 660 gallon storage with a water filtration system that separates the water from the debris so that the debris is disposed of in a nearly dry state, while water is filtered to 100 micron.
- Water Tank – 600 gallon storage.
- Blasting Heads – single blasting head in front that can easily be adapted anywhere from 6-14 inches along with a variety of levels of aggression to match any application. Joystick control for positioning blasting head.

620-3.3 PREPARATION OF SURFACE. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other foreign material which would reduce the bond between the paint and the pavement. The area to be painted shall be cleaned by sweeping and blowing or by other methods as required to remove all dirt, laitance, and loose materials. 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.

620-3.4 LAYOUT OF MARKINGS. The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the Plans. 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. 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 have 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 the marking dimensions and spacings shall be within the following tolerances:

Dimension and Spacing	Tolerance
Less than 36 inches	1/2 inch
36 inches to 6 feet	1 inch
6 feet to 60 feet	2 inches
Over 60 feet	3 inches

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

TABLE 1. APPLICATION RATES FOR PAINT AND GLASS BEADS

Paint Type	Paint, ft^2/gal maximum	Glass Beads lb/gal of paint (±2 oz.)
Waterborne	80	7
Solvent Base	80	6

Pavement shall cure for 7 days or as directed by the Engineer before painting. 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 25 percent of the total application rate. Apply the remaining 75 percent 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.

Pressure apply the glass beads on the marked areas at the locations shown on the Plans using a mechanical dispenser mounted not more than 12 inches behind the paint dispenser. Beads shall be applied at the rate shown in Table 1 and shall adhere to the cured paint or all marking operations shall cease until corrections are made.

All emptied containers shall be returned 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.

Use stencils for application of runway hold short markings, taxiway hold short markings, surface painted holding position signs, taxiway enhanced centerline markings, and ILS markings. Stencils become property of the State. After application and approval of painted traffic markings, deliver the clean and re-useable stencils to ADOT Maintenance and Operations as directed by the Engineer.

620-3.6 PROTECTION. After application of the paint, all markings shall be protected from damage until the paint is dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings of paint.

620-3.7 PAINTED MARKING REMOVAL. Where indicated, use high pressure water or sand blasting 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. 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.

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.

620-4.3 RUNWAY AND TAXIWAY PAINTING BY LUMP SUM. If a lump-sum item appears in the bid schedule, new painted markings will not be measured for payment. In this case, reflective media (glass beads) as indicated on the plans are subsidiary to the item.

620-4.4 PAINTED MARKING REMOVAL. Painted marking removal will be measured by area acceptably completed with the following exception. If painted marking removal is absent from the bid schedule, no measurement will be made and this item will be subsidiary to painting.

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 P-620c	Runway and Taxiway Painting - per lump sum
Item P-620e	Painted Marking Removal - per square foot
Item P-620f	Roadway Painting – per lump sum

TESTING REQUIREMENTS

ASTM C 371	Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders
ASTM D 92	Flash and Fire Points by Cleveland Open Cup

ASTM D 711	No-Pick-Up Time of Traffic Paint
ASTM D 968	Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D 1652	Epoxy Content of Epoxy Resins
ASTM D 2074	Total Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D 2240	Rubber Products-Durometer Hardness
ASTM G 53	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

Alaska DOT/PF Yellow	Traffic Paint - No-Heat Instant Dry Pavement Marking Material; White and
ASTM D 476	Titanium Dioxide Pigments
Code of Federal Regulations	40 CFR Part 60, Appendix A, 29 CFR Part 1910.1200
Code of Federal Regulations	29 CFR Part 1910.1200 – Hazard Communications
Commercial Item Description (CID) A-A-2886B	Paint, Traffic, Solvent Based
Fed. Spec. TT-B-1325	Beads (Glass Spheres) Retroreflective
Fed. Spec. TT-P-1952E	Paint, traffic and Airfield Marking, Waterborne
Federal Standard 595	Colors used in Government Procurement

ITEM P-621 SAW-CUT GROOVES

DESCRIPTION

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

CONSTRUCTION METHODS

621-2.1 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 length of new runway pavement (blast pads do not require grooving). They must be saw-cut transversely in the runway pavement to not less than 10 feet from the runway pavement edge to allow adequate space for equipment operation. The Contractor must provide a grooving machine of a type 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. 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 within the specified tolerances.

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.

621-2.3 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.

621-2.4 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 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. Permit new Portland cement concrete pavements to cure for a minimum of 28 days before 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 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

621-2.7 REPAIR OF DAMAGED PAVEMENT. Grooving must be stopped and damaged pavement repaired at the Contractor's expense when in the opinion of the Engineer the result of the grooving operation will be detrimental to aircraft tires.

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 inches and a resolution of at least 0.005 inches. 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 inches.

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 follows:

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 inches shall be considered less than 3/16 inches.

Width or depth measurements more than 0.330 inches shall be considered more than 5/16 inches.

Width or depth measurements more than 0.235 inches shall be considered more than 1/4 inches.

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.

The Engineer may require a written report indicating the percentage of grooves that meet tolerances and may require a report indicating how many times production was adjusted. Blade wear and surface variability may require more testing than the minimum of three per day per equipment. It is expected that the Contractor will routinely spot check for compliance each time the equipment aligns for a grooving pass.

METHOD OF MEASUREMENT

920-4.1 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

920-5.1 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 P-621b Saw-Cut Grooves - per lump sum

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 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

640-2.2 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 B 209.

(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 punching of holes prior to the base metal preparation.

(3) Treat the aluminum base metal sheets with chromate conversion coating for aluminum conforming to the requirements of ASTM B 449, 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) Cover one side of each panel with orange reflective sheeting, meeting the requirements of AASHTO M 268, Type III.

b. Stanchions. Perforated, galvanized, square steel tubing with the dimensions shown on the Plans and meeting the following requirements:

(1) Fabricate tube with cold-rolled carbon steel sheets, 12 gage, commercial quality, meeting ASTM A 653, coating designation G 90. Form tubes, roll to size, and weld in the corner.

(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 A 36, 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.

640-3.3 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. If Item P-151 is not included in the bid schedule, clearing is subsidiary.

Payment will be made under:

Item P-640b Segmented Circle (Panel-Type) - per lump sum

MATERIAL REQUIREMENTS

AASHTO M 268	Standard Specification for Retroreflective Sheeting
ASTM A 36	Structural Steel
ASTM A 653	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 924	Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B 209	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 449	Standard Specification for Chromates on Aluminum
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-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 chromate conversion coating for aluminum to meet ASTM B 449, 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 AASHTO M 268, for the type specified.

c. Sign Posts. Use the type and size of posts designated on the Plans. See also CBJ Standard Drawings, Detail-127A in Appendix N.

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 P-661a Standard Sign – per square foot

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.

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 x 12 inches and a length of 8 feet. Use pressure treated wood with a preservative salt retention of not less than 0.6 lbs/ft^3, kiln dried after impregnation, and conforming to the American Wood Preservers Bureau (AWPB) FDN Standard. Provide timbers that bear the AWPB Quality Mark of an approved inspection agency as described in the AWPB Standard. Use either oil base or latex exterior paint in colors international orange and white.

b. Hazard Marker Barrier, Plastic. Hazard marker barriers shall be AR 10 x 96 HDPE Airport Barricades as manufactured by Multi-barrier, or approved equal. Provide 10 inch x 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 x 72-inch reflective striping panel for attachment to one side of each barrier.

670-2.2 Flag. Provide heavy vinyl coated nylon, 18 inch x 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 ¾ inch x 30-inch staff.

670-2.3 Flasher Unit. Provide battery-operated omnidirectional flashing red light Airfield Grade C01 Flashing Red Solar Light as manufactured by Multi-Barrier or approved equal.. 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.

670-3.3 STORAGE. Following completion of the project, remove flasher units and flags from the barriers. Barriers, flasher units, and flags are the property of -CBJ. Drain plastic barriers. Deliver to a location on the Airport designated by the Engineer.

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.

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 P-670a Hazard Marker Barrier, [Plastic] - 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 section 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 oz/yd^2, 70% closed mesh allowing water to flow through. Use 3.0 oz/yd^2 woven polyester fabric, coated after weaving with 6.0 oz/yd^2 coating of poly vinyl chloride, color traffic yellow. Minimum tensile strength 230x200 lbs grab method and 200x140 lbs strip method. Meet ASTM D 471 for water absorption, 7 days @160 degrees F, 5.0% maximum weight gain and ASTM D 750 for weathering, 2500 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)

(a) 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. Provide a trailer mounted light assembly conforming to FAA L-893 lighted visual aids to indicate temporary runway or taxiway closure. Provide a commercially manufactured product with integral engine and generator that is listed under AC 150/5345-53, Airport Lighting Equipment Certification Program. This AC, the latest certified equipment list, and the address list of certified airport lighting equipment manufacturers are available on the Internet page for the FAA Office of the Associate Administrator for Airports (ARP). The internet address is

http://www.faa.gov/airports_airtraffic/airports/construction/. Provide Hali-Brite Runway Closure Marker #RCM-D (326) or approved equal that is listed under AC 150/5345-53.

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 Illuminated Panel. Maintain uninterrupted operation of the closure marker. Locate the marker where shown on the plans or as directed by the Engineer.

At the completion of the project, the illuminated panels become the property of the State and shall be delivered to the Nome Airport Manager.

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 P-671a Runway Closure Marker, [Temporary Illuminated Panel] - per each

TESTING REQUIREMENTS

ASTM D 471 Rubber Property – Effect of Liquids

ASTM D 750 Rubber Deterioration in Carbon-Arc Weathering Apparatus

SECTION P-680 GEOTEXTILE FOR SILT FENCE

DESCRIPTION

680-1.1 Furnish, place, maintain, and remove temporary silt fence as shown on the Plans or as directed.

MATERIALS

680-2.1 GEOTEXTILE. Use geotextile that meets AASHTO M 288 for Temporary Silt Fence.

680-2.2 POSTS. Use posts made of wood, steel, or approved synthetic material that will adequately support the fence under forces induced by water and sediment loading.

CONSTRUCTION REQUIREMENTS

680-3.1 Erect geotextile fence before excavation or embankment construction begins.

680-3.2 POST INSTALLATION. Place posts a maximum of 8 feet apart and drive a minimum of 18 inches into the ground.

680-3.3 GEOTEXTILE PLACEMENT. Install geotextile on posts in a vertical position and support by a wire mesh fence or self-support system. Set at the height specified in the Contract. Secure the bottom 18 inches of the geotextile on the upslope side of the fence as shown on the Plans. Backfill trench with tamped soil. Join adjacent sections of geotextile only at posts with a minimum of 6 inches overlap.

680-3.4 MAINTENANCE AND REMOVAL. Maintain the integrity of the fence as long as it is necessary to contain sediment runoff. Inspect the fence daily and correct deficiencies immediately. Remove and dispose of the fence when adequate vegetative growth insures no further erosion of the slopes. Cut off the fabric at ground level and remove the fabric, wire and posts. When thickness of trapped sediment is in excess of 4 inches above the ground, either remove sediment from the site or spread sediment uphill of the fence and seed all exposed soil immediately, following the requirements of Item T-901.

METHOD OF MEASUREMENT

680-4.1 Fence will be measured in place, on the ground along the post line.

BASIS OF PAYMENT

680-5.1 Payment will be made as follows: 60% for installation. 25% for maintenance and repairs, prorated at the Engineer's discretion, 15% for removing it from the site.

Payment will be made under:

Item P-680a Silt Fence – per linear foot

ITEM P-681 GEOTEXTILE FOR SEPARATION AND STABILIZATION

DESCRIPTION

681-1.1 Prepare surfaces and furnish and place geotextiles for embankment separation and/or stabilization as shown on the Plans.

MATERIALS

681-2.1 Use geotextiles and sewing thread that conform to the following:

b. Stabilization. Meet AASHTO M288 for Stabilization, except provide a minimum permittivity of 0.08 sec^{-1}.

CONSTRUCTION REQUIREMENTS

681-3.1 Surface Preparation. Prepare surface by removal of stumps, brush, boulders, and sharp objects. Fill holes and large ruts with material shown on the Plans or as approved.

681-3.2 Geotextile Placement. Unroll geotextile directly onto the prepared surface. Stretch geotextile to remove any creases or wrinkles. Do not expose geotextiles to the elements for longer than 5 days after removal of protective covering.

b. Stabilization. Lay geotextile for embankment stabilization perpendicular to the embankment centerline. Join segments by sewing or an approved bonding or attachment process.

681-3.3 Joining. Join geotextile for stabilization by sewing. Use other attachment methods, if approved.

a. Sew seams with a butterfly or j-seam. Use 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 1-¼ inches (± ¼-inch) from the folded edge of the seam and at least ½-inch from the free edge of the geotextile.

b. Overlapped sections must overlap a minimum of 3 feet.

TABLE 1

GEOTEXTILE PLACEMENT ON CURVES

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

681-3.4 Material Placing and Spreading. During placing and spreading, maintain a minimum depth of 12 inches of cover material at all times between the fabric and the wheels or tracks of the construction equipment.

Spread the material in the direction of the fabric overlap. Maintain proper overlap and fabric 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 spread the cover material simultaneously with dumping to minimize the potential of a localized subgrade failure.

Compact using a smooth drum roller. Do not allow construction equipment to make sudden stops, starts, or turns on the cover material.

681-3.5 Geotextile Repair.

b. Stabilization. Sew according to Subsection 681-3.3.

METHOD OF MEASUREMENT

681-4.1 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.

BASIS OF PAYMENT

681-5.1 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 P-681b Geotextile, Stabilization - per square yard

ITEM T-901 SEEDING

DESCRIPTION

901-1.1 This work consists of preparing the ground and applying seed and fertilizer in conformance with the Plans and Specifications.

The intent of this work is to provide a living vegetative cover in the areas indicated on the Plans and to maintain the cover for the term of the Contract.

MATERIALS

901-2.1 SEED. Furnish the seed mixture listed below. .

Meet the applicable requirements of the State of Alaska Seed Regulations, 11 AAC 34, Articles 1 and 4.

Meet or exceed 90% pure seed and 85% germination.

Furnish 4 signed copies of a report for each lot of seed, certifying it has been tested by an approved laboratory within 9 months of date of seed application. Submit these certifications no later than 10 days prior to seeding. Seed certificates shall be removed from bags on site and submitted to the Engineer prior to installation. Include the following in each certification:

- **a.** name and address of laboratory
- **b.** date of test
- **c.** lot number
- **d.** seed name
- **e.** percent pure seed
- **f.** percent germination
- **g.** percent weed content
- **h.** percent inert matter

901-2.2 REVEGETATION SEED MIX. Conform to the following:

Schedule - A Revegetation Seed Mix

Name	Proportion By Weight	Purity	Germination
Arctared Fescue			
(Festuca rubra)	90%	90%	85%
Annual ryegrass			
(Lolium multiflorum)	10%	90%	85%

901-2.3 FERTILIZER. Furnish a 20-20-10 fertilizer containing no cyanamid compounds or hydrated lime. Tolerances of the chemical ingredients shall be plus or minus 2%.

Use standard commercial fertilizer supplied separately or in mixtures, and in moisture proof containers. Mark each container with the total net weight and with the manufacturer's guaranteed analysis of the contents showing the percentage for each ingredient.

CONSTRUCTION METHODS

901-3.1 SOIL PREPARATION. Clear all areas to be seeded of stones 4 inches in diameter and larger and of all sticks, stumps, noxious weeds, and other debris or irregularities that might interfere with the seeding operation, growth of grass, or subsequent maintenance of the grass covered areas.

Just prior to seeding, roughen the surface of all areas to be seeded by track-walking transversely up and down the slopes or using a scarifying slope board. Round the top and bottom of the slopes, when necessary, to facilitate tracking and to create a pleasing appearance, but do not disrupt drainage flow lines. Where fill is adjacent to wetlands, keep the equipment entirely on the fill slope.

901-3.2 SEEDING SEASONS. Seed and fertilize between May 15 and August 15.

Do not seed during windy conditions or when climatic conditions or ground conditions would hinder placement or proper growth.

901-3.3 APPLICATION. Apply seed and fertilizer at the rates specified below. Use either of the following methods:

Apply seed uniformly at a rate of 153 lbs per acre. Apply fertilizer uniformly over the area to be seeded at a rate of 500 pounds per acre.

a. Hydraulic Method.

(1) Mix a slurry of seed, fertilizer, water, and other components as required by the Special Provisions. Add seed to the slurry mixture no more than 30 minutes before application.

(2) Use hydraulic seeding equipment that will maintain a continuous agitation and apply a homogeneous mixture through a spray nozzle. The pump must produce enough pressure to maintain a continuous nonfluctuating spray that will reach the extremities of the seeding area, without causing damage to the seed bed. Use a hose attachment to reach areas where a fixed nozzle cannot reach.

(3) If mulch material is required, add it to the water slurry in the hydraulic seeder after adding the proportionate amounts of seed and fertilizer.

(4) Apply slurry at a rate that distributes all materials evenly.

b. Dry Method.

(1) Use mechanical spreaders, seed drills, landscape seeders, cultipacker seeders, fertilizer spreaders, or other approved mechanical spreading equipment.

(2) Moisten the soil prior to the application of seed and fertilizer and immediately afterwards.

(3) Mix or rake the seed and fertilizer into the seed bed to a depth of 1/2 inch, unless mulch material is to be applied immediately.

901-3.4 MAINTENANCE OF SEEDED AREAS. Protect seeded areas against traffic using approved warning signs or barricades. Promptly repair surfaces that are gullied or otherwise damaged following seeding by regrading and reseeding, as directed. Maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

Keep temporary erosion control measures in place until the vegetation is accepted.

Water the seeded areas, as required, for proper germination and growth. Use equipment that can acceptably water all seeded areas without vehicular traffic on seeded areas.

Reseed any seeded areas not showing evidence of satisfactory growth, as directed.

Final acceptance will be based on the following criteria and must provide 70% vegetative coverage of the seeded area. If seeding is completed by July 15th, coverage must be attained by September 30th. If seeding is completed by August 15th, coverage must be attained by June 15th of the following season. Final acceptance will be based on the Engineers approval.

METHOD OF MEASUREMENT

901-4.1 The work will be measured according to Subsection 90-02, and as follows:

a. Seeding by the square yard. By the area of ground surface acceptably seeded, fertilized, and maintained. Required reseeding is subsidiary.

BASIS OF PAYMENT

901-5.1 At the contract unit price per unit of measure for the pay items listed below that appear on the bid schedule.

Water for hydraulic application of seed mixtures is subsidiary. Water for maintenance is subsidiary except when it is listed in the bid schedule.

Mulching will be measured and paid for under Item T-908.

Payment will be made under:

Item T-901i Seeding – per square yard

ITEM T-905 TOPSOILING

DESCRIPTION

905-1.1 This work consists of furnishing and spreading topsoil where shown on the Plans.

MATERIALS

905-2.1 TOPSOIL. Furnish a natural friable surface soil without admixtures of undesirable subsoil, refuse, or foreign materials and reasonably free from roots, clods, hard clay, noxious weeds, tall grass, brush sticks, stubble or other litter, and which is free draining and non-toxic.

Meet the grading requirements in Table 1 for Class A topsoil:

TABLE 1. TOPSOIL GRADING

Sieve Designation	Percent Passing By Weight	
	CLASS A	
3 in	-	
1/2 in.	100	
No. 4	95-100	
No. 16	64-90	
No. 200	30-60	
Organic Matter	10-40	

Percent of organic matter will be determined by loss-on-ignition of oven dried samples using ATM 203.

When necessary, amend natural topsoil to meet the above specifications, using approved materials and methods.

905-2.2 SALVAGED TOPSOIL. Salvaged topsoil consists of the top 4” to 12” of soils, as referenced vertically from the undisturbed area and newly constructed safety area, and broken-up vegetation derived from the project footprint. The project footprint includes the areas which shall be excavated or covered by fill as part of construction operations. Do not substitute material derived from deeper segments, or material from outside of the project limits without approval of the Engineer. Use topsoil that is free from construction wastes, petroleum byproducts, trash or other manmade materials. Break the vegetation into pieces less than 12" in the longest direction. Mechanically process the removed topsoil and surface vegetation to separate material that does not pass through a screen with 12" square openings.

CONSTRUCTION METHODS

905-3.1 PREPARING THE GROUND SURFACE. Where grades in the areas to be topsoiled have not been established, smooth-grade the areas to the grades shown on the Plans. Maintain the prescribed grades in an even and properly compacted condition to prevent the formation of low places or pockets where water will stand.

Clear the surface of the area to be topsoiled of all stones larger than 2 inches in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of capillary moisture, or the proper growth of the desired planting.

Immediately prior to dumping and spreading the topsoil, loosen the surface, by approved means, to a minimum depth of 2 inches to facilitate bonding of the topsoil to the covered subgrade soil.

905-3.2 OBTAINING TOPSOIL. Prior to the stripping of topsoil from designated areas, remove any vegetation, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, using approved methods.

When suitable topsoil is available on the site, remove this material from the designated areas to the depth directed. Spread the topsoil on areas already tilled and smooth-graded, or stockpile in approved areas. Grade the stockpile sites and adjacent areas which have been disturbed if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, locate and obtain the supply, subject to approval. Notify the Engineer sufficiently in advance of operations in order that necessary measurements and tests can be made. Remove the topsoil from approved areas and to the depth as directed. Haul the topsoil to the site of the work and stockpile or spread as required.

905-3.3 PLACING TOPSOIL. Spread the topsoil evenly on the prepared areas to a uniform depth of 4 inches after compaction. Do not spread when the ground or topsoil is frozen or excessively wet.

After spreading, break up any large stiff clods and hard lumps with a pulverizer or other effective means. Rake up and dispose of all stones or rocks (2 inches or more in diameter), roots, litter, or any foreign matter. After spreading, compact the topsoil with a cultipacker or by other approved means. The compacted topsoil surface shall conform to the required lines, grades, and cross sections. Promptly remove any topsoil or other dirt falling upon pavements or other surface courses.

Track topsoil with a dozer to make track marks running perpendicular to the direction of drainage.

METHOD OF MEASUREMENT

905-4.1 By the square yard, according to Subsection GCP-90-02, acceptably placed.

BASIS OF PAYMENT

905-5.1 Payment will be made at the contract unit price per square yard.

Stockpiling and rehandling of topsoil are subsidiary.

Payment will be made under:

Item T-905a Topsoiling - per square yard

ITEM T-908 SOIL STABILIZATION

DESCRIPTION

908-1.1 This work consists of furnishing, placing, and maintaining soil stabilization material where shown on the Plans.

MATERIALS

908-2.1 HYDROSEEDING MULCH. Wood Fibers: Hydroseeded areas to be mulched using natural wood cellulose fiber specifically manufactured for the purpose as Weyerhauser Company (Silvafiber), the Conwed Corporation (Conwed), or approved equal. Paper mulch is unacceptable.

a. Contains no growth or germination inhibiting factors.

b. Will remain in uniform suspension in water under agitation and will blend with grass seed, fertilizer and other additives to form a homogeneous slurry, when required.

c. Will form a uniform, blotter-like ground cover on application, having moisture absorption and percolation properties and the ability to cover and hold grass seed in contact with soil.

d. Will not form a hard crust upon drying.

e. Dyed a suitable color to facilitate inspection of its placement.

Ship the mulch in packages of uniform weight (plus or minus 5%) bearing the name of the manufacturer and the air-dry weight content.

Use a commercial tackifier on all slopes 4:1 or steeper Use the amount recommended by the manufacturer.

908-2.2 ROLLED MATTING. Use materials that conform to one of the following standards:

a. Unbleached single jute yarn. Use yarn that is loosely twisted and not varying in thickness more than one-half its normal diameter. Furnish jute mesh in rolled strips conforming to the following requirements.

(1) Width: 45 to 48 inches, ± 1 inch.
(2) 78 warp-ends per width of cloth (minimum).
(3) 41 weft-ends per yard (minimum).
(4) Weight: 1.22 pounds per linear yard, ± 5%

b. Knitted Straw Matting. Commercially manufactured erosion control blanket. Use netting which is biodegradable. Straw shall be from oats, wheat, rye, rice, or other approved grain crops that are free from noxious weeds, mold, or other objectionable material. May contain coconut or other natural fiber to reinforce the straw. Follow the manufacturer's published recommendations.

908-2.3 STAPLES. U-shaped staples for anchoring matting, approximately 6 inches long and 1 inch wide. Machine-made: No. 11 gage or heavier steel wire. Hand-made: 12-inch lengths of No. 9 gage or heavier steel.

CONSTRUCTION REQUIREMENTS

908-3.1 SURFACE PREPARATION. Smooth the surface and backfill all gullies and potholes before application. Remove all sticks and other foreign matter that prevents contact of the mulch or matting and the

soil. Ensure that the surface is moist at the time of placement. If area is to be seeded, soil preparation shall conform to Section 901-3.1.

908-3.2 APPLICATION. Apply soil stabilization material with tackifier at a rate of 37 pounds per 1,000 square feet using the folling hydraulic method:

(1) Mix a slurry of water and mulch with proportions recommended by the mulch manufacturer.

(2) Use hydraulic seeding equipment that will maintain a continuous agitation and apply a homogeneous mixture through a spray nozzle. The pump must produce enough pressure to maintain a continuous nonfluctuating spray that will reach the extremities of the area to be mulched, without causing damage to the finished ground. Use a hose attachment to reach areas where a fixed nozzle cannot reach.

(3) Apply slurry at a rate that distributes all materials evenly.

If seeding is specified, complete the application of mulch or matting within 24 hours after seed is placed. Staple matting every 5 feet at overlapped joints and edges or as recommended by the manufacturer. Do not use vehicles or equipment which cause rutting or displacement of the subgrade or topsoil.

908-3.3 MAINTENANCE. Reshape and reseed any damaged areas and repair the mulch or matting as required.

Maintain the mulch or matting until all work on the project is complete and accepted.

METHOD OF MEASUREMENT

908-4.1 By the square yard, according to Subsection GCP-90-02, acceptably placed. Water, maintenance, and repair are subsidiary.

BASIS OF PAYMENT

908-5.1 At the contract unit price per unit of measure for the pay items listed below that appear on the bid schedule.

Payment will be made under:

Item T-908a Mulching - per square yard

ITEM U-500 ELECTRICAL SYSTEM

DESCRIPTION

500-1.1 Provide all coordination work necessary to allow AEL&P to supply and install equipment and materials needed to extend the existing utility services as shown on the Plans.Perform work in conformance with the Plans and per AEL&P Specifications. All utility work shall be paid for by the City & Borough of Juneau (CBJ). Contractor shall provide all necessary coordination with the utility companies to allow them to perform their work.

CONSTRUCTION REQUIREMENTS

500-3.1 Coordinate with the utilities to allow them to perform their work installing services and extending their facilities on airport property at the locations described in the plans and covered in the bid items.

METHOD OF MEASUREMENT

500-4.1 This work will not be measured for payment.

BASIS OF PAYMENT

500-5.1 Payment will be made at the contract lump sum price for the completed and accepted job. This price will be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item. The utility work shall be performed by the local utilities and paid for by the airport owner. Coordination with the utilities to allow them to perform their work on airport property shall be performed under this item. Any impact to the Contractor's schedule or disturbance of the airport ground associated with the utility work that the Contractor has to correct shall be considered incidental to the pay items in this Item and no other compensation shall be provided for this work. Any utility work coordination performed at any other location on airport property not covered in the pay items below shall be considered incidental to the pay items in this Item and no other compensation shall be provided for this work. Provision of a galvanized post for the Runway 08 FAA MALSR Building Electrical Service shall be paid for under U-500c.

Payment will be made under:

Item U-500c	Runway 08 FAA MALSR Building Electrical Service – per lump sum
Item U-500d	Runway 08 FAA MALSR Building Telephone Service – per lump sum
Item U-500e(1)	Midfield FAA JAWS Electrical Service – per lump sum
Item U-500e(2)	Runway 26 MALSR Building Electrical Service – per lump sum
Item U-500f	CCR Vault Electrical Service – per lump sum
Item U-500g	CCR Vault Telephone Service – per lump sum

Appendix A

Erosion and Sediment Control Plan

(Not Used)

Appendix B

Construction Surveying Requirements

Alaska Department of Transportation and Public Facilities

Alaska Construction Surveying Requirements (US Customary Units)

Alaska Construction Surveying Requirements (US Customary Units)

Table of Contents

1. Survey accuracy requirements

Third order survey

- ✓ Use a 1/5000 horizontal closure.
- ✓ Use an angle closure of $30\sqrt{N}$ seconds, where N equals the number of angles in the traverse.
- ✓ An Alaska-registered professional land surveyor must perform or supervise replacement of survey monuments (property, USGS, USC&GS, BLM, etc.) or establishment of monuments (including centerline).
- ✓ All monument work must comply with AS 34.65.040 and meet standards in the latest version of the Alaska Society of Professional Land Surveyors' *Standards of Practice Manual.*
- ✓ The allowable vertical error for misclosure is e = $0.05\sqrt{M}$ e = maximum misclosure in feet, M = length of the level circuit in miles.

Table 1—Survey accuracy requirements (in feet)

	Stationing	HI	Closure	Horizontal Angle	Distance To center line	Grade
Additional cross sections	1.0	0.01	0.04	**	0.1	0.1
Benches		0.01	0.02			
Blue tops***	1.0	0.01	0.04		0.1	0.02
Bridges	*	0.01	0.02			0.01
Centerline	*			*		
Clearing & Grubbing	1.0				1.0	
Culverts	1.0	0.01	0.04	**	0.1	0.1
Curb & gutter	1.0	0.01	0.02		0.1	0.02
Grade stakes	1.0				0.1	0.1
Guardrail	1.0				0.1	
Manholes, catch basins & inlets	1.0	0.01	0.02		0.1	0.02
Monuments	*			*		
Red tops***	1.0	0.01	0.02		0.1	0.05
Riprap	1.0	0.1	0.04		1.0	0.1
Signs	1.0				0.1	
Slope stakes & RP's	1.0	0.01	0.04	**	0.1	0.1
Under drains & sewer	1.0	0.01	0.02		0.1	0.02

* Third order survey
**Right angle prism or transit angles from center line
*** Use blue tops for top of base course and red tops for the bottom of base course.

1. Survey frequency requirements

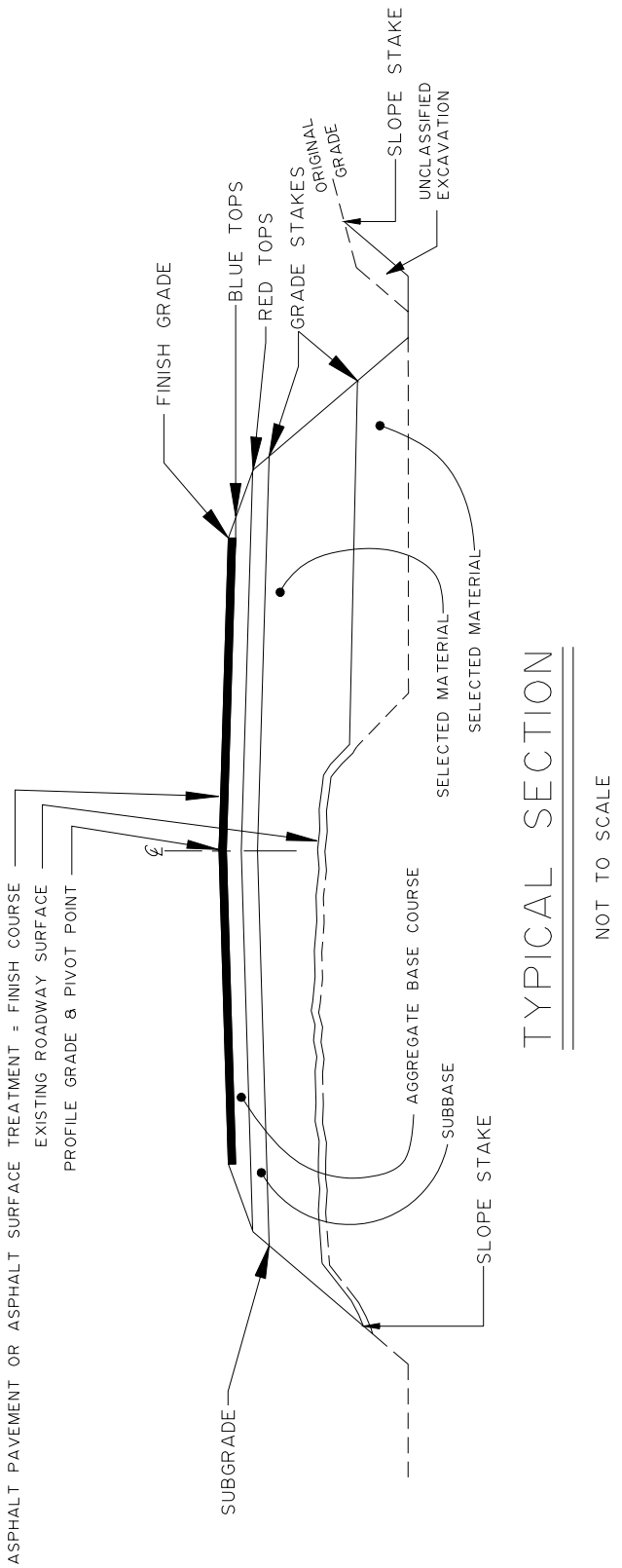
Table 2—Survey frequency requirements (in feet)

	Tangents	Curves	Interchange ramps	Stake each per plan	See special instructions on sample notes
Additional cross sections	*	*	*		
Bench marks					X
Blue tops	100	100**	25		X
Blue tops within 100 feet both sides of railroad track crossings and bridge approaches	25	25	25		X
Bridges				X	X
Center line	100	100**	25		
Clearing	100	100**	25		X
Culverts				X	X
Curb and gutter	25	25	25		
Grade stakes	100	100**	50		
Guardrail	25	25	25		
Manholes, catch basins & inlets				X	
Monuments				X	
Red tops	100	100**	25		X
Riprap	50	50	50		
Signs				X	
Slope stake / cross sections	100	100**	25		X
Under drains and sewers	50	25	25		

* Establish additional cross sections and slope stakes at all breaks in topography and where structures begin and end.

**Curves shall be staked on 50-foot stations if the curve is greater than six degrees.

2. Typical Section Drawing



3. Survey point materials requirements

- ✓ These are minimum requirements; larger sizes may be necessary.
- ✓ Use only stakes with planed sides.

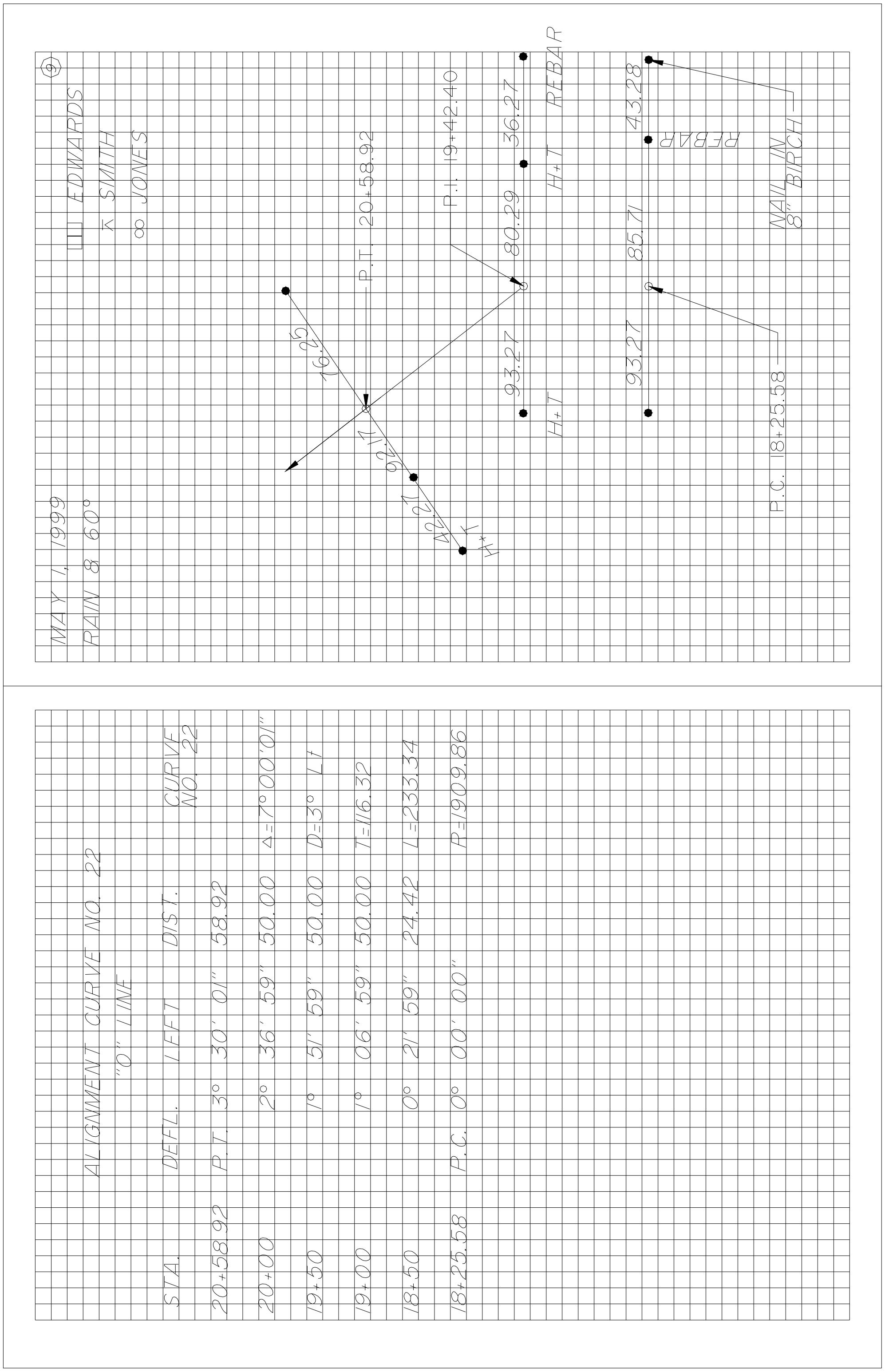
Table 3—Survey point materials requirements

	24" lath or whiskers	2" x 2" x 8" hub	2" x 2" x 12" hub	1" x 2" x 18" stake	1" x 2" x 24" stake	48" lath	Hub and tack	40d nail	60d nail	½" x 24" rebar
Benchmarks									X	
Blue tops	X	X								
Centerline P.C., P.T., P.O.T.			X	X			X *			X*
Centerline reference points			X	X			X *			X *
Centerline station				X				X		
Clearing						X				
Culvert stake			X		X	X				
Culvert stake references			X		X	X				
Curb and gutter			X		X		X			
Guardrail								X		
Major structures			X	X *	X *	X	X *			X *
Red tops	X	X								
Signs						X				
Slope stake					X	X				
Slope stake references			X		X	X				

* Optional depending on conditions, and to be determined by the Project Engineer.

4. Typical alignment notes

- ✓ The Chief of Parties must prepare the alignment book before actual staking.
- ✓ Don't use swing ties for reference points.
- ✓ Use three point right angle ties, two to the right and one left, or vice versa.
- ✓ Reference P.C., P.I., P.T., and P.O.T.



5. Typical clearing notes

- ✓ Exclude areas not needing clearing.
- ✓ Draw a diagram as required to show unusual or confusing areas.

— CLEARING & GRUBBING —

AUG. 6, 1999

80°± CLEAR
CALM

⑧ ◫ EDWARDS
⊼ SMITH
∞ JONES

STA.	CL.LT.		CATCH	CATCH		CL.RT.
5+50	149'	+12'	137'	203'	+12'	215'
6+00	164'		152'	188'		200'
6+50	159'		147'	204'		216'
7+00	167'		155'	180'		192'
7+50	179'		167'	188'		200'

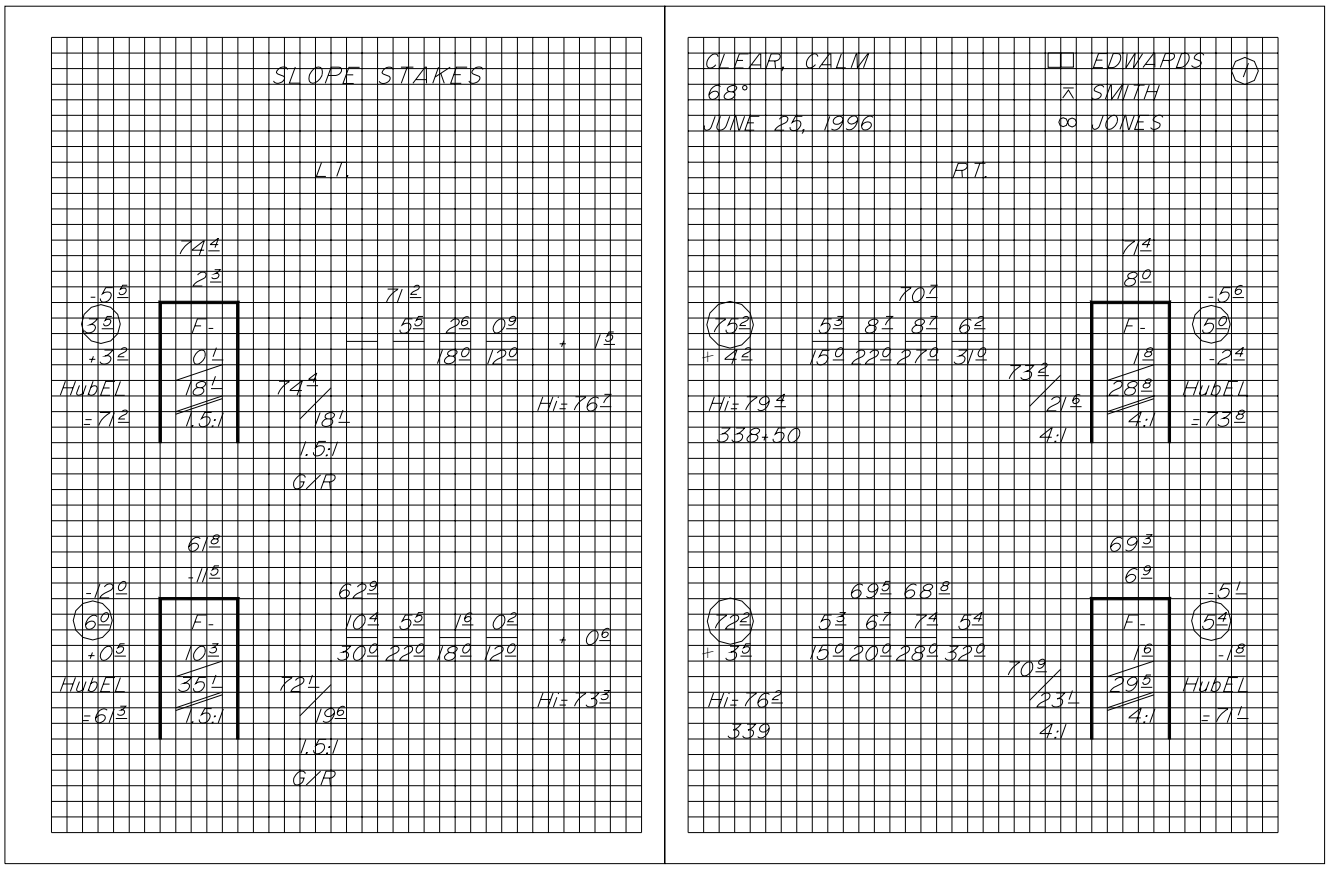
6. Typical level notes

- ✓ Balance back sights and foresights.
- ✓ Establish all benchmarks and take the centerline profile before doing any staking involving elevations.
- ✓ Don't set benchmarks in utility poles.
- ✓ Don't use side shots on benchmarks.
- ✓ Use the turn through method when establishing benchmarks.
- ✓ Re-check benchmarks after each major freeze/thaw cycle and/or any environmental event that may change the benchmark elevation.
- ✓ Do not use double rodding.
- ✓ Run separate level loops between all benchmarks.
- ✓ Set benchmarks in trees of at least six-inch diameter, unless approved by the Project Engineer.
- ✓ Correct errors in benchmark elevations so they will not affect the elevations of succeeding benchmarks.
- ✓ Consult with the Project Engineer before placing benchmarks in areas of permafrost or other unstable ground.
- ✓ Establish benchmarks at intervals and locations consistent with good engineering practice, and generally not more than 1000 feet.
- ✓ Completely describe benchmarks when establishing or re-establishing their elevation. Give centerline stationing, offset, benchmark projection, and observable benchmark characteristics. When checking into or out of benchmarks, note the book and page number that contains the most recent elevation establishment for that benchmark.
- ✓ Write the station on the top twelve inches facing centerline, with numerals a minimum of one inch in height.

STA.	BS+	HI	FS−		ELEV.	45°± CLEAR WARM CALM				⌅ □	㉓ EDWARDS
						WILD 413579		3−23−90		⌖	SMITH
TBM #101											
6+72					161.309		Nail in	base of 12" Spruce			
								85' 10" LT.		6+72	
	3.877	165.186									
6+00			1.95		163.24						
6+25			2.32		162.87						
6+50			2.96		162.23						
T.P.			3.246		161.940						
	1.103	163.043									
6+75			2.31		160.73						
7+00			2.56		160.48						
T.P.			2.823		160.220						
	2.332	162.552									
							Nail in	base of 18" stump			
TBM #102			1.143		161.409		60' 4" RT		7+21	Elev.	161.413

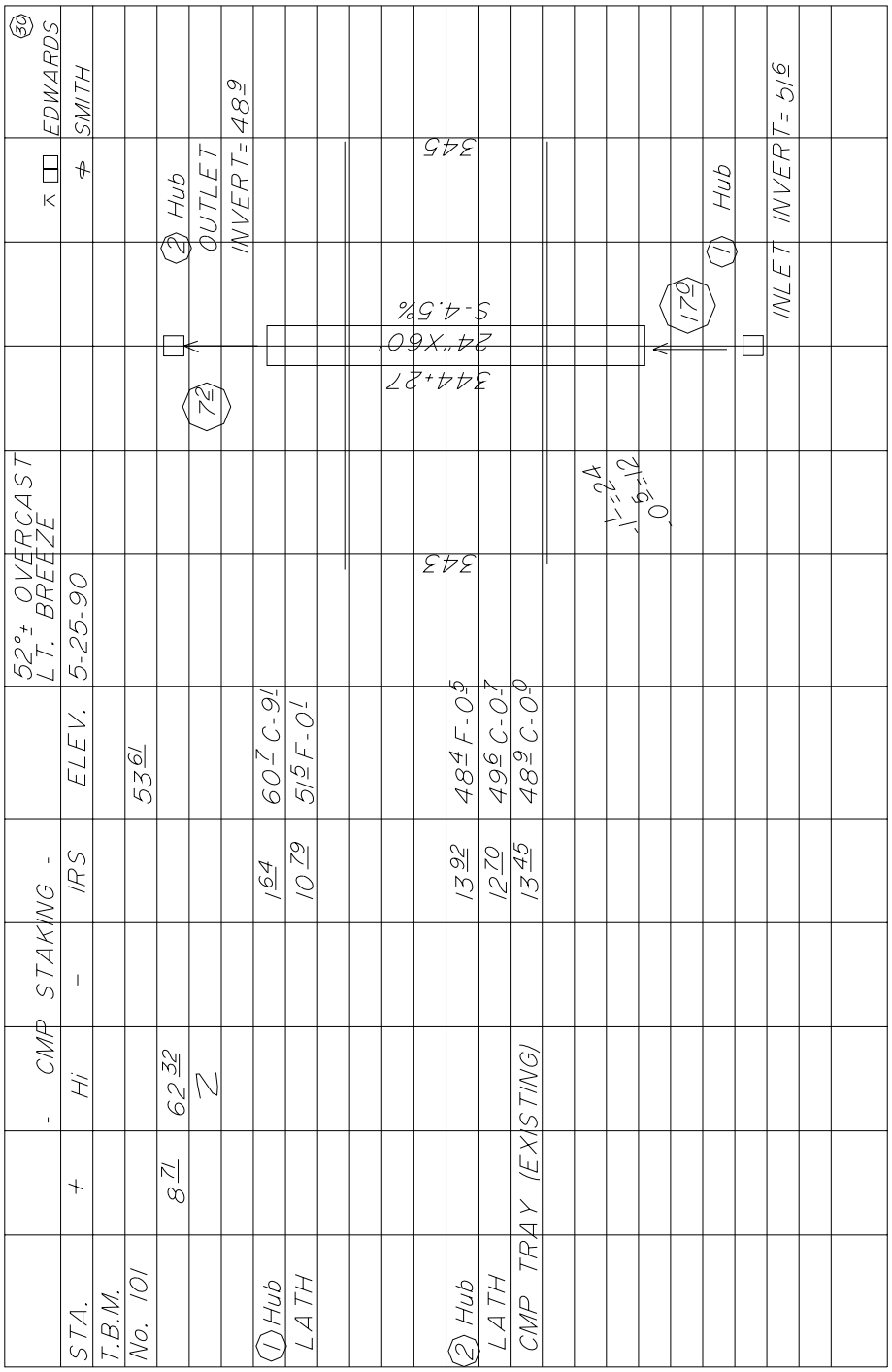
7. Typical slope stake notes

- ✓ Enter the station, elevations, shoulder distance or ditch distances, and slope in the slope stake book before staking begins.
- ✓ In areas where slides or overbreak are anticipated, extend the sections beyond the construction limits.
- ✓ Slope-stake each section that is cross-sectioned.
- ✓ Final re-cross sections are required where there are overbreaks, undercuts, etc. Re-cross section book and page numbers shall be noted on the original cross-section and slope staking page for the relevant stations.
- ✓ Use a hand level only for one turn up or down from the instrument.
- ✓ Clearly note hand level turns.
- ✓ Use a reference point that is 10-20 feet beyond the slope stake.
- ✓ The reference point must show the cut or fill to the slope stake and must include the slope stake information.
- ✓ Slope stake all abrupt changes in typical sections.
- ✓ Position all laths to face centerline.
- ✓ Include at least the following information on the stake: (1) where to begin the cut or fill (2) the slope ratio (3) the depth of cut or height of fill and (4) the station.

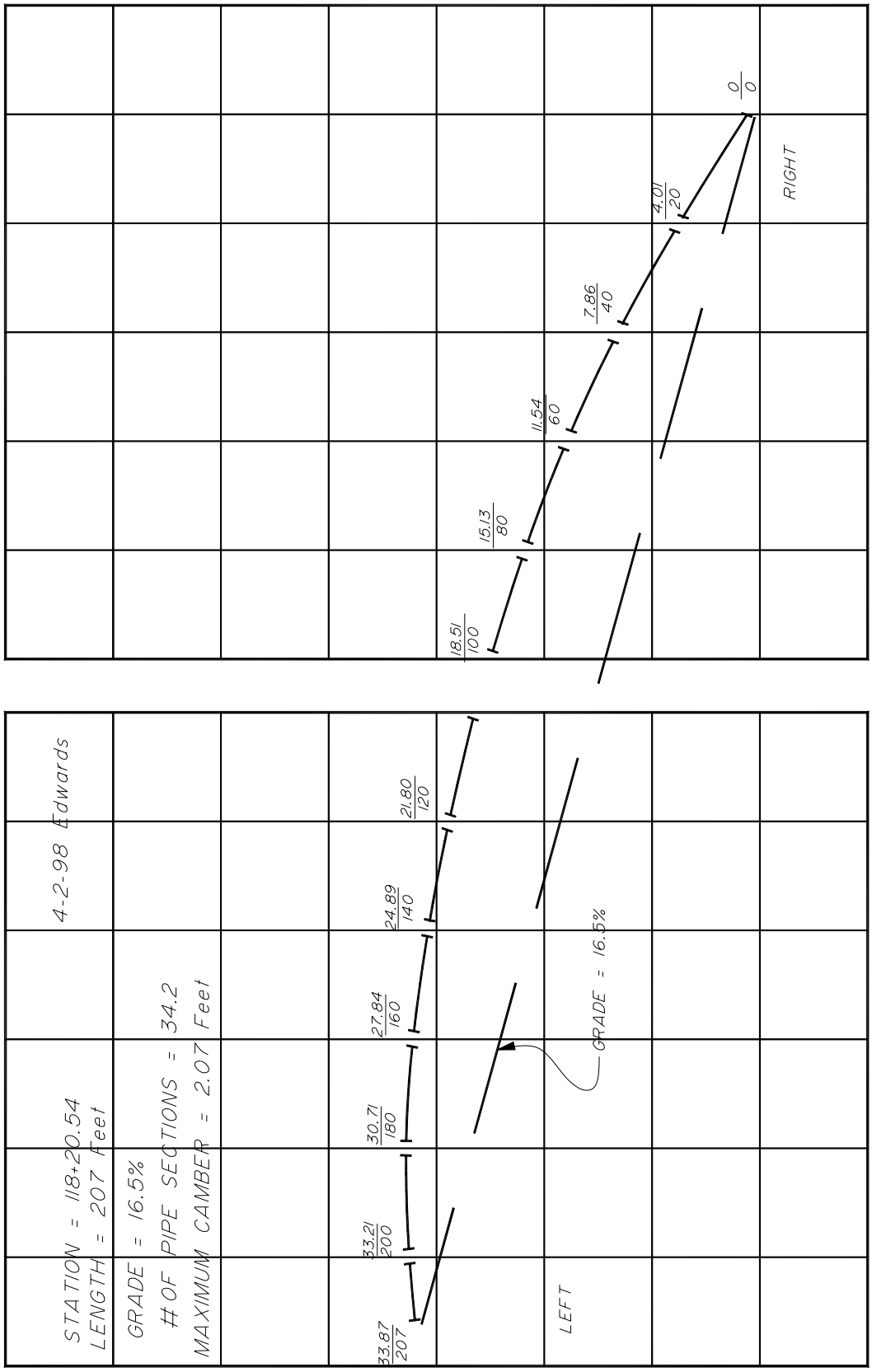


8. Typical culvert notes

- ✓ Show at least the following information on culvert stakes
  - station
  - size
  - length
  - type of pipe (e.g., 24” x 80’ CMP)
  - cut or fill from top of hub to inlet & outlet
  - skew angle
  - horizontal distance from hub to end of pipe
  - gradient of pipe
  - drop of pipe
- ✓ Ensure that all culverts have a minimum camber equal to 1% of the length of the pipe, unless the Project Engineer directs otherwise.
- ✓ Develop a culvert camber diagram showing each section of pipe and its elevation and offset.

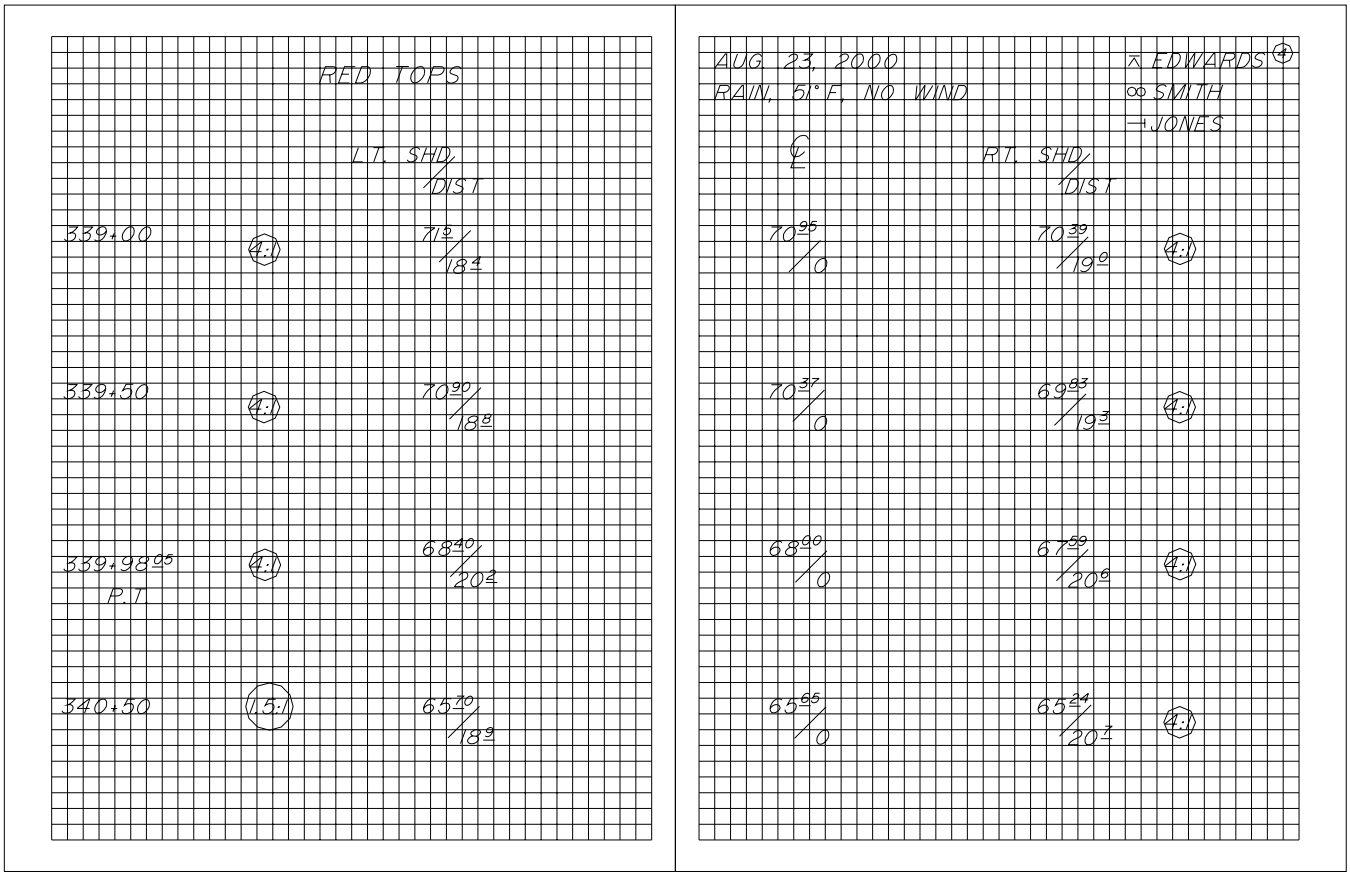


9. Typical culvert camber diagram



10. Typical blue or red tops and grade stake notes

- ✓ Place blue and red tops at each break in typical section and on centerline.
- ✓ Use blue tops for top of base course.
- ✓ Use red tops for the bottom of the base course.
- ✓ Evenly space red/blue tops at and between crown section break points with a maximum spacing of 25 feet between red/blue tops.
- ✓ Establish horizontal control from centerline references and vertical control from benchmarks.
- ✓ Place blue tops at the same interval as slope stakes.
- ✓ Stake all curve transitions.



Appendix C

Materials Sampling and Testing Frequency

Table IX, Materials, Sampling & Testing Frequency, Airports in US Customary Units

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Excavation	Acceptance	(5)	Gradation, P.I., Moisture (or visual description if organic)	1 per 5,000 C.Y. waste or undesignated waste cut	Number consecutively EX-W-1. No need to test, if waste is designated on plans.
Embankment (4)	Acceptance	(5)	Standard Density	As required by change in material	Number consecutively BM-SD-1 or EX-SD-1
			Field Density (1)	1 per 1,500 C.Y. or 1 per 3,000 Tons	Number consecutively BM-D-1 or EX-D-1.
			Gradation, P.I., and Deleterious (visual)	1 per 5,000 C.Y. or 1 per 10,000 Tons (4)	Number consecutively BM-G-1 or EX-G-1.
	Independent Assurance	(5)	Standard Density (2)	1 per source	Use numbers that correspond to acceptance samples. Include field test results with sample.
			Field Density (1)	1 per 15,000 C.Y. or 1 per 30,000 Tons	
			Gradation, P.I., and Deleterious (visual)	1 per 50,000 C.Y. or 1 per 100,000 Tons	
Bedding and Backfill for Structures (Drainage Items, Ducts, Conduits, etc.)	Acceptance	(5)	Standard Density	As required by change in material	Use numbers that correspond to acceptance samples. Include field test results with sample.
			Field Density (1)	(3)	
			Gradation, P.I., and Deleterious (visual)	1 per source or as required by change in material	

General: Independent Assurance **(IA)** Testing may be waived when Acceptance Testing is performed in DOT&PF Regional Laboratories accredited in the specified test method. When DOT&PF Regional Laboratories perform Acceptance Testing, they may also perform the IA Testing if using different personnel and equipment than was used for the Acceptance Testing.

(1) If material is impractical to test for field density, document quantity and/or area by reporting percent oversize and compactive effort used on a proper density acceptance form. IA Testing is not required when material (as shown by gradation testing) is Too Coarse to Test **(TCTT)**.
(2) Required when Standard Density test is run in the field.
(3) One density per structure (pipe, conduit, manhole, catch basin, inlet, utility vault, etc.), with a minimum of one density per 100 lineal feet of trench (for pipes, conduits, buried cables, etc.) installed. Perform densities within 18 inches of the structure or outside diameter of the pipe.
(4) P.I. tests shall be performed on the first five samples at the start of production from any source. If these tests indicate the material to be non-plastic, additional tests need only be performed on the IA samples. The Regional Quality Assurance Engineer **(RQE)** or Regional Materials Engineer **(RME)** may reduce the number of tests required if the source is known to have no value for liquid limit and be non-plastic.
(5) See the specified test method for minimum sample size.

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Subbase Course	Quality	150 lbs.	L.A. Wear, Degradation	1 per source prior to use	Allow minimum of 14 days for testing and transport. Number consecutively Q-SB-1
	Acceptance	(6)	Standard Density	1 per source and as required based on changes in material	Number consecutively SB-SD-1
			Field Density (1)	1 per 1,000 C.Y. or 1 per 2,000 Tons	Number consecutively SB-D-1
			Gradation, LL & P.I., and Deleterious	1 per 2,500 C.Y. or 1 per 5,000 Tons (3)	Number consecutively SB-G-1
	Independent Assurance	(6)	Standard Density (2)	1 per source	Use numbers that correspond to acceptance samples. Include field test results with sample.
			Field Density (1)	1 per 10,000 C.Y. or 1 per 20,000 Tons	
			Gradation, LL & P.I., and Deleterious	1 per 25,000 C.Y. or 1 per 50,000 Tons	
Aggregate Surface Course and Crushed Aggregate Base Course	Quality	150 lbs.	L.A. Wear, Degradation, Soundness	1 per source prior to use	Allow minimum of 14 days for testing and transport. Number consecutively Q-SC-1 or Q-BC-1
	Acceptance	(6)	Standard Density	1 per source and as required based on changes in material	Number consecutively SC-SD-1 or BC-SD-1
			Field Density	1 per 500 C.Y. or 1 per 1,000 Tons	Number consecutively SC-D-1 or BC-D-1
			Gradation, LL & P.I., SE, Fracture, Deleterious	1 per 1,000 C.Y. or 1 per 2,000 Tons (3) (4) (5)	Number consecutively SC-G-1 or BC-G-1
	Independent Assurance	(6)	Standard Density (2)	1 per source	Use numbers that correspond to acceptance samples. Include field test results with sample.
			Field Density	1 per 5,000 C.Y. or 1 per 10,000 Tons	
			Gradation, LL & P.I., SE, Fracture, Deleterious	1 per 10,000 C.Y. or 1 per 20,000 Tons	

(1) If material is impractical to test for field density, document quantity and/or area by reporting percent oversize and compactive effort used on a proper density acceptance form. IA testing is not required when material (as shown by gradation testing) is TCTT.
(2) Required when Standard Density is run in the field.
(3) P.I. tests shall be performed on the first five samples at the start of production from any source. If these tests indicate the material to be non-plastic, additional tests need only be performed on the IA samples. The RQE or RME may reduce the number of tests required if the source is known to have no value for liquid limit and be non-plastic.
(4) Fracture: If the first ten tests indicate the fracture to be 5% or more above specification, additional tests need only be performed on the IA samples.
(5) SE: If the first five tests indicate the material meets specification for Sand Equivalent **(SE)**, additional tests need only be performed on the IA samples. The SE test is not required for Aggregate Surface Course.
(6) See the specified test method for minimum sample size.

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Plant Hot Mix Asphalt and Asphalt Treated Base Course	Quality	150 lbs. Aggregate	L.A. Wear, Degradation, Soundness	1 per source prior to use	Allow 25 days for testing and transport
	Mix Design	500 lbs. (7) Aggregate 5 one gallon cans of AC 1 pint of Anti Strip	Mix Design (1) (2) Sand Equivalent (SE), Flat & Elongated (F&E), Fracture	1 per source and as required by changes in material	Allow 15 days or contract specified time for mix design and testing after receiving contractor's proposed gradation. Contact the Regional Materials Laboratory to see if submitting the asphalt cement or anti-strip is necessary.
	Acceptance	(1) (8)	MSG (Maximum Specific Gravity)	1 per Lot (1) (9)	From Mix Design for the first lot and then from the first sublot of each additional lot.
			Mat Density ,Gradation, Oil Content, LL & P.I., Fracture, F&E, SE, Deleterious, Thickness	1 per 500 Ton sublot (3) (4) (5) (9)	Ross Count (AASHTO T 195, Coating Test) as required by RQE or RME.
			Joint Density	(1) (9)	Top Lift (1)
	Independent Assurance	(8)	MSG	1 per project minimum	Required when MSG is run in the field.
			Mat Density, Gradation, Oil Content, LL & P.I., Fracture, F&E, SE	1 per 5,000 Tons	Use numbers that correspond to acceptance samples. Include field test Results with sample.
	Information	30 lbs.	3-Marshall Biscuits or 2-Gyratory samples	1 per Mix Design Minimum (9)	Compare results to Mix Design
Asphalt Cement	Quality	See Remarks	(1)	1 per each grade and source prior to use	Manufacturer's certification required
	Acceptance	Three 1- Quart Cans		1 per 50,000 gals. or 1 per 200 Tons	Sampled on project. Test for anti-strip if required by RQE or RME

(1) Refer to project specifications.
(2) Recommendations regarding anti-strip requirements must be determined for each mix design.
(3) P.I. tests shall be performed on the first five samples at the start of production from any source. If these tests indicate the material to be non-plastic, additional tests need only be performed on the IA samples. The RQE or RME may reduce the number of tests required if the source is known to have no value for liquid limit and be non-plastic.
(4) Fracture: If the first ten tests indicate the fracture to be 5% or more above spec, additional tests need only be performed on the IA samples.
(5) SE: If the first five tests indicate the material meets specification for Sand Equivalent (SE), additional tests need only be performed on the IA samples.
(6) Flat and Elongated (F&E) tests shall be performed on the first five samples from any source. For known sources, the RQE or RME may waive this requirement.
(7) For multiple stockpiles, proportion each stockpile sample to the proposed Job Mix Design blend ratio.
(8) See the specified test method for minimum sample size.
(9) May not be applicable to Asphalt Treated Base Course. Refer to project specifications.

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Liquid Asphalt for: a. Prime Coat b. Tack Coat c. Seal Coats d. Asphalt Surface Treatment	Quality	See Remarks	Type and Grading	1 per each grade and source prior to use	Manufacturer's certification required
	Acceptance	1 Gallon in plastic jug	(1)	1 per 50,000 gallons or 1 per 200 Tons	Sample must be tested by Lab that did not test material for Quality. Material sampled prior to dilution
Aggregate for Seal Coats and Surface Treatments	Quality	150 lbs. Aggregate	L.A. Wear, Soundness, Degradation	1 per source prior to use	Allow 25 days for testing and transport Test for anti-strip if required by RQE or RME
	Acceptance	(4)	Gradation, Fracture, Flat & Elongated (F&E), Deleterious (visual)	1 per 500 Tons (2) (3)	May be taken from stockpile or production
	Independent Assurance		Gradation, Fracture, F&E, Deleterious (visual)	1 per 5,000 Tons	
Portland Cement Concrete (a) Cement (b) Water (c) (CA) Coarse Aggregate (d) (FA) Fine Aggregate	Quality (a) Cement (b) Water (c) CA (d) FA	(a) Two 1- gallon cans	See Remarks	1 per shipment (5)	Allow 40 days for testing and transport. Manufacturer's certification required.
		(b) ½ gal. in glass jar	See remarks	1 per source	Allow 20 days for testing or potable water accepted by Project Engineer
		(c) 100 lbs.	Deleterious Substances, L.A. Wear, Soundness	1 per source	Allow 25 days for testing and transport
		(d) 25 lbs.	Deleterious Substances, Soundness	1 per source	Allow 25 days for testing and transport
Portland Cement Concrete (a) Cement (b) Water (c) Coarse Aggregate (d) Fine Aggregate (e) Admixtures	Mix Design Submittal (1) (6)	(a) 1 sack (b) None (c) 330 lbs. (d) 110 lbs. (e) 1 qt. each	Mix Design Verification (6)	1 per source prior to use	Manufacturer's certifications and aggregate test reports required. For verification of Contractor-furnished mix design, allow 40 days for testing and transport.

(1) Refer to project specifications.
(2) Fracture: If the first ten tests indicate the fracture to be 5% or more above specification, additional tests need only be performed on the IA samples.
(3) Flat and Elongated (F&E) tests shall be performed on the first five samples from any source. For known sources, the RQE or RME may waive this requirement.
(4) See the specified test method for minimum sample size.
(5) Cement stored in silos or bins over six months, or in bags over two months, may require re-testing, see project specifications.
(6) When 4x8 cylinders are used for strength data, an average of 4 is required.

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Concrete Continued:					
Coarse Aggregate	Acceptance	(4)	Gradation, Deleterious (visual), Flat & Elongated (6)	1 per 200 C.Y. (6)	Number consecutively CA-G-1
Fine Aggregate			Gradation, Deleterious (visual), Fineness Modulus	1 per 200 C.Y.	Number consecutively FA-G-1
Mix		As required by test method	Slump, % Air, Cement factor, Water/Cement Ratio, Unit Weight/Yield	1 per ½ days pour (1) or 1 per 200 C.Y.	(2)
		Cylinders or beams	Compressive strength or Flexural strength (3)	1 per ½ days pour (1) or 1 per 200 C.Y.	Mold two (6x12) or three (4x8) cylinders. Test at 28 days. (2) (5)
	Information	Cylinders or beams	Compressive strength or Flexural strength (3)	As required (e.g. for 7 day break)	Mold two (6x12) or three (4x8) cylinders "As Required" for strength data.
Coarse Aggregate	Independent Assurance	(4)	Gradation, Deleterious, Flat & Elongated (6)	1 per 2,000 C.Y. with minimum of 1 per project if over 100 C.Y. is placed	Mold two (6x12) or three (4x8) Cylinders if acceptance cylinders are not tested in Regional Lab.
Fine Aggregate			Gradation, Deleterious (visual), Fineness Modulus		Numbers correspond to acceptance samples. Include field test results with sample.
Mix		As required by test method	Slump, % Air, Cement factor, Water/Cement Ratio, Unit Weight	1 per 2,000 C.Y.	
		Cylinders or beams	Compressive strength or Flexural strength (3)	1 per 2,000 C.Y.	

(1) Half day's pour considered to be 6 hours or less.
(2) Commercial sources, which are periodically inspected, do not have to be tested if day's total quantity of concrete placement is less than 5 C.Y. as determined by the Project Engineer. Placement reports summarizing all minor pours will be completed.
(3) Only required when strength criteria is included for the item.
(4) See the specified test method for minimum sample size.
(5) Non-structural or minor concrete construction, 1 set minimum per project is recommended.
(6) Refer to project specifications. Flat and Elongated (F&E) tests shall be performed on the first five samples from any source. For known sources, the RQE or RME may waive this requirement.

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Misc. Hardware	Quality	(1)		1 per pay item or assembly, min.	Approved by designated authority; reference MCL.
Concrete Reinforcing Steel	Quality	(2)		1 for each type, grade and size in a shipment	Approved by designated authority; reference MCL.
Joint Sealer, Joint Filler, and Curing Materials for Concrete	Quality	1 Quart for each liquid (see remarks)	(1) See remarks	1 per type	Project Engineer documentation if on QPL. If not on QPL, manufacturer's certification or sample for testing.
Porous Backfill	Acceptance	(3)	Gradation and Deleterious (visual)	1 per source or as required by change in material	Number consecutively PB-G-1
Topsoil	Quality	15 lbs.	Organic content, Gradation, pH	1 per source prior to use	Allow 15 days for testing and transport
	Acceptance	(3)	Gradation	1 per 15,000 square yards or 1 per 2,500 cubic yards	Number consecutively TS-G-1
Lighting Equipment	Quality and Acceptance	Within 30 days following award of the contract, the contractor shall submit to the Project Engineer for approval a complete list of material and equipment that is proposed to be used for this item. The data shall include catalog cuts, diagrams, test reports, manufacturers' certifications, etc. The above data shall be submitted in eight sets. Any proposed deviation from the plans shall also be submitted.			

(1) Certificates of Compliance per Specifications GCP 60
(2) Mill Test Reports to include heat numbers, fabrication date, physical and chemical properties.
(3) See the specified test method for minimum sample size.

Minor Quantities

A. Portland Cement Concrete. Concrete for the following items may be accepted on the basis of an approved mix design and placement reports documenting batch information and pour location, time, and quantity. Under this system arrangements should be made for the producer to state on the delivery ticket accompanying each load of concrete, the class of concrete being furnished, the weights of cement, aggregates and water used in the batch, and the time of batching. Use only State-tested aggregates and cement, or supplier certified cement, approved by the RQE, RME, or Statewide Materials Engineer (SME). Each pour must be documented on a Concrete Placement Report.

1. Sidewalks - not to exceed 150 square yards per day.
2. Curb and gutter, not to exceed approximately 250 lineal feet per day
3. Slope paving and headers.
4. Paved Ditches and flumes.
5. Manhole bases, Catch Basins, Inlets and Inspection Holes.
6. Small culvert headwalls and Miscellaneous Drainage Structures.
7. Fence Post Footings.
8. Sign Post footings.
9. Cable Markers
10. Electrical Duct encasement and markers
11. Electrical vault, light or signal boxes

B. Small Quantities of Miscellaneous Materials. The primary documentation of delivery and placement may be the Project Materials Report.

1. Aggregates—not to exceed 500 Tons per item per project.
2. Asphalt/Aggregate Mixtures—not to exceed 1,500 Tons per approved mix design.
3. Bituminous Material—not to exceed 85 Tons per project.
4. Paint—not to exceed 20 Gallons per project. Acceptance to be based on weights and analysis on the container label.
5. Masonry Items—Subject to checking of nominal size and visual inspection. Not to exceed 100 pieces.
6. Plain concrete or clay pipe— not to exceed100 lineal feet.
7. Topsoil—not to exceed 600 square yards.

Appendix D

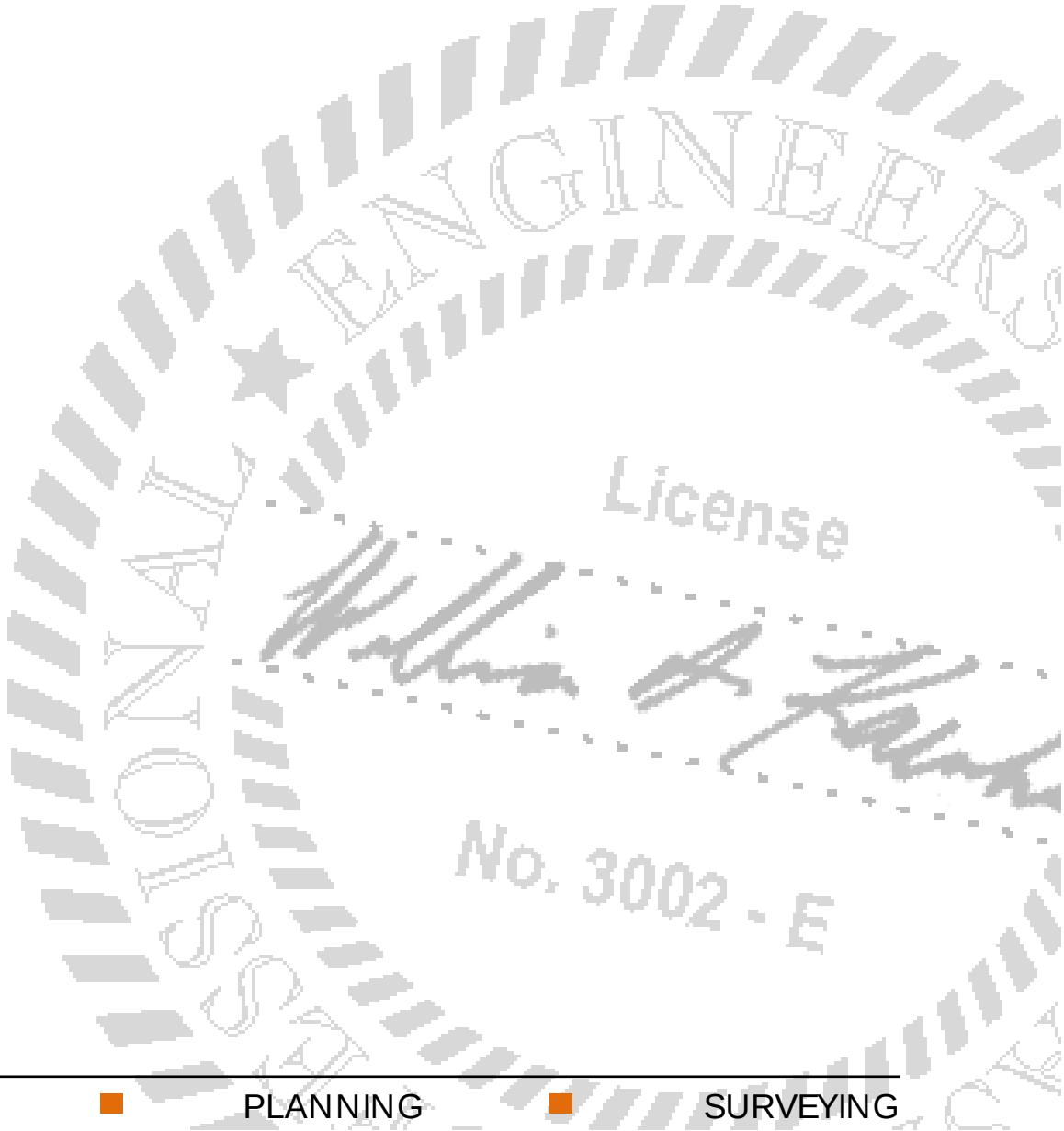
Safety Plan

DOWL HKM

SAFETY PLAN

JUNEAU INTERNATIONAL AIRPORT
RUNWAY SAFETY AREA
IMPROVEMENTS - PHASE 2A

JUNEAU, ALASKA



SAFETY PLAN

JUNEAU INTERNATIONAL AIRPORT
RUNWAY SAFETY AREA IMPROVEMENTS - PHASE 2A
JUNEAU, ALASKA

City and Borough of Juneau Contract No. E12-240
Airport Improvement Program No. 3-02-0133-056-2012

Prepared for:

Juneau International Airport
1873 Shell Simmons Drive, Suite 200
Juneau, Alaska 99801

Prepared by:

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Anchorage, Alaska 99503
(907) 562-2000

W.O. 60633

Safety Plan Preparation Date:
May 2012

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DEFINITION OF TERMS

7460-1	Notice Of Proposed Construction Or Alteration. For on-airport projects, the form submitted to the Federal Aviation Administration (FAA) regional or airports division office as formal written notification of any kind of construction or alteration of objects that affect navigable airspace, as defined in Code of Federal Regulations 14 CFR Part 77, safe, efficient use, and preservation of the navigable airspace. (See guidance available on the FAA web site at https://oeaaa.faa.gov.) The form may be downloaded at http://www.faa.gov/airports/resources/forms/, or filed electronically at https://oeaaa.faa.gov.
7480-1	Notice of Landing Area Proposal. Form submitted to the FAA Airports Regional Division Office or Airports District Office as formal written notification whenever a project without an airport layout plan on file with the FAA involves the construction of a new airport; the construction, realigning, altering, activating, or abandoning of a runway, landing strip, or associated taxiway; or the deactivation or abandoning of an entire airport The form may be downloaded at http://www.faa.gov/airports/resources/forms/.
Advisory Circular (AC)	Standards distributed by the FAA for various practices, such as airport painting, wildlife control, etc. For airports that accept federal funds, they are not advisory, but required.
Airport Operations Area (AOA)	Any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An AOA includes such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runways, taxiways, or aprons.
Certificated Airport	An airport that has been issued an Airport Operating Certificate by the FAA under the authority of 14 CFR Part 139, Certification of Airports.
Common Traffic Advisory Frequency	When the tower is closed, pilots will self-announce their intentions on this frequency.
Construction	The presence and movement of construction-related personnel, equipment, and materials in any location that could infringe upon the movement of aircraft.
Displaced Threshold	A threshold that is located at a point on the runway other than the designated beginning of the runway. The portion of pavement behind a displaced threshold is available for takeoffs in either direction or landing from the opposite direction.
Movement Area	The runways, taxiways, and other areas of an airport that are used for taxiing or hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading aprons and aircraft parking areas (reference 14 CFR Part 139).
Navigational Aid (NAVAID)	Any of a collection of structures that provide distance, height, or lateral guidance to pilots.

Non-Movement Area	The area inside the airport security fence exclusive of the Movement Area. It is important to note that the non-movement area includes pavement traversed by aircraft.
Notice to Airmen (NOTAM)	A standardized method of delivering safety and operational information to pilots. Pilots receive NOTAMs in their pre-flight briefing, or when contacting the FAA air traffic facility.
Object-Free Area (OFA)	An area on the ground centered on the runway, taxiway, or taxilane centerline provided to enhance safety of aircraft operations by having the area free of objects except for those objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes. (See AC 150/5300-13 (series), for additional guidance on OFA standards and wingtip clearance criteria.)
Obstacle-Free Zone (OFZ)	The airspace below 150 feet (45 millimeters) above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance protection for aircraft landing or taking off from the runway and for missed approaches. The OFZ is subdivided as follows: Runway OFZ, Inner Approach OFZ, Inner Transitional OFZ, and Precision OFZ. Refer to AC 150/5300-13 (series) for guidance on OFZ.
Obstruction	Any object/obstacle exceeding the obstruction standards specified by 14 CFR Part 77, subpart C.
Runway Object-Free Area	This area is centered on the runway centerline, and requires clearing of objects protruding above the runway safety area edge elevation, except for objects required for navigation.
Runway Safety Area (RSA)	A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway, in accordance with AC 150/5300-13 (series).
Taxiway Safety Area	A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway, in accordance with AC 150/5300-13 (series).
Temporary	Any condition that is not intended to be permanent.
Temporary Runway End	The beginning of that portion of the runway available for landing and taking off in one direction, and for landing in the other direction. Note the difference from a displaced threshold.
Threshold	The beginning of that portion of the runway available for landing. In some instances, the landing threshold may be displaced.
UNICOM	A radio communications system of a type used at small airports.
Vehicle Pedestrian Deviation	An entry or movement on an airport movement area by a vehicle operator or pedestrian that has not been authorized by the air traffic control.

LIST OF ACRONYMS

AC ..... Advisory Circular
AOA ..... Airport Operations Area
ARFF ..... Aircraft Rescue and Fire Fighting
ASCO ..... Airport Safety and Compliance Officer
ATCT ..... Air Traffic Control Tower
ATC ..... Air Traffic Control
CABC ..... crushed aggregate base course
CASC ..... crushed aggregate surface course
CBJ ..... City and Borough of Juneau
CFR ..... Code of Federal Regulations
CMP ..... corrugated metal pipe
CPP ..... corrugated plastic pipe
CTAF ..... Common Traffic Advisory Frequency
DOT ..... State of Alaska Department of Transportation
EIS ..... Environmental Impact Statement
EVAR ..... emergency vehicle access road
FAA ..... Federal Aviation Administration
FAR ..... Federal Aviation Regulations
FBI ..... Federal Bureau of Investigation
FOD ..... foreign object debris
FSS ..... Flight Service Station
HAZMAT ..... hazardous materials
JAWS ..... Juneau Airport Wind System
JNU ..... Juneau International Airport
LOC ..... Letter of Correction
MALSR ..... medium-intensity approach lighting system with runway alignment indicator
MEDIVAC ..... medical evacuation
MUTCD ..... Manual of Uniform Traffic Control Devices
NAVAID ..... navigational aid
NOTAM ..... Notice to Airmen
NWDA ..... Northwest Development Area
OFA ..... object free area
OFZ ..... obstacle free zone
RCO ..... remote communications outlet
RGL ..... runway guard light
ROD ..... Environmental Impact Statement and Section 4(f) Record of Decision
RSA ..... runway safety area
RW ..... runway
SIDA ..... secured identification display area
SPB ..... seaplane base
SREF ..... snow removal equipment facility
TL ..... taxilane
TSA ..... Transportation Security Administration
TW ..... taxiway
VASI ..... visual approach slope indicator

1.0 INTRODUCTION

The following is the Safety Plan to be used during the Juneau International Airport (JNU) Runway Safety Area Improvements Phase 2A project. The purpose of this plan is to present information to ensure safe airport operations during construction activities, minimize disruption to the operations of air and ground traffic, and to facilitate completion of construction in the shortest time possible.

The proposed JNU Runway Safety Area Improvements Phase 2A project consists of the following:

Runway Safety Area (RSA)-Associated Improvements:

- Relocation of Runway (RW) 26 threshold and Taxiway (TW) G, and associated lighting and signage.
- Realignment of TW E to meet current Federal Aviation Administration (FAA) standards.
- Relocation of RW 08 threshold and TW B, and associated changes to lighting and signage.
- All new runway signs.
- Removal of "finger bank" in Mendenhall River.
- Reconstruction and rehabilitation of the North Seaplane Base (SPB) Road.
- Grading and capping of the Northwest Development Area (NWDA).

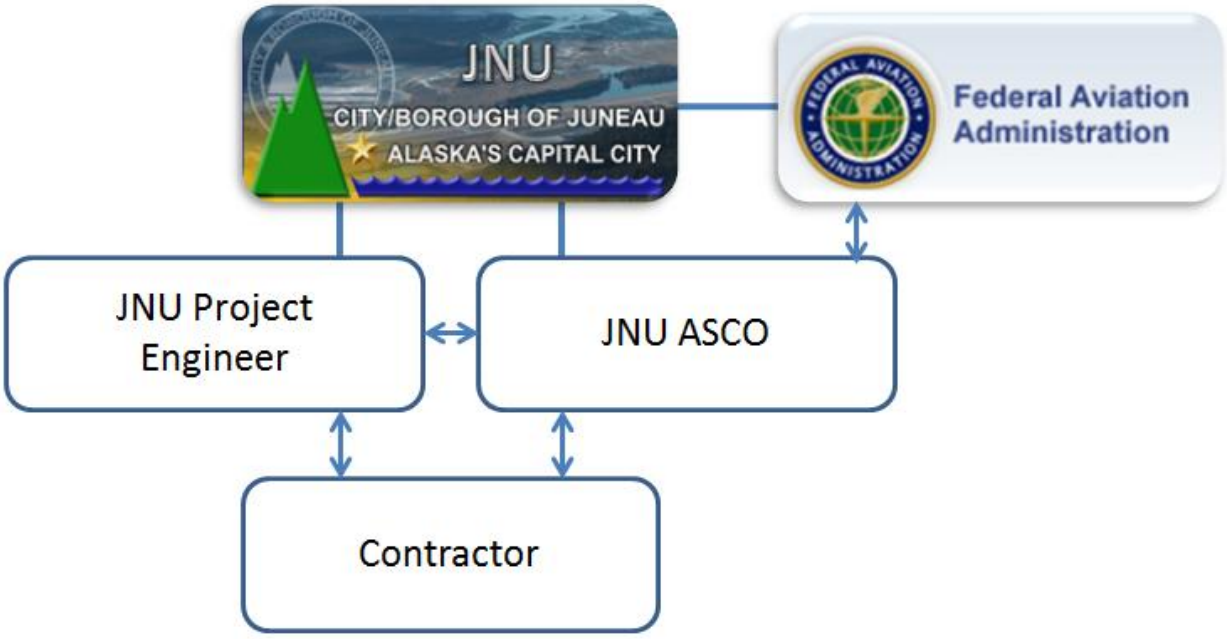
Additive alternates include:

- Construction of wigwags and runway guard lights (RGL) at runway/taxiway intersections.
- Rehabilitation of South SPB Road.
- Construction of Pavement Sensor System for RW 08/26. Sensor stations are anticipated at both ends of the runway and at the center of the runway.

2.0 CONTACTS AND NOTIFICATIONS

2.1 Chain of Notification

Before work begins, the Contractor shall provide a contact person who is available twenty-four (24) hours a day throughout the duration of the project to address any safety issues that may arise, including maintenance of hazard lighting and barricades. That person's twenty-four (24)-hour cell phone number will be supplied to the Project Engineer, Airport Manager, and the Airport Safety and Compliance Officer (ASCO).



The Project Engineer will be the central point of contact between the Contractor and JNU. JNU will be the point of contact for the FAA.

Contract Engineer - TBD

The Contractor is required to comply with direction from the ASCO. The ASCO will advise the Contractor if a directive is an emergency, urgent, or provide another timeline for compliance. The ASCO will notify the Contractor of any emergency operations, including responding Aircraft Rescue and Fire Fighting (ARFF) units, inbound aircraft in distress, law enforcement action, or other activity that may impact Contractor activities or for which the Contractor may need to clear certain areas.

2.2 Issuance of Notice to Airmen

The ASCO will communicate all construction Notices to Airman (NOTAMs) to the Juneau Flight Service Station (FSS). The Contractor shall not issue NOTAMs, but will be responsible for communicating all construction work needing NOTAMs at least forty-eight (48) hours in advance to the Project Engineer and the ASCO. Likewise, changed conditions that might close a NOTAM also need to be communicated.

In the event of an emergency or unforeseen circumstance that is directly related to construction activities and may immediately impact airfield safety, the Contractor is to contact the ASCO immediately and directly, then notify the Project Engineer without delay. The Contractor will follow up with written notification to the Project Engineer within two (2) hours.

2.3 Radio Frequencies

The Contractor is responsible for providing its own radios. The Contractor must be able to communicate with their own staff on their own radio frequency. Additionally, the Contractor must monitor and communicate with the ASCO on a designated Contractor frequency. That frequency will be made available to the ASCO to program into Airport radios. The Contractor is encouraged to communicate on this company frequency whenever possible to encourage "situational awareness" for all project participants. The Contractor may monitor JNU Common Traffic Advisory Frequency 118.7, as an additional safety measure, for emergency aircraft diversions, ARFF response, etc. At no time will the Contractor communicate/transmit on 118.7.

There may be times that radio communications are not appropriate due to complexity or sensitivity of an issue, and in those situations the Contractor may use cell phones:

Project Engineer, TBD: (907) _____
ASCO, Ralph Sanford: (907) 321-1642
Airport Maintenance: (907) 321-3801

If there appear to be unauthorized people in the area, the Contractor is obligated to challenge them. If the people are not able to provide proper identification, the Contractor shall contact the ASCO immediately on the radio, and follow up with a call to Airport Security:

Airport Security: (907) 321-3802

Monitor the individual(s) until JNU representatives arrive. Note that the Transportation Security Administration (TSA) inspectors will attempt to gain access to the site in order to test JNU's security measures, and that failure could result in fines and establishment of more onerous security requirements.

The Contractor may monitor air traffic communication at their discretion, **but at no time will communicate on these frequencies**. The following is a list of radio frequencies used by JNU.

- Common Traffic Advisory Frequency - 118.7 MHz
- Automatic Terminal Information Service - 135.2 MHz
- Tower - 278.3 MHz, 118.7 MHz (and 120.7 MHz between May and September)
- Ground Control - 121.9 MHz
- Juneau Downtown Remote Communications Outlet - 122.15 MHz (Juneau FSS)

3.0 CONSTRUCTION ACTIVITIES

3.1 General Safety Requirements

Throughout the construction project, the following safety and operational practices should be observed:

- *JNU Airfield Ground Vehicle Operator Self-Study Guide*. All construction personnel shall be familiar with the information in the *JNU Airfield Ground Vehicle Operator Self-Study Guide*. This guide is available online at http://www.juneau.org/airport/badging.php. Operators will be required to pass an exam demonstrating their understanding of the study guide.
- Operational safety shall be a standing agenda item during progress meetings throughout the construction project.
- The Project Engineer will coordinate with JNU ARFF on non-emergency routing and utility issues.
- Prior to disruption, the Project Engineer will coordinate with airport operators on access impacts.

- The Contractor, Project Engineer, and ASCO must perform frequent onsite inspections throughout the project, with immediate remedy of any deficiencies, whether caused by negligence, oversight, or project scope change.
- If work is being done on the RSA, in the vicinity of movement areas, or near the SPB water lane, the Contractor shall be in contact with the ASCO, who will coordinate with the appropriate FAA air traffic facility.
- Airport taxiways shall remain open to aircraft operations to the maximum extent possible. Back-taxi distances on the runway shall be minimized, and coordinated in advance with the Project Engineer and ASCO.
- The emergency vehicle access road shall remain open to users to the maximum extent possible. Extended closures will be allowed only when coordinated in advance and approved by the Project Engineer. The Contractor shall provide traffic control measures as required to maintain access.
- The Contractor shall provide flaggers and barricades as necessary to control vehicle movement in the vicinity of work. Flaggers shall be trained and certified.
- The Contractor shall ensure that employees, subcontractors, suppliers and others associated with the work are limited to authorized areas only.
- The Contractor shall not allow any unauthorized persons into the secure areas of the airport through his/her authorized areas.
- The Project Engineer, air traffic control tower, ASCO, or other designated airport representative may order the Contractor to suspend operations; move personnel, equipment, and materials to a safe location; and stand by until cleared to continue operations.
- The Contractor personnel shall comply with all airport safety and security measures.
- The Construction activities shall not penetrate the Code of Federal Regulations 14 CFR Part 77 primary, approach, or transitional surfaces during aircraft operations. These areas are described in the project plans.

- The Contractor shall submit a Safety Plan conforming to this document and any other FAA or JNU requirements pertaining to construction activities at JNU, to be reviewed by the Project Engineer and Airport Manager or designee.

3.2 Construction Maintenance and Facilities Maintenance

It is the Contractor's responsibility to submit an FAA Form 7460 to the FAA prior to beginning construction. This submission begins an airspace study process, and *construction cannot begin* until the study is complete. The form must be submitted at least forty-five (45) days prior to construction, or on the day the construction permit is filed, whichever is earliest. Included with the form are directions on how to complete it.

The FAA airspace study will ensure construction activities do not require the FAA to adjust aircraft approach minimums to account for minimum height from obstacles. The Contractor should advise the FAA of:

- Haul routes, their location, and the height of equipment that will be using them.
- Stockpile locations and approximate height.
- Cranes, drills or structures that will be erected for the duration of the project. Note that temporary operations of these structures can be addressed with a NOTAM, and need to be coordinated with the ASCO in compliance with directions below.

The Contractor must, via the Project Engineer, give notice of proposed location, time, and date of commencement of construction forty-eight (48) hours before beginning any construction activity. Upon completion of work and return of all such areas to standard conditions, the Contractor must, through the Project Engineer, verify cancellation of all notices issued via the NOTAM system. Throughout the duration of the construction project, the Contractor must:

- Be aware of and understand the safety problems and hazards described in Advisory Circular (AC) 150/5370-2 (series), "Operational Safety on Airports During Construction." Note that it is the Contractor's responsibility to use the latest version of the AC.
- Conduct activities so as not to violate any safety standards contained in AC 150/5370-2 (series) or any of the references therein.

- Provide updated information to the Project Engineer for each change in airport operations caused by construction or related activity.
- Inspect all construction and storage areas as often as necessary to be aware of conditions.
- Maintain two-way radio contact with the ASCO at all times while construction activity is in progress.
- Minimize the risk of damage due to foreign object debris (FOD) by sweeping construction sites, when debris is present, after every shift, and as directed by the Project Engineer.
- Promptly take all actions necessary to prevent or remedy any unsafe or potentially unsafe conditions as soon as they are discovered or brought to the Contractor's attention.
- Schedule a routine joint inspection of JNU facilities with the Project Engineer no more than 45 minutes before shutting down the construction operation each day. This is to resolve any access or safety issues. Other joint inspections may be called for at any time on an as-needed basis by either the Contractor or the Project Engineer.
- Request locates and demarcation from all utilities having facilities in the area a minimum of seven (7) days prior to excavation. Demarcation must hold up to weather.
- Maintain aircraft access to the aprons during all stages of work.
- No work is to be performed within the bounds of the active runway, taxiway, or airspace at any time during this project without prior approval and clearance by the ASCO. This includes any hauling, foot and/or vehicle traffic.
- The Contractor will not be allowed in the active movement area without escort.

3.3 Scheduling of Work

The sequence of construction operations is described in the plans and briefly below. These operations have been coordinated with airfield users, including large and small airlines, airfield maintenance, FAA Air Traffic Control, FAA Flight Service, FAA Technical Operations (navigational aids [NAVAIDS]), TSA, ARFF, wildlife control services, and the public. The Contractor shall prepare a detailed schedule for the work of this project and submit to the Project

Engineer for approval prior to beginning work. This schedule must be kept current throughout the project, as many parties have adapted their operations to accommodate it.

The Contractor shall begin work in a timely manner, minimize construction shut-downs, and coordinate with the Project Engineer and ASCO to minimize the impact to airport operations. The Contractor shall give the Project Engineer notice at least thirty (30) days in advance of proposed impacts to the Airport Operations Area (AOA). The Contractor shall propose reasonable limits on the size and duration of any impacts. During 14 CFR Part 121 and/or Category C or larger aircraft operations, personnel and equipment must be outside the OFA. No personnel or equipment will operate within these limits without clearance from the ASCO. Alaska Airlines is the only 14 CFR Part 121 operator currently at JNU. The ASCO will advise the Contractor of any additional operations that require the Contractor to clear the area, and the Contractor should keep in mind that these operations may not be scheduled, and could happen at any time. Additional restrictions may be placed on construction activities during 14 CFR Part 121 operations, such as a requirement for moving equipment out of the movement area and the associated airspace. The proposed schedule for Alaska Airlines operations may be obtained from the Project Engineer.

The Project Engineer and the ASCO will coordinate with JNU ARFF on any impacts to response access or routes.

3.4 Staging

A proposed construction staging and safety plan is included in the construction drawings. The work is divided into several work items to accommodate the construction activities while maintaining airport operations to the fullest extent possible.

Threshold work is anticipated to be the most critical and challenging aspect of sequencing on this project. For each threshold shift, the work will be divided into three major components: construction, interim and final.

Below is a detailed list of all the items that must be considered during the threshold shifts, beginning with RW 26, and following with RW 08. RW 08 work will not begin until RW 26 has been returned to an interim configuration.

RW 26

Project work for RW 26 includes:

- Remove and stockpile topsoil.
- Grading and surfacing of lateral RSA between sta 49+74 to 84+57.
- Relocation of RW 26 threshold from sta 84+57 to 89+77.
- Extension of TW A.
- Construction of relocated TW G.
- Construction of blast pad.
- Grading and surfacing of RW 26 RSA.
- Conduit for 26 medium-intensity approach lighting system with runway alignment indicator (MALSR) and Juneau Airport Wind System (JAWS).
- Installation of runway and taxiway lights and signs.
- Pavement.
- Removal of pavement markings.
- Application of pavement markings.
- Installation of wigwags and RGLs (additive alternate).
- Installation of pavement sensors (additive alternate).

<u>During Construction</u>

- Place temporary threshold lights.
- Remove existing pavement markings including: Threshold bar, aiming bar, runway designator, and chevrons.
- Place temporary pavement markings in the construction configuration, including: Threshold bar, aiming point, runway designator, arrow marking (yellow), taxiway centerline and yellow runway edge markings to displaced threshold.
- Replace lens on all runway edge lights sta 78+60 to 84+60 with blue lenses.
- Replace lens on all runway edge lights sta 58+60 to 78+60 with yellow/white lenses.
- Disconnect and leave in place runway centerline lights sta 78+60 to 84+60.
- Rearrange runway centerline lights sta 48+60 to 78+60 such that lights are as follows:

  - sta 48+60 to 68+60 red/white and white/white alternating starting with red/white
  - sta 68+60 to 78+60 red/white
- Disconnect, cover, and leave in-place distance remaining signs.

NO other work can start until above is complete.

- Remove and stockpile topsoil
- Remove existing threshold lights
- Trench in utilities
- Construct structural section
- Site grading
- Paving
- Electric trim including, but not limited to outrigger threshold lights sta 84+60 with blue lens

Do not activate other new signs, edge and centerline lights prior to move to interim configuration.

Interim Configuration

- Remove markings from vacated TW G.
- Remove temporary construction configuration markings, including: Threshold bar, aiming point, runway designator, yellow centerline and edge stripes on runway, and arrows.
- Place temporary interim markings (in their original location), including: Threshold bar, aiming point, runway designator, runway edge markings to sta 89+77, centerline arrows and arrow heads, and runway shoulder stripes.
- Place permanent markings for new TW G: Hold bar, taxiway centerline and enhanced centerline, taxiway edge and shoulder, compass rose and centerline lead in.
- Remove threshold lights at sta 78+60.
- Replace lens threshold lights at sta 84+60 to yellow/green.
- Replace lens threshold lights at sta 89+77 to red/red.

- Replace lens runway edge lights 58+60 to 64+60 to white/white.
- Replace lens runway edge lights 64+60 to 84+60 to yellow/white.
- Replace lens runway edge lights 84+60 to 89+77 to yellow/red.
- Replace lens runway centerline lights 48+60 to 59+77 to white/white.
- Replace lens runway centerline lights 59+77 to 79+77 to red/white white/white alternating starting with red/white.
- Replace lens runway centerline lights sta 79+77 to 89+77 to white/red.
- Remove old TW G centerline and edge lights per electrical demo drawings.
- Activate new TW G lights and distance remaining signs.
- Reactive and uncover distance remaining signs.

Final Configuration

- Remove outrigger threshold lights at sta 84+60.
- Remove temporary interim markings including: Threshold bar, aiming point, runway designator, arrows, arrow heads, and centerline.
- Apply final, permanent markings including: Threshold bar, aiming point, runway designator, blast pad chevrons and shoulder stripes, edge stripes, and centerline markings.
- Replace lens for threshold at sta 89+77 with green/red.
- Replace lens for runway edge sta 64+60 to 69+77 with white/white.
- Replace lens for runway edge sta 69+77 to 89+77 with yellow/white.
- Disable and remove old runway distance remaining signs, activate new.

RW 08

Project work for RW 08 includes:

- Relocation of RW 08 threshold from sta 0+00 to 1+20.
- Removal of pavement markings.
- Reconstruction and realignment of TW B.

- Construction of MALSR foundations for 2, 4, 6, and threshold bar.
- Conduit work for MALSR 08 and JAWS.
- Grading and surfacing of RW 08 RSA.
- Construction of blast pad.
- Removal of TW B pavement.
- Grading and structural section.
- Pavement.
- Removal of runway and taxiway lights and signs.
- Installation of runway and taxiway lights and signs.
- Installation of wigwags and RGLs (additive alternate).
- Installation of pavement sensors (additive alternate).
- Application of pavement markings.

<u>During Construction</u>

- Place temporary threshold lights sta 8+80.
- Remove existing pavement markings including: Threshold bar, aiming bar, runway designator, and chevrons.
- Place temporary, construction configuration pavement markings including: Threshold bar, aiming point, runway designator, arrow marking (yellow), taxiway centerline, and edge markings to displaced threshold.
- Disconnect all runway edge lights sta 0+00 to 8+80.
- Replace lens on all runway edge lights sta 8+80 to 28+80 with yellow/white lenses.
- Disconnect but leave in place runway centerline lights sta 0+00 to 8+80.
- Rearrange runway centerline lights sta 8+80 to 38+80 such that lights are as follows:
  - sta 8+80 to 18+80 red/white
  - sta 18+80 to 38+80 red/white and white/white alternating ending with red/white
- Disconnect and cover distance remaining signs.

NO other work can start until above is complete.

- Remove existing threshold lights and TW B lights.
- Remove pavement TW B.
- Trench in utilities.
- Construct MALSR foundations for 2, 4, 6, and threshold installations.
- Construct structural section.
- Site grading.
- Paving.
- Electric trim.

Do not activate other new signs, edge and centerline lights prior to move to interim configuration.

Interim Configuration

- Remove temporary construction configuration markings, including: Threshold bar, aiming point, runway designator, yellow centerline and edge stripes on runway, and arrows.
- Place temporary interim markings (original location), including: Threshold bar, aiming point, runway designator, centerline arrows and arrow heads, and runway shoulder stripes.
- Place permanent markings for TW B including: Hold bar, taxiway centerline and enhanced centerline, taxiway edge and shoulder, and centerline lead in.
- Remove threshold lights at sta 8+80.
- Replace lens threshold lights at sta 0+00 to red/green.
- Replace lens runway edge lights 20+00 to 28+00 to white/white.
- Replace lens runway edge lights 0+00 to 20+00 to yellow/white.
- Replace lens runway centerline lights 30+00 to 38+80 to white/white.
- Replace lens runway centerline lights 10+00 to 30+00 to red/white white/white alternating ending with red/white.
- Replace lens runway centerline lights sta 0+00 to 10+00 to white/red.

- Activate new TW B lights.
- Reactivate and uncover existing distance remaining signs.

Final Configuration

- Remove threshold lights at sta 0+00.
- Remove temporary interim markings including: Threshold bar, aiming point, runway designator, arrows, arrow heads, and centerline.
- Apply permanent, final markings including: Threshold bar, aiming point, runway designator, blast pad chevrons, edge stripes, and centerline markings.
- Replace lens for threshold at sta 1+20 with green/red.
- Replace lens for runway edge sta 20+00 to 21+20 with yellow/white.
- Replace lens for runway centerline sta 10+00 to 11+20 with red/white.
- Replace lens for runway centerline sta 11+20 to 31+20 with red/white white/white alternating ending with red/white.
- Remove runway centerline light sta 0+00 to 1+20 per electric demolition plan.
- Remove old MALSR 2, 4, 6, and threshold per electrical demolition plan.
- Disable and remove old distance remaining signs, and activate new.

When equipment is not in use, it must be removed from the object-free area (OFA) and Part 77 airspace.

Other Work Items

The following items also need to be included in the staging plan:

- TW E realignment, and signs
- All new runway signs
- North SPB Road reconstruction
- Wigwags and RGLs (additive alternate)
- Pavement sensors (additive alternate)
- South SPB Road reconstruction (additive alternate)

3.5 Construction Shutdown Periods

The following information on runway and surfaces is provided for planning use, and is mapped on the project plans:

- The SPB water lane is approximately 400 feet wide by 4,800 feet long.
- The runway is 150 feet wide by 8456 feet long.
- The primary surface for RW 08/26 extends 250 feet both side of the centerline (for a total width of 500 feet) and 200 feet beyond the threshold at the same elevation as the runway centerline.
- The approach surfaces for RW 08/26 are longitudinally centered on the runway centerline, extending outward and upward from the end of the primary surface. The inner edge of the approach surface is the same width as the primary surface and expands uniformly to a width of 3,500 feet and extends for a horizontal distance of 10,000 feet at a slope of 34:1.
- The transitional surface extends outward and upward perpendicular to the runway centerline at a slope of 7:1 from the sides of the primary surface and from the sides of the approach surfaces.

All construction shutdowns are to be coordinated in advance with the Project Engineer. All equipment stored on site during shut down periods must be placed within confined areas established by the airport only after prior written approval by the Project Engineer, and remain outside of the OFA unless covered under the FAA Form 7460 submitted for the airspace study. All equipment stored on site during shutdown is the sole responsibility of the Contractor and all appropriate means must be taken to secure the shutdown storage area(s) located within JNU property.

3.6 Haul Routes

Haul routes are shown in the plans. Confine vehicles to the haul routes and work areas as shown on the plans or as directed by the Project Engineer. The Project Engineer must approve all haul routes prior to their use.

Maintain all roads used for hauling purposes during the construction of this project in accordance with the General Contract Provisions. To the degree possible, any roadway signs should comply with City and Borough of Juneau (CBJ) or state *Manual of Uniform Traffic Control Devices* standards. Return roads and all haul route surfaces to their prior conditions upon completion of the work. Provide water or other dust palliative and appropriate distribution equipment, as required, for dust control on the haul route surfaces and in the work area. In addition, develop a Traffic Control Program for use of the public and airport road system as per Section G-710 of the specifications.

Keep all active runway and taxiway areas swept clean of materials spilled by Contractor operations. Remove all material spills from the active runway, taxiways, and aprons immediately to prevent FOD damage to aircraft. Station adequate cleaning equipment at the job site to provide immediate cleanup of any material spills on the active runway, taxiway, and apron surfaces. Assure that all loose material and debris has been removed from the sides of haul vehicles before leaving or entering the site in order to minimize spills of material on airport or road surfaces. Clean all spilled materials off airport operational surfaces before the area is reopened to aircraft. Clean all existing runway and taxiway lights, if necessary, as well as temporary lighting, before opening to aircraft.

When trucks will be traversing operational surfaces, one laborer with a hand broom will be assigned to sweep off excess material that accumulates on the outside of the trucks during loading. Each truck will be hand-swept before leaving the work areas. Alternatively, the Contractor can provide a "truck wash" for trucks leaving the work areas.

If JNU, the Project Engineer, or the ASCO determine that a surface is not adequately cleaned, they will verbally notify the Contractor, and log the communication in the inspection log. The Contractor will have 15 minutes to begin cleanup of the area. If the area is not adequately cleaned JNU will provide clean-up services and charge the Contractor for the service, with a minimum two (2) hour call out.

The Contractor shall be required to procure all necessary equipment for the contract. Use of airport personnel and equipment shall not be allowed, unless emergency or extenuating

circumstances arise. The Contractor shall be billed for use of such equipment and personnel at the discretion of the JNU.

Staging areas are all inside the fence, are shown on the project plans. JNU is not responsible for damage to vehicles or equipment, or for loss of property left on JNU property. Personal vehicles left on the premises after hours or for long durations are subject to fines or towing.

3.7 Location of Flaggers

Flaggers will be positioned at the following locations:

- Where work or hauling operations are being conducted within movement area or associated airspace (including RSA), as coordinated with the ASCO.
- Where construction activity is being conducted in close proximity to operating aircraft and the ASCO determines that a flagger is needed.
- At both sides of the ends of the runway if construction equipment/trucks will be crossing the runway at those locations.
- At gate access points. These flaggers will check for proper identification on all entities accessing the area. This includes proper placarding of vehicles, and proper airfield identification or escort, unless other security measures have been established. If the Contractor requires continuous access through gates or at entry points along existing airport security fence of the AOA, flaggers may be replaced with other security measures upon prior written approval by JNU Security Coordinator. Note: Fence openings or holding gates open requires written thirty (30)-day advance notice to the JNU Security Coordinator. JNU must receive TSA approval of any change to the fencing - including holding open a gate, or breaching the fence.

Generally, flaggers will not be positioned along haul routes except on movement areas and at roadway entrance/exit points, unless safety concerns arise during construction. These locations may be adjusted during construction.

3.8 Borrow and Disposal Area Locations on Airport Property

Most material necessary for the completion of this work is to be excavated from work areas as shown on the plans. Any additional materials necessary for the completion of the work is to be procured from existing borrow material sources located outside of JNU facilities.

Disposal areas for unsuitable materials are shown on the plans. Any excess material shall be disposed of at Contractor-permitted sites.

3.9 Wildlife Control

Contractors will not harass wildlife in any way. The Contractor shall notify the ASCO of:

- Any wildlife that interferes with construction operations.
- Any wildlife that may present a hazard to aircraft. Examples include:
  - Large concentrations of wildlife, such as flocks of birds.
  - Birds that appear to be in the approach path.
  - Deer on the AOA.

Stray domestic animals, such as dogs or horses, should also be reported to the ASCO. Contractor-owned dogs are not allowed inside the AOA.

The ASCO will coordinate with Wildlife Services to address any animal concern. Keep in mind that Wildlife Services personnel are specially trained and permitted to harass wildlife, and their activities are not approved for everyone working on the airfield.

Contractors will minimize wildlife attractants by:

- NEVER feeding or leaving food out for wildlife.
- Not keeping food or food waste (including wrappers) in open vehicles.
- Controlling trash.
- Securing stockpiles and building materials, on the ground or in vehicles. Keep in mind that wildlife may be attracted to shiny objects, insulating materials, or perches.
- Minimize ponding and puddling in the construction area, to minimize attractions to dabbling or sea birds.

- Maintain fence integrity, to the best of the Contractor's ability, to prevent access by deer, dogs, bears, etc.

3.10 Foreign Object Debris

Objects that may impact or be ingested by aircraft are called FOD and do millions of dollars of damage to aircraft every year. FOD is not limited to hard items; things like loose plastic can also cause major impact or ingestion damage. It is important to control FOD on the airport during construction, and the Contractor will minimize FOD by:

- Securing truck loads whenever necessary to prevent loosing debris.
- Securing stockpiles.
- No littering.
- Picking up or securing FOD.
- Cleaning vehicles with a broom or hose before leaving a materials site or driving on a surface.
- Brooming areas where rocks and gravel have been dropped.

Additional information on FOD control can be found under **Section 3.6 Haul Routes**.

3.11 Marking and Lighting of Excavations, Open Trenches, and Other Hazardous Areas

Note that open excavations are never allowed in the RSA of an active runway, or the Taxiway Safety Area of an active taxiway. They should be back-filled, or a cover should support the weight of the largest aircraft using that surface. Back-fills should be graded to support the weight of the largest aircraft using the surface, and to minimize erosion.

All use of barriers and barricades must comply with AC 150/5370-2 (series).

a. Hazard marking and lighting prevents pilots from entering areas closed to aircraft, and prevents construction personnel from entering areas open to aircraft. For any area affected by construction that is normally accessible to aircraft, personnel, or vehicles, there must be prominent, comprehensible warning indicators. Hazard marking and lighting must also be identify open manholes, small areas under repair, stockpiled

material, waste areas, and areas subject to jet blast. Also consider less obvious construction-related hazards, and include markings to identify FAA, airport, and National Weather Service facilities cables and power lines; airport surfaces, such as RSA, OFA, and obstacle-free zone (OFZ); and other sensitive areas to make it easier for contractor personnel to avoid these areas.

b. Equipment

1) Barricades, including traffic cones, (weighted or sturdily attached to the surface) are acceptable methods used to identify and define the limits of construction and hazardous areas on airports. Careful consideration must be given to selecting equipment that poses the least danger to aircraft but is sturdy enough to remain in place when subjected to typical winds, prop wash, and jet blast. The spacing of barricades must be such that a breach is physically prevented barring a deliberate act. For example, if barricades are intended to exclude vehicles, gaps between barricades must be smaller than the width of the excluded vehicles, generally 4 feet. Provision must be made for ARFF access if necessary. If barricades are intended to exclude pedestrians, they must be continuously linked.

2) Lights must be red, either steady burning or flashing, and must meet the luminance requirements of the State Highway Department. Batteries powering lights will last longer if lights flash. Lights must be mounted on barricades and spaced at no more than 10 feet. Lights must be operated between sunset and sunrise and during periods of low visibility whenever the airport is open for operations. They may be operated by photocell, but this may require that the Contractor turn them on manually during periods of low visibility during daytime hours.

3) Supplement barricades with signs (for example “No Entry,” “No Vehicles”) as necessary.

4) Air Operations Area - General. Barricades are not permitted in any active safety area. Within a runway or taxiway OFA, and on aprons, use orange traffic cones,

flashing or steady burning red lights as noted above, collapsible barricades marked with diagonal, alternating orange and white stripes; and/or signs to separate all construction/maintenance areas from the movement area. Barricades may be supplemented with alternating orange and white flags at least twenty (20) by twenty (20) inches square and securely fastened to eliminate FOD. All barricades adjacent to any open runway or taxiway/taxilane safety area, or apron must be as low as possible to the ground, and no more than eighteen (18) inches high, exclusive of supplementary lights and flags. Barricades must be of low mass; easily collapsible upon contact with an aircraft or any of its components; and weighted or sturdily attached to the surface to prevent displacement from prop wash, jet blast, wing vortex, or other surface wind currents. If affixed to the surface, they must be frangible at grade level or as low as possible, but not to exceed three (3) inches above the ground.

5) Air Operations Area - Runway/Taxiway Intersections. Use highly reflective barricades with lights to close taxiways leading to closed runways. Evaluate all operating factors when determining how to mark temporary closures that can last from ten (10) to fifteen (15) minutes to a much longer period of time. However, even for closures of relatively short duration, close all taxiway/runway intersections with barricades. The use of traffic cones is appropriate for short duration closures.

6) Maintenance. The construction specifications must include a provision requiring the Contractor to have a person on call twenty-four (24) hours a day for emergency maintenance of airport hazard lighting and barricades. The Contractor must file the contact person's information with the Project Engineer and ASCO. Lighting should be checked for proper operation at least once per day, preferably at dusk.

Stockpiles and waste areas that are on the AOA will also need demarcation and approval by the Project Engineer.

Barricades must be able to be removed by emergency response crews.

3.12 Failure to Comply

JNU will stop work if construction operations are not in compliance with this manual. If the JNU does not maintain safe conditions on the airport, they can be fined, lose millions of dollars in funding, and be denied certification for air carrier operations. JNU takes airport operational safety very seriously, and appreciates the Contractor's full cooperation with these provisions.

4.0 AIRCRAFT OPERATIONS AREA

4.1 Restriction of Aircraft Activity During Closures of Airport Operation Areas, Runways, and Taxiways

Construction will not require full closure of RW 08/26, but may require partial closures at either end. Construction will be occurring at the same time that large aircraft operations are occurring; these include 14 CFR Part 121 and/or Category C or larger aircraft operations. The ASCO will advise the Contractor when to clear the area for these operations, and the Contractor is required to immediately clear all personnel and equipment from the movement area and airspace. Clearing the airspace includes items such as lowering cranes and drills, and lowering the arm on excavators. Coordinate with the ACSO on "refuge areas" the Contractor can move equipment to. Limited runway and taxiway closures can be proposed and put in effect only with the approval of the ASCO.

The Contractor shall provide the ASCO forty-eight (48)-hour notice for NOTAMs and seven (7)-day advance notice for closures of the runway or taxiways. In addition, weekly meetings will be held between the Airport, Project Engineer, ASCO and Contractor to provide an update of construction work and its impact on current airport operations, tenants, and to those providing emergency medical evacuation (MEDIVAC) services. Additional meetings will be held when the scope of work changes.

4.2 Setback Lines from Active Runways and Taxiways

Work cannot occur on an active surface. The OFA and airspace are the setbacks for work in the vicinity of an open runway or taxiway. No equipment will operate within these limits without clearance from the ASCO. Exceptions to these construction limitations may occur only with permission of the ASCO and only after the proper NOTAMs have been issued, if necessary.

4.3 Conditions for Closure

The construction contract documents require appropriate notices and markings before any restrictions are placed on airport services. The Contractor shall coordinate their activities and cooperate with the Project Engineer and ASCO, which will include:

- Thirty (30) days notice for activities that are anticipated to impact AOA operations or security operations.
- Fifteen (15) days notice for work in the AOA that is not anticipated to impact AOA operations.

4.4 Runway and Taxiway Closure Markings

No full runway closures are anticipated as part of this project, but partial closures are anticipated. These closures will be closely coordinated with the ASCO, who will issue appropriate NOTAMs.

The Contractor shall provide barriers and markings for any and all taxiway closures in accordance with the plans and specifications and this safety plan, **Section 3.11 Marking and Lighting of Excavations, Open Trenches, and Other Hazardous Areas**. Note that movement area closures require use of low-profile barriers that are lit and weighted. Winter closures must be closely coordinated to ensure that low barriers remain visible during snow events. All solar-powered lighting must have a battery back-up, and the Contractor will visually inspect all lighting at dusk, and ensure all lights are operational. As noted in **Section 2.1 Chain of Notification**, the Contractor must have a representative available twenty-four (24) hours a day to address lighting and other barrier concerns that may arise.

5.0 NAVIGATIONAL AIDS AND VISUAL AIDS

There are a number of NAVAIDs that assist pilots with finding the airport and landing in poor weather conditions. All questions regarding NAVAIDs and possible impacts should be directed to the Project Engineer.

Do not drive across the approach path of the runway if an aircraft is landing. You can interfere with lights and radio signals that will help them land.

There are FAA approach-light elements to this project, and the Contractor is limited to providing conduit and handholes. The Contractor will not pull wires, or demolish or dispose of existing wire. If the Contractor inadvertently comes across direct-bury lines they will contact the Project Engineer immediately.

The RW 08 and 26 MALSRs, which are FAA NAVAIDs, will be relocated during the construction season. This process is coordinated by the FAA and is not anticipated to involve the Contractor. However, due to the importance and complexity of this endeavor, it is important for the Contractor to maintain situational awareness regarding this process. If the Contractor has any concerns or questions he should contact the Project Engineer.

5.1 Federal Aviation Administration Navigational Aids and Associated Critical Areas

Along the side of the runway are visual approach slope indicators (VASI). These are orange boxes on tubular legs. Do not park in front of these structures. See the plan set to fully understand the critical areas for these NAVAIDs.

There is highly sensitive FAA wind sensing equipment located within the work areas. The Contractor shall meet with the FAA through the Project Engineer to identify and mark these sensitive areas in the field prior to conducting work.

5.2 Federal Aviation Administration Visual Aids

The Contractor is not anticipated to need to work with the FAA's visual aids. If the Contractor inadvertently blocks or damages a visual aid, they will notify the ASCO immediately, and the ASCO will issue a NOTAM.

The segmented circle and the wind cone near the west end of the runway will be relocated farther to the west.

Shifting of the thresholds may require temporary markings and lighting. Markings might include painted threshold boards beside the runway, or may include temporary lighting. Any temporary installations need to be secured so that they are not moved by prop wash or jet blast. Any temporary markings must be in accordance with AC 150/5340-1 (series), Standards for Airport Markings.

6.0 SECURITY PROGRAM

JNU is a 14 CFR Part 139 certificated airport and has a security program in place. See the plans and specifications for additional security requirements.

The Airport Manager must control access to the airport and prevent unauthorized persons from entering secure areas. In compliance with this requirement, the Airport Manager has established procedures to authorize or deny access to the AOA and to identify and control persons while in these areas. You will see signs denoting these areas as "Restricted Areas," and providing requirements for access.

Access to Restricted Areas requires an airport security badge. Badging is a privilege, not a right. Failure to comply with access rules can result in fines and denial of access. Each person granted a badge is obligated to challenge people who are not displaying appropriate identification, and to immediately notify JNU of possible unauthorized access.

6.1 Badging

The Contractor is advised to begin the badging process as soon as possible after receiving Notice to Proceed. As outlined below, the Airport does their best to make the process smooth and clear, but there are time-consuming aspects that the Airport does not have control over. The Contractor is advised to take that under consideration when scheduling the start of construction activities on the airport.

Current badging rules and protocols are available at the airport web site, and will be reviewed prior to a badge being issued to an individual. Badges are issued through the Airport Badging Office.

Contractor personnel should anticipate applying for a Secured Identification Display Area (SIDA) badge. They can find application and training materials at the Airport Badging Office web site: http://www.juneau.org/airport/badging.php.

In order to receive a SIDA badge, the applicant must be able to do the following:

- Provide required documentation to verify a person's identity. The list of appropriate documents is included with the badge application.

- Pass a Federal Bureau of Investigation (FBI) finger-print-based background check. Note that the SIDA badge application includes a list of disqualifying crimes. If an individual has committed any of these crimes within the last ten (10) years, they are ineligible to hold a badge.
- Pass a Security Threat Assessment, conducted by TSA. This assessment is in addition to the FBI check noted above.
- Pass the *Juneau International Airport Security Identification Display Area Training Course*.

The TSA, FBI, or JNU can prohibit a person from receiving a badge if they believe, for any reason, that an individual may be a threat to security.

The Contractor will need to provide a letter on business stationary stating who has authority to serve as a badging coordinator for the Contractor. These parties will authorize all people who will be given a badge under the auspices of this project, and will be responsible for ensuring that badges are renewed, collected and returned as required. These people need to have their badges before they can authorize others to receive their badges.

A badge applicant must physically present the application to the Airport Badging Office in order to begin the process, which will include an FBI finger-print-based and TSA background checks. The background check usually takes up to a week, but can take longer depending on FBI and TSA work load. A badge cannot be issued until the background check has been done, and the airport has no control over how long it takes the FBI and TSA to do the background check, so all personnel are strongly encouraged to start the badging process as soon as possible.

A badge holder needs to have special endorsements to drive on the airport. Holding a badge does not automatically authorize someone to drive on the airport. Please refer to the *Juneau International Airport Airfield Ground Vehicle Operator Self-Study Guide*, available at the Airport Badging Office web site referenced above.

A badge holder may require escort to non-badged personnel under certain circumstances - refer to page 17 of the *Juneau International Airport Security Identification Display Area Training*

Course, VII. Escort Authority. This document can be found at the Airport Badging Office web site referenced above.

Any violation of Airport access rules can result in a fine in excess of $11,000 per event. A lost badge will require the payment of a fine that is currently $200, but is subject to change. Immediately notify the airport in writing of any lost badge, so that it can be inactivated and so that gate monitors can be notified that it is no longer valid.

6.2 Aeronautical Operation Area Entry Control

The Contractor will be responsible for preventing unauthorized access to the AOA by way of the construction site, including the maintenance of JNU perimeter gates in either: (1) a locked condition, or (2) attended by persons who ensure that only authorized personnel or vehicles are admitted through them. Any opening that would allow unauthorized access and permit a person into a restricted AOA must be approved by the Airport Security Coordinator in writing thirty (30) days in advance, and be either secured to preclude unauthorized access or must be attended by persons as outlined above.

Security control must be maintained during fence removal or construction/demolition activities. Fence breaches or openings must be secured to the Project Engineer's satisfaction when not actively monitored by the Contractor. The Contractor is responsible for providing a flagger or other security monitor at any unsecured access gate or fence opening being used. The flagger must have the ability to call for assistance via radio or cell phone. They must also have a list of any personnel who have been denied access, but whose badges have not been recovered. They should also be briefed on vehicle equipment requirements, including two-way radios, flags, beacons and placards. The flagger has the authority to hold anyone at the gate who does not meet these requirements.

6.3 Gate Access

Gate proximity cards are issued through the Airport Badging Office, see Section 6.1 above. Any gates that will be held open must be approved by Airport Security Coordinator thirty (30) days in advance. Flaggers monitoring the gates should be advised that other users of the gate--private pilots, airline vehicles, etc.--may not have the same vehicle requirements, and should not be

denied access for those reasons. Again, the flagger should have communications available that allow them to ask questions or call for assistance.

6.4 Vehicle Operation, Marking and Control

In addition to the *Airfield Ground Vehicle Operator Self-Study Guide*, the following provisions regarding vehicle use must be followed:

- All Contractor vehicles shall be properly identified in accordance with AC 150/5210-5 (series) "Painting, Marking, and Lighting of Vehicles Used on an Airport." To operate a vehicle inside the perimeter fence, vehicles shall:
  - Display an orange and white aviation flag, in good repair, on a staff attached to the vehicle so that the flag will be readily visible. Rigs with booms, dump trucks, and similar equipment at any height must have flags and lit beacons. NOTE: Different vehicles require different lighting; refer to the AC for details.
  - Any vehicle or equipment, including loaders, operating inside the perimeter fence must also be equipped with a flashing amber beacon, per the AC. At no time will a personal vehicle be used in the project area.
  - All vehicles using movement areas will have two-way company radios to communicate with the Project Engineer and ASCO.
  - All vehicles will be marked with the vendor information on both sides. **Magnetic placards are absolutely forbidden**, as they have a tendency to come loose.
- Contractor's employee personal vehicle parking, as well as Contractor equipment parking, shall be located as designated by airport management.
- Haul routes for this project are as shown on the plans. Use of alternate haul routes must be submitted for review and approved by the Project Engineer prior to being used.
- Before beginning and at the conclusion of hauling operations, the Contractor and the Project Engineer will conduct a haul route inspection. After the post-construction inspection the Contractor will, at a minimum, restore the haul route(s) to the pre-hauling condition in accordance with the specifications. The Contractor shall document the pre-hauling condition by digital pictures or video.

- Contractor staging areas are shown in the plans. No stockpiles may be in the runway or taxiway OFAs unless they were submitted as part of the FAA Form 7460 Aeronautical Study. Before occupying a temporary use/staging area, the Contractor shall mark the staging area limits with lath and flagging and then arrange a joint inspection with the Project Engineer to record the area's original condition. No motorized equipment shall be staged on dirt surfaces in the staging area(s) without a drip pan. When the area is no longer needed, the Contractor shall arrange an inspection with the Project Engineer in order to ensure that the area is returned to an original condition. The Contractor shall document the original condition of the staging area by digital pictures or video and provide copies of these to the Project Engineer.

7.0 ADDITIONAL CONTACTS

Project Engineer
To be Determined

Airport Engineer
Airport Engineer, Juneau International Airport
1873 Shell Simmons Drive, Ste. 200
Juneau, Alaska 99801
Telephone: (907) 586-0453
Fax: (907) 586-0407
Email:

Juneau International Airport, Airport Manager
Ms. Jeannie Johnson
Airport Manager
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Juneau, Alaska 99801
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Fax: (907) 789-1227
Email: Jeannie_Johnson@ci.juneau.ak.us

Juneau International Airport, Field Maintenance Superintendent
Steve Ayers
Superintendent, Maintenance and Operations
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Telephone: (907) 789-4001
E-mail:

Juneau International Airport, Airport Deputy Manger
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Airport Security Coordinator
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Fax: (907) 789-1227
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Juneau International Airport, Airport Safety and Compliance Officer
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Airport Safety Officer
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Airport Security
Telephone: (907) 586-0899
Telephone: (907) 321-3802

Federal Aviation Administration Facilities
Mr. Bruce Lobdell
Glacier Sector Service Center, Airway Facilities
Telephone: (907) 966-2535

Emergency Services
Captain, Glacier Fire Station
Capital City Fire/Rescue
1700 Crest Avenue
Juneau, Alaska 99801
Telephone: (907)586-7379

Automated Flight Service Station
Mr. Steven J. Lyon
Facility Manager
9230 Cessna Drive
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Federal Aviation Administration Air Traffic Control Tower
Mr. Steve Turner
Air Traffic Manager
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Alaska Airlines
Dan Kane, Station Manager, Juneau
Telephone: 789-9266
Mobile: 957-6260
Email: dan.kane@alaskaair.com
Chris Andree, Construction Manager
Telephone: 206-392-5441
Mobile: 206-304-0527
Email: chris.andree@alaskaair.com

Airlift Northwest (now two companies)
To be updated
Ms. Shelly Deering
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Telephone: 907-790-4944
Mobile: 907-723-0168
Email: shelly.deering@airliftnw.org

Appendix E

Permits

(Not Used)

Appendix F

Traffic Plan

(Not Used)

Appendix G

Sign Plan

(Not Used)

Appendix H

Mining Plan

(Not Used)

Appendix I

Aviation Materials Certification List

AIRPORT MATERIALS CERTIFICATION LIST (current 01/30/2012)

Project Name Juneau International Airport Runway Safety Area Improvements - Phase 2A

Project Number E12-240/AIP 3-02-0133-056-2012

Project Engineer Signature

Unshaded boxes indicate who approves the manufacturer's certificate of compliance or materials submittals.
If two boxes not shaded, either approving authority may be used.

Materials Item	Specification	Construction			Design		Statewide Materials		Remarks	Materials Certificate Location e.g. Binder #
		Project Engineer	Regional Materials or QA Engineer	Airport Ltg. Equipment Certification Program	Civil Design Engineer of Record	Electrical Design Engineer of Record	*Qualified Products List (QPL)	State Materials or QA Engineer		
D-701 STORM DRAINS AND CULVERTS										
Pipe										
(Type) Pipe or Arch, __ Diam. or ____ Rise & Span	D-701-2.2									
Concrete Mix Design	D-701-2.3									
Rubber Gaskets	D-701-2.4									
Joint mortar										
Portland Cement	D-701-2.5									
Joint fillers	D-701-2.6									
Plastic gaskets	D-701-2.7									
D-704 STEEL ENCASED AUGER BORINGS										
Pipe										
Steel Casing Pipe, __ Diam., __ gage	D-704-2.2 1./Plans									
Joints	D-704-2.2 2./Plans									
D-751 MANHOLES, CATCH BASINS, INLETS, AND INSPECTION HOLES										
Brick	D-751-2.1									
Mortar										

*Unshaded boxes under the QPL do not indicate that the materials are on that list. They indicate materials with potential for being on the QPL once qualified.
See GCP 60-05 for submittal requirements.

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Materials Item	Specification	Construction			Design		Statewide Materials		Remarks	Materials Certificate Location e.g. Binder #
		Project Engineer	Regional Materials or QA Engineer	Airport Ltg. Equipment Certification Program	Civil Design Engineer of Record	Electrical Design Engineer of Record	*Qualified Products List (QPL)	State Materials or QA Engineer		
Portland Cement	D-751-2.2									
Concrete	D-751-2.3/P-610									
Precast Concrete Pipe Manhole Rings	D-751-2.4									
Corrugated Metal	D-751-2.5									
Frames, Covers and Grates										
Gray Iron Castings	D-751-2.6 a.									
Malleable Iron Castings	D-751-2.6 b.									
Steel Castings	D-751-2.6 c.									
Structural Steel for Grates and Frames	D-751-2.6 d.									
Ductile Iron Castings	D-751-2.6 e.									
Austempered Ductile Iron Castings	D-751-2.6 f.									
Steps	D-751-2.7									
D-754 CONCRETE GUTTERS, DITCHES, AND FLUMES										
Concrete Mix Design	P-610									
Reinforcing Steel	P-610-2.9/Plans									
Joint Filler	P-605-2.1									
Premolded Joint Material	P-610-2.7									
F-162 CHAIN-LINK FENCE										
Fabric	F-162-2.1									

*Unshaded boxes under the QPL do not indicate that the materials are on that list. They indicate materials with potential for being on the QPL once qualified.
See GCP 60-05 for submittal requirements.

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Materials Item	Specification	Construction			Design		Statewide Materials		Remarks	Materials Certificate Location e.g. Binder #
		Project Engineer	Regional Materials or QA Engineer	Airport Ltg. Equipment Certification Program	Civil Design Engineer of Record	Electrical Design Engineer of Record	*Qualified Products List (QPL)	State Materials or QA Engineer		
Barbed Wire	F-162-2.2									
Posts, Rails, and Braces	F-162-2.3/Plans									
Gates	F-162-2.4									
Wire Ties And Tension Wires	F-162-2.5									
Misc. Fittings And Hardware	F-162-2.6									
Concrete Mix Design	F-162-2.7									
Pre-mixed Sacked Concrete (Sac-Crete)	F-162-2.7									
Gate Locks	F-162-2.9									
Keyless Locks	F-162-2.10									
G-135 CONSTRUCTION SURVEYING AND MONUMENTS										
Monument Cases	G-135-1.2a./Plans									
Primary Monument	G-135-2.2									
Secondary Monument	G-135-2.3									
G-710 TRAFFIC CONTROL FOR ROADS, STREETS AND HIGHWAYS										
Traffic Control Devices	G-710-2.1								G-710 Materials approved on project with TCP conforming to Alaska Traffic Manual (ATM).	
L-100 RUNWAY AND TAXIWAY LIGHTING										
Constant Current Regulator, L-828	L-100-2.1 a.(1)									
Runway Edge Light, Bi-Directional High-Intensity, L-862	L-100-2.1 a.(2)									

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Taxiway Edge Light, Medium Intensity, L-861T	L-100-2.1 a.(4)									
Airport Signs, L-858, internally lighted	L-100-2.1 a.(5)									
Airport Light Base, L-867	L-100-2.1 a.(7)									
Airport Light Base, L-868	L-100-2.1 a.(9)									
Isolating Transformer, L-830	L-100-2.1 a.(10)									
Radio Control Equipment, L-854	L-100-2.1 a.(14)									
Flush Runway Light Fixture	L-100-2.1 a.(16)									
Primary Hand Hole, L-868	L-100-2.1 a.(17)									
Wind Cone Primary Handhole, L-867	L-100-2.1 a.(18)									
Temporary Lighting System	L-100-2.1 a.(22)									
Elevated Runway Guard Light	L-100-2.1 a.(23)									
Flush Runway Guard Light	L-100-2.1 a.(24)									
Regularly Used Commercial Items	L-100-2.1 e.									
Lock Washers	L-100-2.1 f.									
Lubricant and Sealant	L-100-2.1 h.									
Soft Gasket	L-100-2.1 i.									

L-107 WIND CONE

Wind Cones	

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		Project Engineer	Regional Materials or QA Engineer	Airport Ltg. Equipment Certification Program	Civil Design Engineer of Record	Electrical Design Engineer of Record	*Qualified Products List (QPL)	State Materials or QA Engineer		
Type L-806, Style I-B, Size 1	L-107-2.2 b.									
Type L-807, Style I-B, Size 2	L-107-2.2 d.									
Wire	L-107-2.3									
Conduit	L-107-2.4									
Paint										
Priming for ungalvanized metal	L-107-2.6 a.									
Priming for galvanized metal	L-107-2.6 b.									
Orange	L-107-2.6 c.									
L-108 UNDERGROUND CABLE										
L-824 Cable										
5000 V	L-108-2.2/Plans									
600V	L-108-2.2/Plans									
Underground Electrical	L-108-2.2/Plans									
Telephone control	L-108-2.2/Plans									
Counterpoise Conductors	L-108-2.2/Plans									
Insulated Copper Wire	L-108-2.3									
Cable Connections										
Field-attached Plug-in Splice	L-108-2.4 c.									
Factory-molded Plug-in Splice	L-108-2.4 d.									

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		Project Engineer	Regional Materials or QA Engineer	Airport Ltg. Equipment Certification Program	Civil Design Engineer of Record	Electrical Design Engineer of Record	*Qualified Products List (QPL)	State Materials or QA Engineer		
Electrical Insulating Tape	L-108-2.4 e.									
Concrete Mix Design	P-610									
Marker Tape	L-108-2.6									
L-109 TRANSFORMER VAULT AND VAULT EQUIPMENT										
Concrete Mix Design	L-109-2.2/P-610									
Reinforcing Steel	L-109-2.3									
Brick	L-109-2.4									
Asbestos Cement Duct	L-109-2.5									
Rigid Steel and Intermediate Conduit	L-109-2.6									
Lighting (Inside Vault)	L-109-2.7									
Outlets	L-109-2.8									
Switches	L-109-2.9									
Paint										
Priming for ungalvanized metal	L-109-2.10 a.									
White	L-109-2.10 b.									
Priming for wood surfaces	L-109-2.10 c.									
Inside Vault Paint	L-109-2.10 d.									
Roof Coating	L-109-2.10 e.									
High Voltage Bus	L-109-2.11									

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		Project Engineer	Regional Materials or QA Engineer	Airport Ltg. Equipment Certification Program	Civil Design Engineer of Record	Electrical Design Engineer of Record	*Qualified Products List (QPL)	State Materials or QA Engineer		
Bus Connectors	L-109-2.12									
Bus Supports	L-109-2.13									
Ground Bus	L-109-2.14									
Square Duct	L-109-2.15									
Ground Rods	L-109-2.16									
Potheads	L-109-2.17									
Prefabricated Metal Housing	L-109-2.18									
FAA-Approved Equipment										
L-821 Panels for Remote Control of Airport Lighting	L-109-2.19									
Circuit Selector Switch	L-109-2.19									
L-824 Underground Electrical Cable for Lighting Circuits	L-109-2.19									
Constant Current Regulators and Regulator Motors	L-109-2.19									
L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits	L-109-2.19									
Other Electrical Equipment										
Constant-current regulators	L-109-2.20									
Distribution Transformers	L-109-2.20									
Oil Switches	L-109-2.20									

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		Project Engineer	Regional Materials or QA Engineer	Airport Ltg. Equipment Certification Program	Civil Design Engineer of Record	Electrical Design Engineer of Record	*Qualified Products List (QPL)	State Materials or QA Engineer		
Cutouts	L-109-2.20									
Relays	L-109-2.20									
Terminal Blocks	L-109-2.20									
Transfer Relays	L-109-2.20									
Circuit Breakers	L-109-2.20									
All other items	L-109-2.20									
Wire										
Control Circuits										
Wire	L-109-2.21 a./ Plans									
Telephone control cable	L-109-2.21 a./ Plans									
Power Circuits										
600 volts maximum	L-109-2.21 b.(1)									
3,000 volts maximum	L-109-2.21 b.(2)									
Over 3,000 volts	L-109-2.21 b.(3)									
Wood Platform Foundation	L-109-2.22/P-650									
Electrical Enclosure	L-109-2.23/Plans									
Foundation	L-109-2.23/Plans									
Panels and Facings	L-109-2.23 a.									
Insulation Core	L-109-2.23 b.									

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		Project Engineer	Regional Materials or QA Engineer	Airport Ltg. Equipment Certification Program	Civil Design Engineer of Record	Electrical Design Engineer of Record	*Qualified Products List (QPL)	State Materials or QA Engineer		
Panel Joints	L-109-2.23 c.									
State Fire Marshall's Approval	L-109-2.23 e.									
Metal Flashing	L-109-2.23 f.									
Louvered Vent	L-109-2.23 g.									
Refrigerator-style doors	L-109-2.23 h.									
Metal Storage Cabinet	L-109-2.23 j.									
Wall Mounted Shop Desk	L-109-2.23 j.									
Flexible Metal Conduit	L-109-2.24									
Tapes										
Pipe Sealing Tape	L-109-2.25 a.									
Corrosion Preventive Tape	L-109-2.25 b.									
Electrical Insulating Tape	L-109-2.25 c.									
Doors	L-109-2.26									
Radio Control Equipment, L-854	L-109-2.27									
Antenna for Receiver-Controller	L-109-2.28									
Apron Floodlight	L-109-2.29									
Photo Electrical Control	L-109-2.30									
Panel Boards	L-109-2.31									

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		Project Engineer	Regional Materials or QA Engineer	Airport Ltg. Equipment Certification Program	Civil Design Engineer of Record	Electrical Design Engineer of Record	*Qualified Products List (QPL)	State Materials or QA Engineer		
Branch Breakers	L-109-2.31									
Enclosure	L-109-2.31									
Panel Board Circuit Breakers	L-109-2.31									
Transfer Switch	L-109-2.32									
Identification Ties	L-109-2.33									
Service Entrance Equipment	L-109-2.34/Plans									
Plug Cutout	L-109-2.35									
Supports for Wall-Mounted Panels, Panel Boards, and Fixtures	L-109-2.36									
Push-Button Stations	L-109-2.37									
Electric Heater	L-109-2.38									
Indoor Lighting Fixtures	L-109-2.39									
Hardware	L-109-2.40									
L-110 UNDERGROUND ELECTRICAL DUCT										
Steel Conduit	L-110-2.4									
Concrete	L-110-2.5									
Underground Plastic Conduit										
Rigid, non-metallic conduit Schedule 40 PVC	L-110-2.6 a.									
Type III, rigid, HDPE pipe	L-110-2.6 b.									

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		Project Engineer	Regional Materials or QA Engineer	Airport Ltg. Equipment Certification Program	Civil Design Engineer of Record	Electrical Design Engineer of Record	*Qualified Products List (QPL)	State Materials or QA Engineer		
Flexible Metal Conduit	L-110-2.7									
Tapes										
Pipe Sealing tape	L-110-2.8 a.									
Corrosion preventive tape	L-110-2.8 b.									
L-119 OBSTRUCTION LIGHTS										
Obstruction Lights	L-119-2.2									
Insulating Transformers	L-119-2.3									
Transformer Housing	L-119-2.4									
Conduit	L-119-2.5									
Wires	L-119-2.6/Plans									
Miscellaneous	L-119-2.7/Plans									
L-127 AIRFIELD LIGHTING CONTROLS AND MONITORING SYSTEM (ALCMS)										
General	L-127-2.1									
L-130 SURFACE SENSORS										
Sensor System Equipment	L-130									
HDPE Conduit	L-130									
GRS Conduit	L-130									
Other Equipment Required	L-130									
L-132 APPROACH LIGHTING AIDS										

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4'x4'x4' Hand Holes/Vaults	L-132									
Conduit	L-132									
Wire	L-132									
Other Equipment Required	L-132									
L-135 FAA EQUIPMENT										
TBD										
L-145 STANDBY GENERATOR AND ENCLOSURE										
TBD										
P-157 EROSION, SEDIMENT AND POLLUTION CONTROL										
BMP Installations	P-157-2.5								P-157 Control and Stabilization Materials identified and documented in SWPPP and approved on project.	
P-401 PLANT HOT MIX ASPHALT PAVEMENT										
Mix Design	P-401-3.2									
Joint Adhesive	P-401-4.12									
Longitudinal Joint Sealant	P-401-5.2 f.(3)									
P-610 STRUCTURAL PORTLAND CEMENT CONCRETE										
Concrete Mix Design	P-610-3.2									
Premolded Joint Material	P-610-2.7									
Joint Filler	P-605									

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		Project Engineer	Regional Materials or QA Engineer	Airport Ltg. Equipment Certification Program	Civil Design Engineer of Record	Electrical Design Engineer of Record	*Qualified Products List (QPL)	State Materials or QA Engineer		
Steel Reinforcement	P-610-2.9									
Cover Materials for Curing	P-610-2.10									
Waterproof paper	P-610-2.10									
Polyethylene Sheeting	P-610-2.10									
Liquid Membrane-Forming	P-610-2.10									
P-620 RUNWAY AND TAXIWAY PAINTING										
Paint, Waterborne										
White	P-620-2.2									
Yellow	P-620-2.2									
Paint, Solvent Base										
White	P-620-2.2									
Yellow	P-620-2.2									
Reflective Media, Combined Cert. with Paint	P-620-2.3									
P-640 SEGMENTED CIRCLE										
Barrels	P-640-2.1 a.									
Primer Paint for Barrels	P-640-2.1 b.									
Finish Paint for Barrels	P-640-2.1 c.									
Panel-Type										
Panels	P-640-2.2 a.(1), (2) & (3)									

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		Project Engineer	Regional Materials or QA Engineer	Airport Ltg. Equipment Certification Program	Civil Design Engineer of Record	Electrical Design Engineer of Record	*Qualified Products List (QPL)	State Materials or QA Engineer		
Reflective Sheeting	P-640-2.2 a. (4)									
Stanchions	P-640-2.2 b./Plans									
Hardware and Fasteners										
Gusset and splice plates	P-640-2.2 c.(1)									
Fasteners	P-640-2.2 c.(2)									
P-680 GEOTEXTILE OR SILT FENCE										
	P-680-2.01									
	P-680-2.02									
P-681 GEOTEXTILE FOR SEPARATION AND STABILIZATION										
	P-681-2.01									
T-901 SEEDING										
Seed	T-901-2.1									
Fertilizer	T-901-2.2									
T-908 SOIL STABILIZATION										
Mulch	T-908-2.1									
Rolled Matting										
Unbleached Jute Yarn	T-908-2.2 a.									
Knitted Straw Matting	T-908-2.2 b.									

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Staples	T-908-2.3									
U-500 ELECTRICAL SYSTEM										
General	U-500-2.1									
ADDITIONAL MATERIALS										

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Appendix J

FAA Technical Specifications for Approach Lighting Aids

(Not Used)

Appendix K

Mandatory Post-Award Conference Notice and Agenda

(Not Used)

Appendix L

Snow Removal Equipment Building Technical Specifications

(Not Used)

Appendix M

Material Sales Agreement

(Not Used)