STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION
AND PUBLIC FACILITIES

STANDARD SPECIFICATIONS
FOR
AIRPORT CONSTRUCTION

(Advisory Circular 150/5370-10H, Standard Specifications for Construction of Airports, as modified, and approved by the Federal Aviation Administration for Airport Improvement Program contracts in Alaska)

Revised 10/20

US Customary

NOTE: Special Provisions for each project are marked as changes to the text of the Standard Specifications. Deleted text is identified by strikethrough. Additions are underlined. The location of each Special Provision is shown by a vertical bar in the margin.

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PART I

GENERAL CONTRACT PROVISIONS

SECTION 10
DEFINITION OF TERMS

10-01 GENERAL. The following terms and definitions apply in these Specifications. If a term is not defined, the ordinary, technical, or trade meanings for that term shall apply, within the context in which it is used.

Titles and headings of sections, subsections, and subparts are intended for convenience of reference and will not govern their interpretation. Working titles which have a masculine gender, such as “workman” and “flagman” and the pronouns and adjectives “he”, “his” and “him” are utilized in the contract documents for the sake of brevity, and are intended to refer to persons of either sex. Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.

Cited publications refer to the most recent issue, including interim publications, in effect on the date of the Invitation To Bid, unless specified by year or date.

These Specifications are written to the Bidder or Contractor. Unless otherwise noted, all actions required by the specifications are to be performed by the Bidder, the Contractor, or the Contractor's agent.

Some portions of these Specifications are written using imperative mood, abbreviated format, incomplete sentences and/or active voice to communicate the Contractor's responsibilities in a direct and concise manner. Omission of words or phrases such as “a,” “an,” “the,” “the Contractor shall,” “unless otherwise specified,” or “unless otherwise directed” is intentional. Interpret the Contract as if they were included.

For all Specification language except the General Contract Provisions, whenever anything is, or is to be, done, if, as, or, when, or where “acceptable, accepted, approval, approved, authorized, determined, designated, directed, disapproved, ordered, permitted, rejected, required, satisfactory, specified, submit, sufficient, suitable, suspended, unacceptable, unsatisfactory, or unsuitable,” the expression is to be interpreted as if it were followed by the words “by the Engineer” or “to the Engineer.”

10-02 ACRONYMS. Wherever the following abbreviations are used in these Specifications or on the Plans, they are to be construed the same as the respective expression represented. :

AAC	*Alaska Administrative Code*
AASHTO	American Association of State Highway and Transportation Officials
AC	*FAA Advisory Circular*
ACI	American Concrete Institute
AIA	American Institute of Architects
AIP	Airport Improvement Program
AKOSH	Alaska Occupational Safety and Health
ANSI	American National Standards Institute
AOA	Air Operations Area
AS	*Alaska Statute*
ASDS	*Alaska Sign Design Specifications*
ASTM	American Society for Testing & Materials
ATM	Alaska Test Method
ATMM	*Alaska Test Methods Manual*
CFR	*Code of Federal Regulations*
CSPP	Construction Safety and Phasing Plan
CTAF	Common Traffic Advisory Frequency
DOLWD	Alaska Department of Labor and Workforce Development
DOT&PF	Alaska Department of Transportation and Public Facilities
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FM	Factory Mutual

FOP	Field Operating Procedure (See *Alaska Test Methods Manual*)
FSS	Flight Service Station
ICEA	Insulated Cable Engineers Association (formerly IPCEA)
MCL	Materials Certification List
MRP	Mining and Reclamation Plan
NEC	*National Electrical Code*
NEMA	National Electrical Manufacturers Association
NOTAMs	*Notices to Airmen*
RASSO	Regional Airport Safety and Security Officer
SPCC	*Spill Prevention, Control, and Countermeasure* (Plan)
SPCD	Safety Plan Compliance Document
SSAC	*DOT&PF Standard Specifications for Airport Construction*
SSPC	Society for Protective Coatings
SWPPP	*Storm Water Pollution Prevention Plan*
TCP	*Traffic Control Plan*
UL	Underwriters Laboratory
WAQTC	Western Alliance for Quality in Transportation Construction (See *Alaska Test Methods Manual*)

10-03 DEFINITIONS.

ACCEPTANCE SAMPLING AND TESTING. Sampling and testing performed by the State of Alaska, or its designated agent, to evaluate acceptability of the final product.

ACCESS ROAD. The right-of-way, the roadway, and all improvements constructed thereon connecting the airport to another public thoroughfare.

ADDENDA. Clarifications, corrections, or changes to the Plans, Specifications, or other Contract documents issued graphically or in writing by the Department after the advertisement but prior to bid opening.

ADVERTISEMENT. The public announcement, as required by law, inviting bids for specified work or materials.

ADVISORY CIRCULAR (AC). FAA standards and guidance for their Airport Improvement Program.

AGREED PRICE. An amount negotiated between the Department and the Contractor after Contract award for additional work performed or additional materials supplied under the Contract.

AIR OPERATIONS AREA (AOA). Any area of the airport used or intended to be used for the landing, takeoff, surface maneuvering, or parking of aircraft. An air operation area shall include such paved or unpaved areas, that are used or intended to be used for the unobstructed movement of aircraft, in addition to its associated runway, taxiway, or apron.

AIRPORT. An area of land or water that is used or intended for use for the landing and takeoff of aircraft, and any appurtenant areas that are used or intended for use for airport buildings or other airport facilities or right of way, together with airport buildings and facilities.

AIRPORT IMPROVEMENT PROGRAM (AIP). A grant-in-aid program, administered by the FAA.

ALASKA STANDARD PLAN. Detail drawing adopted by the Department for repetitive use, showing details to be used where appropriate. Alaska Standard Plans are adopted as Alaska's accepted standards, in accordance with AS 19.10.160(a), and for use in conformity with 12 AAC 36.185(a)(2).

ALASKA TEST METHODS MANUAL (ATMM). The materials testing manual used by the Department. It contains Alaska Test Methods, WAQTC Test Methods, WAQTC FOPs for AASHTO Test Methods, and Alaska Standard Practices for evaluating test results and calibrating testing equipment.

ALASKA TRAFFIC MANUAL. The standard for traffic control devices on Alaska roads, per AS 28.01.010(d). The Alaska Traffic Manual is comprised of the Manual on Uniform Traffic Control Devices

(MUTCD) published by the Federal Highway Administration as modified by the Alaska Traffic Manual Supplement, and any adopted revisions or interim addenda issued subsequently and corrections to known errors in either document.

AVIATION MATERIALS CERTIFICATION LIST. See Materials Certification List.

AWARD. Acceptance of the successful bid by the Department. The award is effective upon execution of the Contract by the Contracting Officer.

BASE COURSE. One or more layers of specified material placed on a subbase or subgrade to support a surface course.

BID (OR PROPOSAL). The bidder's offer, on the prescribed forms, to perform the specified work at the prices quoted.

BID BOND. A type of bid guaranty.

BIDDER. An individual, firm, corporation, joint venture, or any acceptable combination of individuals and entities submitting a bid for the advertised work.

BID FORMS. Department-furnished forms that a bidder must complete and submit when making a bid in response to an advertised project. Bid forms may include a bid schedule, certification forms, acknowledgment forms, and other documents.

BID GUARANTY. The security furnished with a bid to guarantee that the bidder will enter into a contract if the Department accepts the bid.

CALENDAR DAY. Every day shown on the calendar, beginning and ending at midnight.

CHANGE ORDER. A written order by the Department to the Contractor making changes to the Contract, within its general scope, and establishing the basis of payment and time adjustment, if any, for the work affected.

COMMON TRAFFIC ADVISORY FREQUENCY (CTAF). A designated frequency for the purpose of carrying out airport advisory practices while operating to or from an airport that does not have a control tower or an airport where the control tower is not operational. CTAF is identified in appropriate aeronautical publications such as the current *Alaska Flight Information Supplement,* a civil/military flight information publication issued by FAA every 56 days.

COMPLETION DATE. The date on which all Contract work is specified to be completed.

CONSTRUCTION. Physical activity by the Contractor or any Subcontractor using labor, materials or equipment within the Project, or within material sources planned for use on the Project.

CONSTRUCTION SAFETY AND PHASING PLAN (CSPP). The overall plan for safety and phasing of a construction project developed by the Department and approved by the FAA. It is included in the invitation for bids and becomes part of the project specifications.

CONTINGENT SUM. A method for paying for a Contract bid item reserved by the Department for specified contingencies. The Contractor shall perform Contingent Sum work only upon the Directive of the Engineer. The basis of payment for Contingent Sum work shall be specified in the Contract or the Directive.

CONTRACT. The written agreement between the Department and the Contractor setting forth the obligations of the parties for the performance and completion of the work.

The Contract includes the Invitation To Bid, Bid Form, Standard Specifications, Special Provisions, Plans, Bid Schedule, Contract Forms, Contract Bonds, Addenda, and any Change Orders, Interim Work

Authorizations, Directives, or Supplemental Agreements that are required to complete the work in an acceptable manner, all of which constitute one instrument.

CONTRACTING OFFICER (PROCUREMENT OFFICER). The person authorized by the Commissioner of the Department to enter into and administer the Contract on behalf of the Department. The Contracting Officer has authority to make findings, determinations, and decisions with respect to the Contract and, when necessary, to modify or terminate the Contract. The Contracting Officer is identified on the Invitation To Bid.

CONTRACT ITEM (PAY ITEM). A specifically described item of Contract work listed on the Bid Schedule or in a Change Order.

CONTRACTOR. The individual, firm, corporation, joint venture, or any acceptable combination of individuals and entities contracting with the Department for performance of the Contract.

CONTRACT TIME. The time allowed under the Contract, including authorized time extensions, for the completion of all work by the Contractor.

CONTROLLING ITEM. Any feature of the work considered at the time by the Engineer: (1) essential to the orderly completion of the work and (2) a feature which, if delayed, will delay the time of completion of the Contract (such as an item of work on the critical path of a network schedule).

COST. Amounts actually incurred by the Contractor in the performance of the Contract that are (a) actually reflected in contemporaneously maintained accounting or other financial records and (b) supported by original source documentation. Costs are to be stated in U.S. dollars.

CULVERT. A pipe or arch half pipe, that provides an opening under the embankment.

DAY. Calendar day unless preceded by the word “working”.

DEPARTMENT. The State of Alaska Department of Transportation and Public Facilities.

DIGITAL SIGNATURE. An electronic signature that conforms to the Uniform Electronic Transactions Act, AS 09.80.010 et seq.

DIRECTIVE. A written communication to the Contractor from the Engineer enforcing or interpreting a Contract requirement or ordering commencement or suspension of an item of work already established in the Contract.

DRAINAGE SYSTEM. The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.

ELECTRONIC BID. A bid that a bidder (i) prepares on the Department’s bid forms accessed through the Department’s approved online bidding service and (ii) submits to the Department through use of that bidding service’s online submittal process.

ELECTRONIC MAIL (EMAIL). A system for sending messages from one person to another via telecommunications links between computers or terminals using dedicated software.

ENGINEER. The authorized representative of the Department's Contracting Officer. The Engineer is responsible for administration of the Contract.

EQUIPMENT. All machinery, tools, apparatus, and supplies necessary to preserve, maintain, construct, and complete the work.

EQUITABLE ADJUSTMENT. An increase or decrease in Contract price or time calculated according to the terms of this Contract.

EXTRA WORK. An item of work not provided for in the Contract as awarded but found essential by the Engineer for the satisfactory completion of the Contract within its intended scope.

FEDERAL AVIATION ADMINISTRATION (FAA). Branch of the U.S. Department of Transportation. When used to designate a person, FAA shall mean the Administrator or their duly authorized representative.

FEDERAL SPECIFICATIONS. The most current version of the Federal Specifications and Standards, Commercial Item Descriptions, and supplements, amendments, and indices thereto which are prepared and issued by the General Services Administration (GSA) of the Federal Government in effect on the date bids are opened.

FOREIGN OBJECT DEBRIS (FOD). Any object, live or not, located in an inappropriate location in the airport environment that has the capacity to injure airport or air carrier personnel and damage aircraft.

HIGHWAY, STREET, OR ROAD. A general term denoting a public way used by vehicles and pedestrians, including the entire area within the right-of-way.

HIGHWAY TRAFFIC CONTROL PLAN. See traffic control plan.

HOLIDAYS. State of Alaska legal holidays are:

- **a.** New Year's Day - January 1
- **b.** Martin Luther King, Jr. Day - Third Monday in January
- **c.** Presidents' Day - Third Monday in February
- **d.** Seward's Day - Last Monday in March
- **e.** Memorial Day - Last Monday in May
- **f.** Independence Day - July 4
- **g.** Labor Day - First Monday in September
- **h.** Alaska Day - October 18
- **i.** Veteran's Day - November 11
- **j.** Thanksgiving Day - Fourth Thursday in November
- **k.** Christmas Day - December 25
- **l.** Every Sunday
- **m.** Every day designated by public proclamation by the President of the United States or the governor as a legal holiday.

If a holiday listed above falls on a Saturday then that Saturday and the preceding Friday are both legal holidays for officers and employees of the state. If the holiday falls on a Sunday, except (12) above, then that Sunday and the following Monday are both legal holidays.

INSPECTOR. An authorized representative of the Engineer assigned to make all necessary inspections, observations, and/or tests, observation of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

INTERIM WORK AUTHORIZATION. A written order by the Engineer initiating changes to the Contract, within its general scope, until a subsequent Change Order is executed.

INVITATION TO BID. The advertisement for bids for all work or materials on which bids are required.

LABORATORY. The official testing laboratories of the Department or such other laboratories as may be designated by the Engineer.

LIGHTING. A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.

MAJOR CONTRACT ITEM. A Contract item for which the Contractor's Bid Amount is 5 percent or more of the total Contract award amount. Determination of a Major Contract Item is made at the time of Award.

MANUAL BID. A bid that a bidder (i) prepares on the Department's bid forms accessed either through the Department's approved online bidding service or obtained from the Department's Regional Contracts Office and (ii) submits to the Department in physical paper form by hand delivery, U.S. Mail, or courier service.

MATERIALLY UNBALANCED BID. A mathematically unbalanced bid that either (a) gives rise to a reasonable doubt that it will ultimately result in the lowest overall cost to the Department, even though it may be the lowest bid or (b) is so unbalanced as to be tantamount to allowing a significant advance payment.

MATERIALS. Substances specified for use in the construction of the project.

MATERIALS CERTIFICATION LIST (MCL). Also referred to as "Aviation Materials Certification List". A list of materials for which the Contractor shall submit certifications to the Engineer. The MCL will also designate electrical products requiring listing by an approved independent electrical testing laboratory. The MCL is included in the Contract documents as an appendix.

MATHEMATICALLY UNBALANCED BID. A bid (a) where each pay item fails to carry its share of the cost of the work plus the bidder's overhead and profit, or (b) based on nominal prices for some pay items and enhanced prices for other pay items.

MINOR CONTRACT ITEM. A Contract item with a total value of less than 5 percent of the Contract award amount.

NON-FROST SUSCEPTIBLE. Stone, gravel or sand, that contains 6 percent or less material passing the No. 200 screen as determined by sieve analysis performed with ATM 304 on the minus 3-inch material, and has a plastic index of 6 or less as determined by ATM 205.

NOTICE OF INTENT TO AWARD. The written notice by the Department announcing the apparent successful bidder and establishing the Department's intent to award the Contract when all required conditions are met.

NOTICE TO PROCEED. Written notice to the Contractor to begin the Contract work.

ORIGINAL GROUND (OG). The ground surface prior to the start of work.

PAVEMENT STRUCTURE. The combination of subbase, base course, and surface course placed on a subgrade to support and distribute the traffic load. Some layers may not be present, see Plans.

PAYMENT BOND. The security furnished by the Contractor and the Contractor's Surety to guarantee payment of all persons who supply labor and material in prosecution of the work provided for in the contract.

PERFORMANCE BOND. The security furnished by the Contractor and the Contractor's Surety to guarantee performance and completion of the work provided for in the contract.

PLANS. The Department's contract drawings, profiles, typical cross sections, and supplemental drawings or reproductions showing the location, character, dimensions, and details of the work.

PRECONSTRUCTION CONFERENCE. A meeting between the Contractor and the Engineer to discuss the project before the Contractor begins the work.

PROCESS CONTROL. See quality control.

PROCUREMENT OFFICER. See contracting officer.

PROFILE. The vertical elevation of the surface of the layer at the location indicated. It is typically indicated at the longitudinal centerline of the top layer of pavement on the runway, taxiway, apron, or roadway. On a material or fabrication it may be used to indicate a shape, or a thickness of material or thickness of a coating.

PROJECT. (a) The specific section of the airport or other property and related facilities on which construction is to be performed, or (b) the work that is to be performed under the Contract whether completed or partially completed.

QUALIFIED PRODUCTS LIST. A list of products that the Department has found conforms to the SSAC, except for Buy American and Alaska Agricultural/Wood Products. The Department makes no guarantee that any product on the Qualified Products List meets the requirements of Subsection 60-09 Buy American Steel and Manufactured Products, or Alaska Agricultural/Wood Products.

QUALITY CONTROL (QC) also called **PROCESS CONTROL**. The system used by a contractor to monitor, assess and adjust their production or placement processes to ensure that the final product will meet the specified level of quality. Quality control includes sampling, testing, inspection and corrective action (where required) to maintain continuous control of a production or placement process.

RESOURCES. Labor, equipment, materials, supplies, tools, transportation, and supervision necessary to perform the work.

RESPONSIBLE BIDDER. A bidder that the Department determines has the skill, ability, financial resources, legal capacity to contract, equipment, required licenses, integrity, satisfactory record of performance and that is otherwise fully capable of performing the Contract.

RESPONSIVE BID. A bid that the Department determines conforms in all material respects with the solicitation for bids.

RETAINAGE. A percentage of a payment established in advance under a contract or subcontract to be withheld from a progress payment due on the contract or subcontract. Payment or a percentage of payment withheld for unsatisfactory performance is not retainage.

RIGHT-OF-WAY. Land or property or an interest in property available for a project. The uses allowed in portions of right-of-way may be restricted.

RUNWAY. The area of the airport prepared for the landing and takeoff of aircraft.

RUNWAY SAFETY AREA (RSA). A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event an aircraft undershoots, overshoots, or departs from the runway.

SAFETY PLAN COMPLIANCE DOCUMENT (SPCD). A document prepared by the Contractor that details how the Contractor will comply with the CSPP, and approved by the Department.

SECURITY PLAN. A Contract document that specifies methods of controlling the operations of the Contractor, subcontractors, and suppliers so as to provide for (1) security of workers, equipment, and public, (2) security of aircraft in the Air Operations Areas of the airport, and (3) security of the Airport property.

SPECIAL PROVISION. Addition or revision that amends or supersedes the Standard Specifications and is applicable to an individual project.

SPECIALTY ITEM. A Contract item identified in the Contract that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract.

SPECIFICATIONS. General term applied to all Contract terms, conditions, directions, provisions, and requirements.

STANDARD SPECIFICATIONS. A book or electronic file of specifications approved by the Department for general application and repetitive use.

STATE. The State of Alaska, acting through its authorized representative.

STRUCTURE. Bridge, building, catch basin or inlet, cribbing, culvert, electrical duct, flexible and rigid pavements, handholes, junction boxes, lighting fixture and base, manhole, navigational aid, retaining wall, storm and sanitary sewer lines, transformer, underdrain, vault, visual aid, water line, and other manmade features of the airport that may be encountered in the work and not otherwise classified herein.

SUBBASE. Layer of specified material between the subgrade and base course.

SUBCONTRACTOR. Individual or legal entity to whom or to which the Contractor sublets part of the Contract.

SUBGRADE. The soil or embankment upon which the pavement structure is constructed.

SUBSIDIARY. Work or material not measured or paid for directly. Compensation for such work is included in the payment for other items of work.

SUBSTANTIAL COMPLETION. The point at which the project (1) can be safely and effectively used by the public without further delays, disruption, or other impediments; and (2) pavement structure, shoulder, drainage, sidewalk, permanent signing and markings, guardrail and other traffic barrier, fencing, safety appurtenance, structures, utilities, lighting, bridge deck and parapet work, and guidance systems for aircraft is complete.

For projects built in phases the work is substantially complete when it is ready for the subsequent project.

SUPERINTENDENT. The Contractor's authorized representative in responsible charge of the work.

SUPPLEMENTAL AGREEMENT. Negotiated written agreement between the Department and the Contractor authorizing performance of work beyond the general scope of, but in conjunction with, the original Contract. Supplemental agreements are new procurements under the State Procurement Code, AS 36.30.

SURETY. Corporation, partnership, or individual, other than the Contractor, executing a bond furnished by the Contractor.

SURFACE COURSE. Top homogenous layer of the pavement structure. It is designed to withstand the wear of traffic and the disintegrating effects of climate. Sometimes called the wearing course.

TAXIWAY. The portion of the air operations area of an airport that has been designated for movement of aircraft to and from runways or aircraft parking areas.

TAXIWAY SAFETY AREA (TSA). A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

TRAFFIC CONTROL PLAN (TCP). Also referred to as “Highway Traffic Control Plan”. A drawing or drawings indicating the method for safely 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.

UTILITY. Line, facility, or system for producing, transmitting, or distributing communications, power, electricity, light, heat, gas, oil, crude products, water, steam, waste, storm water not connected with highway drainage, or other similar commodity, including a publicly owned fire or police signal system, street lighting system, or railroad which directly or indirectly serves the public. Also means lighting as defined in this subsection. Also means a utility company, inclusive of any subsidiary.

VERIFICATION SAMPLING AND TESTING. See ACCEPTANCE SAMPLING AND TESTING.

WORK. Depending on the context, (a) The act of furnishing all resources for the project and performing all duties and obligations required by the Contract or (b) the physical construction, facility or end–product that is contemplated under the Contract, whether completed or partially completed.

WORKING DAYS. Calendar days, except Saturdays and state holidays.

WORKING DRAWINGS. Stress sheets, shop drawings, erection plans, falsework plans, framework plans, cofferdam plans, bending diagrams for reinforcing steel, wiring diagrams and schematics, traffic control plans, or any other supplementary plans or similar data which the Contractor is required to submit to the Engineer for approval.

SECTION 20
PROPOSAL REQUIREMENTS AND CONDITIONS

20-01 QUALIFICATION OF BIDDERS. A bidder shall:

a. When requested, submit a completed Contractor's Questionnaire (Form 25D-8) stating previous experience in performing comparable work, business and technical organization, financial resources, and equipment available to be used in performing the work;

b. On wholly state-funded projects, submit evidence of a valid Department of Commerce, Community, and Economic Development certificate of Contractor Registration (Contractor Registration) under AS 08.18, and submit evidence of a valid Alaska Business License prior to award under AS 36.30.110(b); and

c. On federal-aid projects, submit evidence of Alaska Business License and Contractor Registration prior to award.

All firms desiring to participate in DOT&PF construction projects must register annually by submitting a completed Bidder Registration (Form 25D-6).

20-02 CONTENTS OF BID PACKAGE. Upon request, the Department will furnish prospective bidders with a bid package, at the price stated in the Invitation To Bid.

The bid package includes the following:

a. Location and description of the project;

b. Estimates of quantities of work and materials to be furnished;

c. Schedule of contract items for which bid prices are invited;

d. Time in which the work must be completed

e. Amount of the bid guaranty;

f. Date, time, and place for the bid opening;

g. Plans and specifications; and

h. Bid forms.

Unless otherwise stated in the bid package, the Plans, Specifications, permits, forms and any other documents designated in the bid package are considered a part of the bid whether attached or not.

20-03 INTERPRETATION OF QUANTITIES IN BID SCHEDULE. Bid prices shall be based on the estimated quantities shown in the bid schedule. Quantities of work to be done and materials to be furnished are approximate and are prepared only for the comparison of bids. These quantities may increase, decrease, or be eliminated. Payment for unit price items will be made for the actual accepted quantities of work performed and materials furnished under the Contract, as determined using the method of measurement specified in the Contract.

20-04 EXAMINATION OF PLANS, SPECIFICATIONS, SPECIAL PROVISIONS, AND WORK SITE. Bidders shall examine the work site and all Contract documents before preparing a bid. Submitting a bid is a binding representation that the bidder has examined the work site, is aware of the conditions to be encountered, and has examined and understands all of the Contract documents.

Department records of subsurface and hydrological investigations, including but not limited to, boring logs, test results, soil investigation reports, material reports, and other supplemental information are made

available for information purposes only. These records are not part of the Contract. These records indicate subsurface conditions only at specific locations at the time sampled, and only to the depths penetrated. They do not necessarily reflect frozen state, or variations in soil, rock or hydrology that may exist between or outside such locations or at other times. Actual conditions, including ground water levels and saturation, may differ from what is shown in the records.

Material sources referenced in Department records may not contain materials of sufficient quantity or quality to meet project requirements. Sources may be subject to operational restrictions. The availability of these records does not constitute approval, nor guarantee suitability of soils or sources, or the right to use sources referenced in these records for this project. Department records shall not substitute for independent investigation, interpretation, or judgment of the bidder. The Department is not responsible for any interpretation or conclusion drawn from its records by the bidder. Bidders shall examine Subsection 60-02 Material Sources for further information.

Geotechnical reports referenced in the Notice to Bidders, or otherwise made available, may contain data, discussions, and references to material sources. The inclusion of material source information in these reports does not mean they are a Mandatory, Designated, or Available Source as described in Subsection 60-02. For a material source to be considered Mandatory, Designated, or Available, it must be included in the Special Provisions, or so described on the Plans.

Any questions about bidding procedures, site conditions, or Contract requirements must be submitted in writing according to the Invitation To Bid (Form 25D-7). Questions must be submitted in sufficient time to get a reply before submitting a bid. No oral responses or other oral statements are binding on the Department. Any response to a material question shall be issued by addendum sent to all bidders.

20-05 PREPARATION OF BID. A bidder shall prepare its bid using either the Department approved bid preparation software or the Department provided bid forms or legible copies of the Department's forms. All entries shall be legible and in ink or type. Bidders shall:

a. Enter all prices required on the Bid Schedule, in figures;

b. Enter a unit price for each contract item for which a quantity is given;

c. Enter the products of the respective unit prices and quantities in the column provided;

d. Enter lump sum prices for lump sum contract items in the column(s) provided; and

e. Enter the total amount of all contract items for the basic bid and, when specified, any alternates.

When a bid item contains a choice to be made by the bidder, the bidder shall indicate a choice according to the Specifications for that item. No further choice is permitted.

The bid must be signed in ink or by digital signature by the person or persons authorized to sign the Contract for the bidder. If a bidder is a corporation, the bid must be signed by a corporate officer or agent with authority to bind the corporation. If a bidder is a partnership, a partner must sign. If the bidder is a joint venture, each principal member must sign. If a bidder is a sole proprietorship, the owner must sign. Each person signing the bid must initial any changes made to entries on the bid forms.

A bidder submitting an electronic bid agrees that its digital signature constitutes a binding signature.

The bidder shall make no claim against the Department in the event it is unable to submit its bid through approved online bidding service and/or approved online bidding service is unable to submit the bid(s) to the Department. The Department reserves the right to postpone the public bid opening in the event of technical problems.

For multiple-project bid openings, the bidder may limit the total dollar amount or number of projects to be accepted by completing and attaching the following statement with its bid for at least one of the projects. The Department will then determine which of the low bids it will accept, up to the total indicated.

"We wish to disqualify all of our successful bids at this bid opening which exceed the total of $_____ or ____ contracts and hereby authorize the Department to determine which bids to disqualify, based on this limit."

20-06 NONRESPONSIVE BIDS.

a. A bid shall be rejected as nonresponsive if it:

(1) Is not properly signed by an authorized representative of the bidder and in a legally binding manner;

(2) Contains unauthorized additions, conditional or alternative bids, or other irregularities that make the bid incomplete, indefinite, or ambiguous;

(3) Includes a reservation of the right to accept or reject any award, or to enter into a contract pursuant to an award, except for an award limitation under Subsection 20-05;

(4) Fails to include an acceptable bid guaranty with the bid;

(5) Is materially unbalanced

(6) Fails to meet any other material requirement of the Invitation To Bid; or

(7) Fails to include a materially complete Certification of Buy American Compliance (Form 25D-151 or Form 25D-152), except on wholly state-funded projects.

b. A bid may be rejected as nonresponsive, in the Department's discretion, if it:

(1) Is not typed or completed in ink;

(2) Fails to include an acknowledgement of receipt of each addendum by assigned number and date of issue; or

(3) Is missing a bid price for any pay item, except when alternate pay items are authorized.

20-07 BID GUARANTY. Bids shall be accompanied by a bid guaranty in the amount specified on the Invitation To Bid. The guaranty shall be unconditionally payable to the State of Alaska and shall be in the form of an acceptable paper Bid Bond (Form 25D-14), an electronic bid bond acceptable to the Department and verified through its online bidding service, a certified check, a cashier's check, or a money order.

The surety of a Bid Bond may be any corporation or partnership authorized to do business in Alaska as an insurer under AS 21.09. A legible power of attorney shall be included with each paper Bid Bond (Form 25D-14).

An individual surety will not be accepted as a bid guaranty.

20-08 RESERVED.

20-09 DELIVERY OF BIDS. Bids shall be submitted electronically through the online bidding service, or shall be submitted in a sealed envelope. When bids are submitted in a sealed envelope, the envelope shall clearly indicate its contents and the designated address, as specified on the Invitation to Bid. Bids for other work may not be included in the envelope. In the event of a bid delay, electronic bidders that have already submitted their bid prior to the bid delay must resubmit their bid utilizing all Bid Forms EBSX Files or their bid will not be received.

The Department will not accept a bid submitted by email or fax unless specifically called for in the Invitation to Bid.

20-10 WITHDRAWAL OR REVISION OF BIDS. Manual Bids may be withdrawn or revised in writing delivered by mail, fax, or email, provided that the designated office receives the withdrawal or revision before the deadline stated in the in the Invitation To Bid. Withdraw requests must be signed and submitted by the bidder's duly appointed representative who is legally authorized to bind the bidder. Revisions shall include both the modification of the unit bid price and the total modification of each item modified but shall not reveal the amount of the total original or revised bids.

Electronic Bids may be withdrawn or resubmitted through the online bidding service. Revisions to electronic bids delivered by mail, fax, or email will not be permitted. If electronic bid withdrawal is unsuccessful, electronic bids may be withdrawn in writing delivered by mail, fax, or email provided that the designated office receives the withdrawal before the deadline stated in the Invitation To Bid. Written withdrawal requests must be signed and submitted by the bidder's duly appointed representative who is legally authorized to bind the bidder.

20-11 PROTEST OF INVITATION TO BID. An interested party, as defined in AS 36.30.699, may protest an Invitation to Bid before the bid opening according to AS 36.30.560 and AS 36.30.565. Submit a protest to the Contracting Officer.

20-12 ADDENDA REQUIREMENTS. The Department will issue addenda if it determines, in its discretion, that clarifications or changes to the Contract documents or bid opening date are needed. The Department may send addenda by any reasonable method such as fax, email, or may post the addenda on its website or online bidding service. Unless picked up in person or included with the bid documents, addenda or notice that an addendum has been issued will be addressed to the individual or company to whom bidding documents were issued and sent to the email address or fax number on the plan holders' list. Notwithstanding the Department's efforts to distribute addenda, bidders are responsible for ensuring that they have received all addenda affecting the Invitation To Bid. Bidders must acknowledge all addenda on the Bid Forms, by fax, or by email before the deadline stated in the Invitation to Bid.

20-13 RECEIPT AND OPENING OF BIDS. The Department will only consider bids, revisions, and withdrawals received before the scheduled deadline stated in the Invitation to Bid.

The Department will assemble, open, and publicly announce timely-received bids at the time and place indicated in the Invitation to Bid, or as soon thereafter as practicable. The Department is not responsible for prematurely opening or failing to open bids that are improperly addressed or identified.

20-14 RESPONSIBILITY OF BIDDERS. The Department may find a bidder is nonresponsible for any one of the following reasons, but is not limited in its responsibility analysis to the following factors:

a. Evidence of bid rigging or collusion;

b. Fraud or dishonesty in the performance of previous contracts;

c. More than one bid for the same work from an individual, firm, or corporation under the same or different name;

d. Unsatisfactory performance on previous or current contracts;

e. Failure to pay, or satisfactorily settle, all bills due for labor and material on previous contracts;

f. Uncompleted work that, in the judgment of the Department, might hinder or prevent the bidder's prompt completion of additional work, if awarded;

g. Failure to reimburse the state for monies owed on any previous contracts;

h. Default under previous contracts;

i. Failure to submit evidence of registration and licensing;

j. Failure to comply with any qualification requirements of the Department;

k. Engaging in any activity that constitutes a cause for debarment or suspension under the State Procurement Code (AS 36.30) or submitting a bid during a period of debarment;

l. Failure to satisfy the responsibility standards set out in state regulations;

m. Lack of skill, ability, financial resources, or equipment required to perform the contract; or

n. Lack of legal capacity to contract.

Nothing contained in this section deprives the Department of its discretion in determining the lowest responsible bidder.

20-15 FOREIGN TRADE RESTRICTION. The Contractor by submission of an offer and/or execution of a contract, certifies that it:

a. Is not owned or controlled by one or more citizens or nationals of a foreign country included in the list of countries that discriminate against U.S. firms published by the Office of the United States Trade Representative (USTR);

b. Has not knowingly entered into any contract or subcontract for this project with a contractor that is a citizen or national of a foreign country on said list, or is owned or controlled directly or indirectly by one or more citizens or nationals of a foreign country on said list; and

c. Has not procured any product nor subcontracted for the supply of any product for use on the project that is produced in a foreign country on said list.

Unless the restrictions of this clause are waived by the Secretary of Transportation according to 49 CFR 30.17, no contract shall be awarded to a contractor who is unable to certify to the above. If the Contractor knowingly procures or subcontracts for the supply of any product or service of a foreign country on the said list for use on the project, the FAA may direct, through the Department, cancellation of the contract at no cost to and with no damages available from the Department or the Federal government.

The Contractor shall incorporate this provision for certification without modification in each contract and in all lower tier subcontracts. The Contractor shall require subcontractors to provide immediate written notice to it if the subcontractor learns that its certification was erroneous, or has become erroneous, by reason of changed circumstances. The Contractor may rely upon the certification of a prospective subcontractor unless it has knowledge that the certification is erroneous.

The Contractor shall provide immediate written notice to the Department if the Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances.

This certification is a material representation of fact upon which reliance was placed when making the award. If it is later determined that the Contractor or subcontractor knowingly rendered an erroneous certification, the FAA may direct, through the Department, cancellation of the contract or subcontract for default at no cost to, and with no damages available from, the Department or the Federal Government.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

This certification concerns a matter within the jurisdiction of an agency of the United Stated of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

20-16 ELECTRONIC MAIL. Within its submitted bid, a bidder must include a current electronic mail (email) address of bidder's representative who possesses authority to receive, process, and respond to Department emails regarding the advertised project.

The Department may send notices and information to a bidder by using the furnished email address of the bidder's authorized representative.

A bidder shall notify the Department if the bidder requests the Department to send email notices or information to an address different from the email address initially provided in its bid forms. The bidder shall notify the Department of such change by sending a request in writing to the Contract's point of contact identified on the Invitation to Bid that is signed by a representative who is authorized and empowered to legally bind the bidder.

Delivery of an email sent by the Department is complete upon receipt in the addressee's email account. An email sent after 4:30 pm shall be deemed to have occurred at the opening of business on the next working day.

If needed, the Department may demonstrate proof of email delivery by affidavit or certification that includes the following:

a. The date and time that the Department sent the email message;

b. The email address from which the Department sent the message;

c. The name and email address to which the Department sent the message;

d. A statement that the Department sent the email message and that the person signing the affidavit or certification believes the transmission to have been complete and without error; and

e. An attached copy of the subject email.

SECTION 30
AWARD AND EXECUTION OF CONTRACT

30-01 CONSIDERATION OF BIDS. After the bids are opened and read, the bids will be mathematically checked and compared on the basis of the sum of the products of the bid schedule quantities and the unit bid prices. The unit bid prices govern if there is an error in extending the unit bid prices, or in totaling the extensions, or if an extension is missing. The results of the bid comparisons will be made available to the public as soon as practicable.

Until the Award, the Department may reject any or all bids, waive minor informalities or advertise for new bids without liability to any bidder if the Department, in its discretion, determines that to do so is in the best interests of the state.

A bidder may request withdrawal of a bid after opening and before the Award only according to AS 36.30.160(b) and State procurement regulations. Submit the request to the Contracting Officer.

An interested party, as defined in AS 36.30.699, may protest a proposed Award of contract as per AS 36.30.560 and AS 36.30.565. Submit the protest to the Contracting Officer.

WHOLLY STATE-FUNDED PROJECTS. On wholly state-funded projects, determination of the low bidder will include bidder preferences as required under AS 36.30.321, according to subsections a. – c. below. Alaska Bidder Preference, Alaska Veteran Preference, and Alaska Product Preference are not applicable on projects with federal funding.

a. **Alaska Bidder Preference**: A bidder claiming this preference shall provide with their bid an Alaska Bidder Preference Certification, certifying they qualify as an Alaska bidder eligible for Alaska Bidder Preference according to AS 36.30.

If the bidder qualifies as an Alaska Bidder, a five percent (5%) preference will be applied to the price of the bid. "Alaska bidder" means a person who:

(1) holds a current Alaska business license;

(2) submits a bid for goods, services, or construction under the name appearing on the person's current Alaska business license;

(3) has maintained a place of business within the state staffed by the bidder or an employee of the bidder for a period of six months immediately preceding the date of the bid;

(4) is incorporated or qualified to do business under the laws of the state, is a sole proprietorship and the proprietor is a resident of the state, is a limited liability company organized under AS 10.50 and all members are residents of the state, or is a partnership under former AS 32.05, AS 32.06, or AS 32.11 and all partners are residents of the state; and

(5) If a joint venture, is composed entirely of ventures that qualify under (1) through (4), above.

b. **Alaska Veteran Preference:** A bidder claiming this preference shall provide an Alaska Veteran Preference Certification, certifying they qualify as an Alaska bidder eligible for Alaska Veteran preference according to AS 36.30.

If a bidder qualifies as an Alaska bidder and is a qualifying entity, an Alaska Veteran Preference of five percent shall be applied to the bid price. The preference may not exceed $5,000 (AS 36.30.321). A “qualifying entity” means a:

(1) sole proprietorship owned by an Alaska veteran;

(2) partnership under AS 32.06 or AS 32.11 if a majority of the partners are Alaska veterans;

(3) limited liability company organized under AS 10.50 if a majority of the members are Alaska veterans; or

(4) corporation that is wholly owned by individuals, and a majority of the individuals are Alaska veterans.

A preference under this section is in addition to any other preference for which the bidder qualifies.

To qualify for this preference, the bidder must add value by the bidder itself actually performing, controlling, managing and supervising a significant part of the services provided or the bidder must have sold supplies of the general nature solicited to other state agencies, governments, or the general public.

An Alaska veteran is a resident of Alaska who:

(1) served in the Armed forces of the United States, including a reserve unit of the United States armed forces; or the Alaska Territorial Guard, the Alaska Army National Guard, the Alaska Air National Guard, or the Alaska Naval Militia; and

(2) was separated from service under a condition that was not dishonorable.

c. Alaska Product Preference: A bidder claiming this preference shall complete and sign the Alaska Product Preference Worksheet, according to the worksheet instructions, and submit the completed worksheet with their bid.

Except for timber, lumber and manufactured lumber products used in the construction project under AS 36.30.322(b), an Alaska products preference will be given as required under AS 36.30.326 - 36.30.332 when the bidder designates the use of Alaska products.

If the successful bidder/contractor proposes to use an Alaska product and does not do so, a penalty will be assessed against the successful bidder/contractor according to AS 36.30.330(a).

Each Alaska product declared on the Alaska Product Preference Worksheet must have an "Approval" date on the Alaska Product Preference Program List, that is on or before the bid opening date for this contract, and that does not expire before the bid opening date for this contract.

30-02 SUBCONTRACTOR LIST. The apparent low bidder shall submit a completed Subcontractor List, Form 25D-5, within five working days following receipt of written notification by the Department that it is the low bidder.

An apparent low bidder who fails to submit a completed Subcontractor List form within the time allowed will be declared nonresponsible and may be required to forfeit the bid security. The Department will then consider the next lowest bidder for award of the Contract.

If a bidder fails to list a subcontractor, or lists more than one subcontractor for the same portion of work, and the value of that work is in excess of one-half of one percent of the total bid amount, the bidder agrees to perform that portion of work without a subcontractor and represents that it is qualified to perform that work.

A bidder who lists as a subcontractor another contractor who, in turn, sublets the majority of the work required under the Contract, violates this subsection.

On federal-aid projects, subcontractors must obtain an Alaska business license and certificate of contractor registration prior to award of the Contract.

On wholly state-funded projects, all subcontractors listed by the Contractor shall have a valid Alaska business license and a valid certificate of registration as a contractor, as defined in AS 08.18, at the time the bid is opened. If a subcontractor listed by the Contractor does not have a valid business license and certificate of registration at the time the bid is opened, the Contractor shall replace the subcontractor with a

subcontractor that had a valid Alaska business license and a valid certificate of registration as a contractor under AS 08.18 at the time the bid was opened.

A bidder or Contractor may, without penalty, replace a listed subcontractor who:

a. Fails to comply with licensing and registration requirements of AS 08.18;

b. Fails to obtain a valid Alaska business license;

c. Files for bankruptcy or becomes insolvent;

d. Fails to execute a subcontract for performance of the work for which the subcontractor was listed, and the bidder acted in good faith;

e. Fails to obtain bonding acceptable to the Department;

f. Fails to obtain insurance acceptable to the Department;

g. Fails to perform the subcontract work for which the subcontractor was listed;

h. Must be replaced to meet the bidder's required state or federal affirmative action requirements;

i. Refuses to agree or abide with the bidder's labor agreement; or

j. Is determined by the Department to be not responsible.

In addition to the circumstances described above, a Contractor may in writing request permission from the Department to add a new subcontractor or replace a listed subcontractor. The Department will approve the request if it determines in writing that allowing the addition or replacement is in the best interest of the State.

A bidder or Contractor shall submit a written request to add a new subcontractor or replace a listed subcontractor to the Contracting Officer a minimum of five working days before the date the new subcontractor is scheduled to begin work on the construction site. The request must state the basis for the request and include supporting documentation acceptable to the Contracting Officer.

If a bidder or Contractor violates this subsection, the Contracting Officer may:

a. Cancel the Contract after Award without any damages accruing to the Department; or

b. After notice and a hearing, assess a penalty on the bidder or Contractor in an amount not exceeding 10 percent of the value of the subcontract at issue.

30-03 AWARD OF CONTRACT. The Department will award the Contract to the lowest responsible and responsive bidder unless it rejects all bids. The Department will notify all bidders in writing via email, fax, or U.S. Mail of its intent to award.

The Department will notify the successful bidder in writing of its intent to award the Contract and request that certain required documents, including the Contract Form, bonds, insurance and, except on wholly state-funded projects, a completed Form 25D-159 (Certification for Tax Delinquency and Felony Convictions) be submitted within the time specified. The successful bidder's refusal to sign the Contract and provide the requested documents within the time specified may result in cancellation of the notice of intent to award and forfeiture of the bid security.

If an award is made, it will be made as soon as practicable and usually within 40 days after bid opening. Award may be delayed due to bid irregularities or a bid protest, or if the award date is extended by mutual consent. Bids shall be valid for 120 days after bid opening, and may be extended by mutual consent.

For AIP contracts, no award shall be made until the FAA has concurred in the Department's recommendation to make such award and has approved the Department's proposed contract to the extent that such concurrence and approval are required by 49 CFR Part 18.

30-04 RETURN OF BID GUARANTY. The Department will return bid guaranties, other than bid bonds:

- **a.** To all except the two lowest responsive and responsible bidders, as soon as practicable after the opening of bids; and
- **b.** To the two lowest responsive and responsible bidders immediately after Contract award.

30-05 PERFORMANCE AND PAYMENT BONDS. The successful bidder shall furnish all required Performance and Payment Bonds on forms provided by the Department for the sums specified in the Contract. If no sum is specified, the successful bidder shall comply with AS 36.25.010. The Surety on each bond may be any corporation or partnership authorized to do business in the state as an insurer under AS 21.09 or two individual sureties approved by the Contracting Officer.

If individual sureties are used, two individual sureties must each provide the Department with security assets located in Alaska equal to the penal amount of either the performance bond or the payment bond. Any costs incurred by the Contractor and the individual Surety are subsidiary and shall be borne by the Contractor or the individual Surety. In no event will the Department be liable for these costs.

Individual sureties shall provide security by one, or a combination, of the following methods:

- **a. Escrow Account.** An escrow account with a federally insured financial institution, in the name of the Department. Acceptable securities include, but are not limited to, cash, treasury notes, bearer instruments having a specific value, or money market certificates.
- **b. Irrevocable Letters of Credit.** Irrevocable letters of credit with a financial institution approved by the Contracting Officer, with the Department named as beneficiary.
- **c. Cashiers or Certified Check.** A cashier's check or certified check made payable to the State of Alaska issued by financial institutions approved by the Contracting Officer.

These bonds and security assets, as applicable, shall remain in effect for 12 months after the date of final payment or, if longer, until all obligations and liens under this Contract are satisfied, including, but not limited to, obligations under Subsection 70-19.

The Department may, in its discretion, notify the bonding company or Surety of any potential default or liability.

The Contractor shall substitute, within five working days, another bond or surety acceptable to the Department if an individual Surety or the Surety on any bond furnished in connection with the Contract:

- **a.** Becomes insolvent or is declared bankrupt;
- **b.** Loses its right to do business in any state affecting the work;
- **c.** Ceases to meet Contract requirements;
- **d.** Fails to furnish reports of financial condition upon request; or
- **e.** Otherwise becomes unacceptable to the Department.

When approved by the Contracting Officer, the Contractor may replace:

- **a.** An individual surety with a corporate surety; or

b. Posted collateral with substitute collateral.

Failure to maintain the specified bonds or to provide substitute bonds when required under this section may be grounds for withholding contract payments until substitute bonding is obtained, and may, in the Department's discretion, be grounds for declaring the Contractor in default.

30-06 INSURANCE REQUIREMENTS. The Contractor shall provide evidence of insurance with an insurance carrier or carriers satisfactory to the Department covering injury to persons and property suffered by the State of Alaska or by a third party as a result of operations under this contract by the Contractor or by any subcontractor. The Contractor's insurance shall provide protection against injuries to all employees of the Contractor and the employees of any subcontractor engaged in work under this Contract. All insurance policies shall be issued by insurers that (i) are permitted to transact the business of insurance in the State of Alaska under Title 21 of the Alaska Statutes and (ii) have a financial rating acceptable to the Department. A certificate of insurance must be furnished to the Department prior to award. The certificate of insurance must provide for notice of cancellation or non-renewal in accordance with policy provisions.

Where specific limits and coverages are shown, it is understood that they shall be the minimum acceptable. The requirements of this subsection shall not limit the Contractor's indemnity responsibility under Subsection 70-13. Additional insurance requirements specific to this contract are contained in the Special Provisions, when applicable.

The Contractor shall maintain the following policies of insurance with the specified minimum coverages and limits in force at all times during the performance of the Contract:

a. Workers' Compensation: as required by AS 23.30.045, for all employees of the Contractor engaged in work under this Contract. The Contractor shall be responsible for Workers' Compensation Insurance for any subcontractor who performs work under this Contract. The coverage shall include:

(1) Waiver of subrogation against the state;

(2) Employer's Liability Protection at $500,000 each accident/each employee and $500,000 policy limit;

(3) "Other States" endorsement if the Contractor directly utilizes labor outside of the State of Alaska;

(4) United States Longshore and Harbor Workers' Act Endorsement, whenever the work involves activity over or about navigable water; and

(5) Maritime Employer's Liability (Jones Act) Endorsement with a minimum limit of $1,000,000, whenever the work involves activity from or on a vessel on navigable water.

b. Commercial General Liability: on an occurrence policy form covering all operations, including contractual liability and products-completed operations, with combined single limits not less than:

(1) $1,000,000 Each Occurrence;

(2) $1,000,000 Personal Injury;

(3) $2,000,000 General Aggregate; and

(4) $2,000,000 Products-Completed Operations Aggregate.

c. Automobile Liability: covering all vehicles used in Contract work, with combined single limits not less than $1,000,000 each occurrence.

d. Umbrella Coverage: for Contract amounts over $5,000,000 not less than $5,000,000 umbrella or excess liability. Umbrella or excess policy shall include products-completed operations coverage and

may be subject to $5,000,000 aggregate limits. Further, the umbrella or excess policy shall contain a clause stating that it takes effect (drops down) in the event the primary limits are impaired or exhausted.

The State of Alaska shall be named as an additional insured on policies required by paragraphs **b** thru **d** above. All of the above insurance coverages shall be considered to be primary and non-contributory to any other insurance carried by the State of Alaska, whether through self-insurance or otherwise.

In any contract or agreement with subcontractors performing work, the Contractor shall require that all indemnities and waivers of subrogation it obtains, and any stipulation to be named as an additional insured it obtains, shall also be extended to waive rights of subrogation against the State of Alaska and to add the State of Alaska as an additional named indemnitee and as an additional insured.

The apparent low bidder shall furnish evidence of insurance to the Department before award of the Contract. The evidence shall be issued to the Department and shall be either a certificate of insurance or the policy declaration page with all required endorsements attached and must:

a. Denote the type, amount, and class of operations covered;

b. Show the effective (and retroactive) dates of the policy;

c. Show the expiration date of the policy;

d. Include all required endorsements;

e. Be executed by the carrier's representative; and

f. Provide that the Department shall receive written notice of cancellation or non-renewal in accordance with policy provisions.

The Department’s acceptance of deficient evidence of insurance does not constitute a waiver of Contract requirements.

Failure to maintain the specified insurance or to provide substitute insurance if an insurance carrier becomes insolvent, is placed in receivership, declares bankruptcy, or cancels a policy may be grounds for withholding Contract payments until substitute insurance is obtained, and may, in the Department's discretion, be sufficient grounds for declaring the Contractor in default.

30-07 EXECUTION AND APPROVAL OF CONTRACT. The successful bidder shall execute and return the Contract Form and all other required documents to the Department within the time specified, or within 15 days after receipt by the bidder if no time is specified. A contract is awarded only after it has been signed by the Contracting Officer.

30-08 FAILURE TO EXECUTE CONTRACT. If the successful bidder fails to appropriately execute and return the Contract Form and other documents within time specified, as required above, the Department may cancel the intent to award and keep the bid guaranty. The Department will then, in its discretion, award the Contract to the next lowest responsive and responsible bidder or readvertise the work.

30-09 ORAL STATEMENTS. The written terms of the Contract are binding. No oral statement of any person shall, in any manner or degree, modify or otherwise affect, change, or amend the terms of the Contract.

30-10 INTEGRATED CONTRACT. This Contract is an integrated document and contains the complete agreement and understanding of the parties. There are no unwritten agreements or understandings between the parties. Changes ordered or agreed upon, Directives given, or Equitable Adjustments issued under this Contract, and all other matters affecting the Contract, must be in writing in order to be binding and effective.

SECTION 40
SCOPE OF WORK

40-01 INTENT OF CONTRACT. The intent of the Contract is to provide for the construction and completion of every detail of the described work. The Contractor shall furnish all labor, material, supervision, equipment, tools, transportation, supplies, and other resources required to complete the work in the time specified and according to the Contract.

The Contractor is responsible for the means, methods, techniques, sequence, and procedures of construction, safety, and quality control, and is responsible to perform and furnish the work in accordance with the Contract documents and any applicable federal, state, and local laws, rules, regulations, and ordinances.

40-02 CHANGES.

a. Within Contract Scope. The Engineer may order changes within the general scope of the Contract at any time, and without notice to sureties, including altering, ordering additions to, or ordering deletions of quantities of any item or portion of the work. These changes shall be made by a written Change Order and shall not invalidate the Contract or release the sureties.

(1) If the change does not materially differ in character or unit cost from specified Contract work, the Contractor shall perform the work at the original contract measurement methods and prices, subject to the provisions of Subsection 90-04.

(2) If the change is materially different in character or unit cost from that specified in the Contract, a new Contract Item will be established, and an equitable adjustment to Contract price and Contract time shall be calculated by one of the following methods:

(a) The Engineer and Contractor agree upon an adjustment to Contract price and Contract time, and the Engineer issues a change order for the described work;

(b) The Engineer requires the Contractor to proceed with the described work, with an adjustment to contract price and contract time, calculated by time and materials basis under Subsection 90-05, and the Engineer issues a change order for the work. The Contractor shall keep complete daily records of the cost of such work; or

(c) The Engineer may issue a unilateral Change Order requiring the Contractor to proceed with the work with an adjustment to the payment amount or Contract time based on the Engineer's estimate of reasonable value. The Contractor shall keep complete daily records of the cost of such work.

(3) If the Engineer eliminates a Contract item, the Contractor shall accept compensation under Subsection 90-09.

b. Outside Contract Scope. Changes determined to be outside the general scope of the Contract shall be made only by Supplemental Agreement issued according to AS 36.30 and the State's procurement regulations. Additional bonding or insurance may be required.

c. Cost and Pricing Data. Before a Change Order or Supplemental Agreement covering work for which there is no established Contract price will be written, the Contractor shall submit detailed cost or pricing data regarding the changed work. The cost or pricing data shall include an itemization of production rates and all costs including labor, materials, and equipment required for the work. The Contractor shall certify that the data submitted are, to the best of its knowledge and belief, accurate, complete, and current as of a mutually agreed date and that the data will continue to be accurate and complete during the performance of the changed work.

d. Time Analysis. Before a Change Order or Supplemental Agreement that adds or subtracts time from the Contract will be written, the Contractor shall provide an analysis and documentation demonstrating changes to controlling items of work that affect Contract time. The Contractor shall certify that the data submitted are, to the best of its knowledge and belief, accurate, complete, and current as of a mutually agreed date and that the data will continue to be accurate and complete during the performance of the changed work.

40-03 DIFFERING SITE CONDITIONS. If, during the progress of the work, a differing site condition is discovered, the party discovering the differing site condition shall promptly notify the other party in writing of the specific differing conditions. The written notification shall occur before the site is further disturbed and before the affected work is performed. A differing site condition is defined as:

a. Subsurface or latent physical conditions at the site, differing materially from those shown in the Contract documents, that could not have been discovered by a careful examination of the site; or

b. Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

When the Contractor is the discovering party, failure of the Contractor to give the Engineer prompt written notice of the alleged differing site condition as required under this section constitutes a waiver of any future claim arising from or relating to the alleged differing site condition.

Unless otherwise directed by the Engineer, the Contractor shall leave the affected area undisturbed and suspend work in that area until the Engineer investigates the conditions.

The Engineer will notify the Contractor of the determination whether or not an adjustment of the contract is warranted. If the Engineer finds that such conditions differ materially and increase or decrease the cost of, or the time required for, performance of the Contract, the Engineer will prepare a Change Order for an Equitable Adjustment to the Contract. The Contractor shall cooperate with the Engineer's preparation of the Change Order, and submit data for actual costs and time to perform differing site work according to Subsection 40-02.

The Change Order will provide an equitable adjustment to Contract price and Contract time, as agreed, to perform the work under a differing site condition. The Change Order will not include expected reimbursement, or anticipated profits suffered or claimed, for the work affected by the differing site condition.

If the Contractor and the Engineer are unable to reach an agreement concerning the alleged differing site condition, the Contractor may file a claim under Subsection 50-17.

The Contractor shall keep accurate and detailed records of the actual cost of the work done as a result of the alleged differing site condition and shall allow the Engineer access to those records. Failure to keep records, to provide the Engineer with access to those records, or to give the notice required above will bar any recovery for the alleged differing site condition.

40-04 USE OF MATERIALS FOUND ON THE WORK. Before using borrow, the Contractor shall utilize Useable Excavation to construct the embankment layer on the project. Useable Excavation is material encountered within the lines and grades of the project that is determined suitable by the Engineer under P-152-2.3, Suitable Material. For excavating the Useable Excavation and constructing the embankment with Useable Excavation, the Contractor shall be paid only the unit bid price for excavation. Hauling, placing, compacting and other activities required to construct the embankment with Useable Excavation shall be subsidiary to excavation, and the Contractor shall not be paid additional sums for those activities. The Engineer may approve the use of borrow when Useable Excavation is not available.

The Engineer may authorize the Contractor to use the Useable Excavation for Contract items other than construction of embankment, and the Contractor shall be paid both for the excavation of the Useable

Excavation and for the other Contract Item for which it is acceptably used. If this action results in a shortage of embankment material:

a. The Contractor shall replace the Useable Excavation used for Contract items other than embankment, on a yard for yard basis with borrow acceptable to the Engineer; and

b. This replacement shall be at the Contractor's expense and at no additional cost to the Department. The Contractor shall pay any royalties required for the borrow.

The Contractor shall not excavate or remove any material that is within the project limits but outside the lines and grades, without written authorization from the Engineer.

In the event the Contractor has processed material from state-furnished sources in excess of the quantities required for performance of the Contract, the Department may retain possession of the surplus processed materials, including any waste material produced as a by-product, without obligation to pay the Contractor for processing costs. When the surplus materials are in a stockpile, the Engineer may direct the Contractor to leave the materials in the stockpile, level the stockpile(s) or remove the materials and restore the premises to a satisfactory condition at no additional cost to the Department.

The Contractor may temporarily use material from a structure that is designated to be removed to erect a new structure, but shall not cut or otherwise damage such material without the Engineer's approval.

40-05 MAINTENANCE OF TRAFFIC. It is the explicit intention of the Contract that the safety of aircraft, the public, the airport's equipment and personnel, and the Contractor's equipment and personnel, shall be the most important consideration. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas of the airport, except as specifically provided in this Contract or in the SPCD, with respect to its own operations and the operations of all its subcontractors. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft, whenever the airport is open to the arrival or departure of aircraft as detailed on the plans, CSPP, and SPCD.

With respect to the Contractor's own operations and the operations of all the Contractor's subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying: personnel; equipment; vehicles; storage areas; and any work area or condition that may be hazardous to the operation of aircraft, fire-rescue equipment, maintenance vehicles, or support vehicles at the airport.

When the Contract requires the maintenance of vehicular traffic on an existing roadway, the Contractor shall keep such roadway open to all traffic, and shall provide such maintenance as may be required to accommodate traffic and to keep the roadway smooth and even. The Contractor shall furnish, erect, and maintain barricades, warning signs, flaggers, and other traffic control devices in reasonable conformity with the *Manual on Uniform Traffic Control Devices for Streets and Highways* (published by the United States Government Printing Office) and the *Alaska Traffic Manual Supplement*, unless otherwise specified by the Department. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roadways, and as required in Subsection 50-13.

The Contractor shall make their own estimate of all labor, materials, equipment, and incidentals necessary for providing the maintenance of aircraft and vehicular traffic as specified in this subsection.

The cost of maintaining the aircraft and vehicular traffic specified in this subsection shall not be measured or paid for directly, but shall be subsidiary to the various contract items, except when pay items are included in the bid schedule that directly pay for traffic control measures. The traffic control measures included for payment will be specifically described under those items.

40-06 REMOVAL OF EXISTING STRUCTURES. The Contractor shall leave in place, work around and protect from damage existing structures encountered within the project lines and grades; unless such existing structures are to be removed, demolished, relocated, or salvaged.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the Plans, the Contractor shall notify the Engineer prior to disturbing such structure. The Engineer will determine the disposition of existing structures so encountered according to the provisions of the contract.

The cost of working around and protecting existing structures, or removing existing structures including landfill waste fees, shall not be measured or paid for directly, but shall be subsidiary to the various contract items.

Structures that may be encountered within the project lines and grades shall be utilized in the work, and shall remain the property of the owner when so utilized in the work, unless otherwise indicated in the Contract.

40-07 CLEANUP. The Contractor shall remove all rubbish, solid waste, temporary structures, excess materials, and equipment from the project site, from state owned materials sources, and from all work areas before project completion, or seasonal suspension of construction activities.

SECTION 50
CONTROL OF WORK

50-01 AUTHORITY OF THE ENGINEER. The Engineer has immediate charge of the engineering details of the project and is responsible for Contract administration. The Engineer has authority to reject defective material and suspend work not performed in accordance with the Contract. The Engineer has authority to accept completed work, issue Directives, Interim Work Authorizations, and Change Orders, and recommend Contract payments.

The Engineer will decide all questions about the quality and acceptability of the materials furnished and whether the work performed by the Contractor was in accordance with the Contract, the Contractor's rate of progress, Contract interpretation and all other questions relating to Contract compliance.

The Engineer has authority to suspend work for reasons listed under Subsection 80-06. If the suspension is to protect the traveling public 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 to the Contractor. 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 it is corrected; and

b. Employ others to correct the condition and deduct the cost from the Contract amount.

The Engineer may, at reasonable times, inspect any part of the plant or place of business of the Contractor or any subcontractor that is related to Contract performance, including private or commercial plants, shops, offices, or other places of business.

The Engineer may audit all books and records related to performance of the Contract, whether kept by the Contractor or a subcontractor, including cost or pricing data submitted under Subsection 40-02.

50-02 PLANS AND WORKING DRAWINGS. The Department shall provide the Contractor at least two full size sets of the conformed Plans and Contract including Special Provisions. If cross-sections are available, one set will be provided if requested in writing by the Contractor. The Contractor shall keep a complete set of these documents available on the project site at all times.

The Contractor shall supplement structure plans with working drawings that include all details that may be required to adequately control the work and that are not included in the Plans furnished by the Department. The Contractor shall not perform work or order materials until the working drawings for such work, or for changes, are approved by the Engineer. The Engineer's approval of working drawings or changes shall not be deemed a determination that the working drawings or changes comply with federal, state or local laws, rules, regulations and ordinances. It is Contractor's duty to insure the working drawings comply with the Contract and any applicable federal, state or local laws, rules, regulations, and ordinances.

The Contractor shall submit to the Engineer for approval any required preliminary detail or working drawings. The project name and number shall be stated in the title block for all drawings, as shall the state bridge number, when applicable. The Contractor shall submit drawings in either an electronic or paper format that is acceptable to the Engineer. When paper copies are submitted, provide three sets.

The Contractor shall submit drawings to the Engineer in time to allow for review and correction before beginning the work detailed in the drawing. The Engineer shall return one set of these drawings, either approved or marked with corrections to be made, and shall retain the other sets. The Engineer's approval of working drawings does not change the Contract requirements or release the Contractor of the responsibility for successful completion of the work.

The Contractor is responsible for the accuracy of dimensions and details and for conformity of the working drawings with the Plans and Specifications. The Contractor shall indicate clearly on the working drawings any intended deviations from the Plans and Specifications and itemize and explain each deviation in the Contractor's transmittal letter. The Engineer may order the Contractor to comply with the Plans and Specifications at the Contractor's sole expense if the approved working drawings deviate from the Plans and Specifications and the Contractor failed to itemize and explain the deviations in the Contractor's transmittal letter.

Once the Contractor receives approval of the working drawings, the Contractor shall furnish to the Engineer:

a. Enough additional copies to provide eight approved sets of prints;

b. One set of reproducible transparencies (polyester film); and

c. If requested, an electronic file in AutoCAD drawing interchange format (.DXF).

The Contractor shall include the cost of furnishing all working drawings in the Contract price.

50-03 CONFORMITY WITH PLANS AND SPECIFICATIONS. Work performed and materials furnished shall conform to the Plans, Specifications and approved Working Drawings, and be within specified tolerances. When tolerances are not specified, the Engineer will determine the limits allowed in each case.

All work or material not conforming to the Plans, Specifications, and approved Working Drawings is considered unacceptable unless the Engineer finds that reasonably acceptable work has been produced. In this event, the Engineer may allow non-conforming work or material to remain in place, but at a reduced price. The Engineer will document the basis of acceptance and payment by Change Order, unless the contract specifies a method to adjust the price of that item.

The failure of the Department to strictly enforce the Contract in one or more instances does not waive its right to do so in other or future instances.

50-04 COORDINATION OF PLANS, SPECIFICATIONS, AND SPECIAL PROVISIONS. These Standard Specifications, Plans, Special Provisions, and all supplementary documents are essential parts of the Contract. They are intended to complement each other and describe and provide for a complete project. A requirement occurring in one is as binding as if occurring in all.

In case of conflict, calculated dimensions will govern over scaled dimensions. In the event that any of the following listed contract documents conflict with another listed contract document, the order of precedence is (with **a.** having precedence over **b.**, and **b.** having precedence over **c.**, etc.):

a. Special Provisions

b. Plans

c. Standard Specifications

d. Materials testing standards

e. FAA Advisory Circulars

The Contractor shall not take advantage of any apparent error or omission in the Contract documents. The Contractor may not base a claim for additional compensation or Contract time on a patent error, omission, or conflict in the Contract documents. The Contractor shall notify the Engineer immediately of any apparent errors or omissions in the Contract documents. The Engineer will make any corrections or interpretations necessary to fulfill the intent of the Contract.

50-05 COOPERATION BY CONTRACTOR. The Contractor shall give the work the constant attention necessary for its progress, and shall cooperate fully with the Engineer, Department staff, and other contractors in every way possible.

Either the Contractor's Superintendent or an acting Superintendent with authority to represent and act for the Contractor shall be available within the proximity of the project whenever work is occurring. The Contractor shall employ, as its agent, a competent superintendent thoroughly experienced in the type of work being performed and capable of reading and thoroughly understanding the Plans and Specifications. The Contractor shall provide 24-hour contact information for the Superintendent. The Contractor shall ensure that the superintendent is available at all times to receive and execute Directives and other instructions from the Engineer, to supervise workers and to coordinate the work of subcontractors. The Contractor shall give the superintendent full authority to supply the resources required. The Contractor shall furnish superintendence regardless of the amount of work sublet.

50-06 UTILITIES.

a. Bid Considerations. Bidders shall include in their bid the cost of:

(1) Providing uninterrupted operation of all visual and electronic signals, including power supplies and Lighting used in the guidance of aircraft, except as specified in the CSPP and SPCD;

(2) All utility work that is specified in the Contract as work to be performed by the Contractor;

(3) Working around or through all permanent and temporary utilities shown on the Plans, in both their present and adjusted positions;

(4) Accommodating the removal, adjustment, or relocation of utilities shown on the Plans by entities other than the Contractor;

(5) Construction and removal of temporary utilities, to provide temporary utility service during the construction or repair of a permanent utility; and

(6) Other utility work not specifically identified as compensable in Subparagraph d Compensation.

The Department will show the approximate locations of utilities it knows to be within the work zone on the Plans. Bidders shall expect that the location, elevation and nature of utilities may vary from what is shown on the Plans and shall factor those contingencies into the bid price. Additional utilities may exist that are not shown on the Plans. Compensation related to utilities not shown on the plans will only be available according to Subparagraph d Compensation.

When an entity other than the Contractor is to remove, adjust, or relocate any utility, or perform other utility related work within the project boundaries, the applicable completion dates or specific calendar days to complete the removal, adjustment, relocation, or other utility related work may be stated in the Special Provisions. If no date is stated in the Special Provisions, the Contractor shall work cooperatively with the utility owner during the Project.

b. Cooperation with Utility Owners. The Contractor assumes the obligation of coordinating their activities with utility owners, and shall cooperate with utility owners to facilitate removal, adjustment, or relocation operations, avoid duplication of work, and prevent unnecessary interruption of services. When a utility owner is identified in the Contract as being responsible for removing, adjusting, or relocating a utility, the Contractor shall give the utility owner 15 days advance written notice regarding the dates when the utility owner is required to begin and end operations.

The Contractor shall cooperate with utility owners to determine a utility progress schedule for all parties' utility work. The Contractor shall submit the schedule to the Engineer before beginning that portion of utility work. The Contractor shall update the utility progress schedule monthly and shall note time delays and their cause.

Utility owners are not required to work in more than one location at a time, and shall be allowed to complete a specific section of work prior to commencing another section. Utility owners will not normally perform adjustment or relocation of underground utilities when the ground is frozen. Utility owners may prohibit the Contractor, through the Engineer, from working near utilities when the ground is frozen.

The Department has sole discretion to grant permits for utility work within the state right-of-way. The Contractor shall allow parties with utility permits to work and make excavations in the project**.**

If utility owners do not complete their work in a timely manner, the Engineer may direct the Contractor to temporarily relocate the utilities, to construct new utilities, or to make necessary repairs to complete the utility work.

c. Utility Work. The Contractor shall:

(1) Make all necessary arrangements with utility owners to locate all utilities that may be within an area of work before excavation in that area, according to AS 42.30.400;

(2) Provide right-of-way staking and construction staking with lines and grades before excavation in that area;

(3) Prevent damage to utilities or utility property within or adjacent to the project;

(4) Carefully uncover utilities where they intersect the work;

(5) Immediately stop excavating in the vicinity of a utility and notify the Engineer and the utility owner if an underground utility is discovered that was not field marked or was inaccurately field marked;

(6) Promptly notify the utility owner, the Engineer, and the Airport Manager in the event of accidental interruption of utility service, and cooperate with the utility owner and the Engineer until service is restored;

(7) Take all precautions necessary to protect the safety of workers and the public when performing work involving utilities;

(8) Follow an approved TCP;

(9) Keep the length of open trench excavation to a minimum, backfill trenches as work is completed;

(10) Cover open trenches with metal plates capable of bearing traffic where traffic will cross trenches;

(11) Maintain continuous utility service and install temporary utility systems where needed;

(12) Ensure all excavation conforms to AS 42.30.400 – 42.30.490;

(13) Ensure all excavation and utility work conforms to excavation requirements in 29 CFR 1926, Subpart P, and confined space requirements in 29 CFR 1926.21(b)(6);

(14) Ensure all work undertaken near energized high voltage overhead electrical lines or conductors conforms to AS 18.60.670, AS 18.60.675, AS 18.60.680 or other applicable law;

(15) Ensure all work undertaken near energized high voltage underground electric lines or conductors conforms to all applicable laws and safety requirements of the utility owner;

(16) When required by the utility owner, provide for a cable watch of overhead power, underground power, telephone, and gas;

(17) Obtain plan approval from the local fire authority, and provide for the continued service of fire hydrants, before working around fire hydrants;

(18) Do all pressure testing or camera testing required to verify utility acceptance in a timely manner; and

(19) Coordinate the Storm Water Pollution Prevention Plan (SWPPP) (Item P-641) with their work and the utility companies' work.

d. Compensation.

(1) Except as otherwise specifically provided in this Subparagraph d, no equitable adjustment will be paid by the Department:

(a) Due to any variations in location, elevation, and nature of utilities shown on the Plans, or the operation of removing, adjusting, or relocating them;

(b) For any delays, inconvenience, or damage sustained as a result of interference from utility owners, interference from utilities, or interference from the operation of removing, adjusting, or relocating utilities; or

(c) For any adjustments or relocations of utilities requested for the Contractor's convenience.

(2) Except as otherwise specifically provided in this Subparagraph d, the Engineer will issue a Change Order with equitable adjustment if:

(a) Utilities not shown on the Plans require removal, adjustment, or relocation;

(b) Conflicts occur between utilities not shown on the Plans and other necessary work; or

(c) Conflicts due to the required elevation of a utility occur between new and existing utilities that are both shown on the Plans.

(3) When the Contractor damages utilities, the utility owner may choose to repair the damage or require the Contractor to repair the damage. When the Contractor damages utilities:

(a) No equitable adjustment will be paid by the Department, and the Contractor shall be solely responsible for repair costs and expenses, when:

1. The Contractor failed to obtain field locates before performing the work that resulted in the damage;

2. The utility was field located by the utility owner or operator, and the field locate is accurate within 24 horizontal inches if the utility is buried 10 feet deep or less, or the field locate is accurate within 30 horizontal inches if the utility is buried deeper than 10 feet;

3. The plan profile or the field locate does not indicate or inaccurately indicates the elevation of a buried utility;

4. The utility is visible in the field; or

5. The Contractor could otherwise reasonably have been aware of the utility.

(b) The Engineer will issue a Change Order with an equitable adjustment for the cost of repairing damage if:

1. The field locate by the owner or operator of a buried utility erred by more than 24 horizontal inches if the utility is buried 10 feet deep or less, or 30 horizontal inches if the utility is buried deeper than 10 feet;

2. The utility was not shown on the Plans or other Contract documents, and the Contractor could not reasonably have been expected to be aware of the utility's existence; or

3. The Contractor made a written request for a field locate according to AS 42.30.400, the utility owner did not locate the utility according to AS 42.30.410, and the Contractor could not reasonably have been expected to be aware of the utility's existence or location.

(4) If a delay is caused by a utility owner, is beyond the control of the Contractor, and is not the result of the Contractor's fault or negligence, the Engineer may issue a Change Order with an equitable adjustment to contract time, but no equitable adjustment will be made for the cost of delay, inconvenience or damage. Additional contract time may be granted if the cause of delay is because a utility owner is to perform utility work:

(a) By dates stated in the Special Provisions, and the utility work is not completed by the dates stated; or

(b) In cooperation with the Contractor and the utility owner does not complete the work in a timely manner, based on a written progress schedule agreed upon by the Contractor, the utility owner, and the Engineer.

(5) If the Engineer orders the Contractor to make necessary construction or repairs due to incomplete utility work by utility owners, the Contractor will be paid as specifically provided for in the Contract, or the Engineer will issue a Change Order with equitable adjustment.

e. Cooperation with Airport Management and FAA. The Contractor shall coordinate their activities and cooperate with the Airport Management and the FAA, and shall provide 45 days advance written notice to them before working on utilities in the Air Operations Area. All coordination with Airport Management and the FAA shall be through the Engineer. Refer to the CSPP for coordination requirements. The Contractor shall include and cooperate with Airport Management, the FAA, and the Engineer, in determining a utility progress schedule for work on the Airport Property.

The Contractor shall submit a written plan to repair damaged utilities to the Engineer, and shall follow the plan when repairing damaged utilities. The plan shall identify repair personnel or subcontractors. The Contractor shall not work on or adjacent to utilities unless repair personnel are available to repair damaged utilities. Personnel repairing utilities shall be licensed for the work required, and shall have the tools and material required to repair damaged utilities within the time limits required.

When damage affects, or may in the Engineer's opinion affect, the function of navigational or visual aids, the Contractor shall repair damage within two hours. When damage affects, or may in the Engineer's opinion affect, the function of utilities, the Contractor shall repair the damage within 24 hours.

50-07 COOPERATION BETWEEN CONTRACTORS. The Department may, at any time, contract for and perform other or additional work on or near the Project. The Contractor shall allow other contractors reasonable access across or through the Project.

The Contractor shall cooperate with other contractors working on or near the Project, and shall conduct work without interrupting or inhibiting the work of other contractors. All contractors working on or near the Project shall accept all liability, financial or otherwise, in connection with their Contract. No claim shall be made by the Contractor or paid by the Department for any inconvenience, delay, damage or loss of any kind to the Contractor due to the presence or work of other contractors working on or near the Project.

The Contractor shall coordinate and sequence the work with other contractors working within the same project limits. The Contractor shall properly join the work with work performed by other contractors and shall perform the work in the proper sequence to that of the others. The Contractor shall arrange, place, and dispose of materials without interfering with the operations of other contractors on the same project. The Contractor shall defend, indemnify and save harmless the Department from any damages or claims caused by inconvenience, delay, or loss that the Contractor causes to other contractors.

50-08 SURVEY CONTROL. The Department will provide sufficient horizontal and vertical control data to establish the planned lines, grades, slopes, shapes, and structures. The Contractor shall provide all additional survey work to maintain control during the project.

50-09 DUTIES OF THE INSPECTOR. The Department's inspectors are authorized to examine all work done and materials furnished, but cannot approve work or materials. Only the Engineer can approve work or materials. The inspectors can reject work or materials until any issues can be referred to and decided by the Engineer. The inspectors may not alter or waive any Contract requirements, issue instructions contrary to the Contract or act as foremen for the Contractor.

50-10 INSPECTION OF WORK. All materials and each part and detail of the work shall be subject to inspection by the Department for compliance with the Contract. The Contractor shall allow safe access to all parts of the work and provide information and assistance to the Engineer to ensure a complete and detailed inspection.

Any work done or materials used without inspection by an authorized Department representative may be ordered removed and replaced at the Contractor's expense, unless the Department failed to inspect after being given reasonable written notice that the work was to be performed.

The Contractor shall remove and uncover portions of finished work when directed. After inspection, the Contractor shall restore the work to Contract requirements. The cost to uncover and restore work shall be at the Contractor's expense, except the Department will pay the cost to uncover and restore work if (1) an authorized Department representative had previously inspected the work or the Contractor had provided reasonable prior written notice that the work was to be performed and (2) the Department finds the uncovered work to be acceptable. If the Department finds the uncovered work to be unacceptable, the cost to correct the work, or remove and replace the work, shall be at the Contractor's expense.

Representatives of Contract funding agencies have the right to inspect the work. This right does not make that entity a party to the Contract and does not interfere with the rights of parties to the Contract.

The Department's observations, inspections, tests and approvals shall not relieve the Contractor from properly fulfilling its Contract obligations and performing the work according to the Contract. Work that has been inspected but contains latent or hidden defects shall not be deemed acceptable even though it has been inspected and found to be according to the Contract.

The State of Alaska Department of Labor may require electrical inspection of Public Structures. The Contractor shall request inspection by contacting the Electrical Inspector in Anchorage, Alaska, Phone (907) 269-4925. The Contractor shall request inspection a minimum of two weeks prior to the expected date of inspection being needed. If more than one item requires inspection, the Contractor shall submit a list to the Engineer and Electrical Inspector, with dates for all stages that requires inspection. The Department has no control over or responsibility for the timing of inspections by the Electrical Inspector.

50-11 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK. All work that does not conform to the requirements of the Contract shall be deemed unacceptable by the Engineer, unless otherwise determined acceptable under Subsection 50–03. The Contractor shall correct, or remove and replace, work or material that the Engineer deems unacceptable, as ordered by the Engineer and at no additional cost to the Department.

The Contractor shall establish necessary lines and grades before performing work. Work done before necessary lines and grades are established, work done contrary to the Department's instructions, work done

beyond the limits shown in the Contract, or any extra work done without authority, will be considered as unauthorized and shall not be paid for by the Department, and may be ordered removed or replaced at no additional cost to the Department.

If the Contractor fails to promptly correct, remove, or replace unacceptable or unauthorized work as ordered by the Engineer, the Engineer may employ others to remedy or remove and replace the work and will deduct the cost from the Contract payment.

50-12 LOAD RESTRICTIONS. The Contractor shall comply with all vehicle legal size and weight regulations of 17 AAC 25 and the *Administrative Permit Manual,* and shall obtain permits from the DOT&PF Division of Measurement Standards & Commercial Vehicle Enforcement before moving oversize or overweight equipment on a state highway.

The Engineer may permit oversize and overweight vehicle movements within the project limits provided the Contractor submits a written request and an acceptable Traffic Control Plan. No overloads will be permitted on a pavement, base or structure that will remain in place in the completed project. The Contractor shall be responsible for all damage done by their equipment due to overloads, and for damage done by a load placed on a material that is curing and has not reached adequate strength to support the load.

50-13 MAINTENANCE DURING CONSTRUCTION. The Contractor shall maintain the airport and related airport facilities located within the project from the date construction begins until the Contractor receives a letter of project completion. The Contractor shall maintain these areas continually and effectively on a daily basis, with adequate resources to keep them in satisfactory condition at all times. The Contractor shall maintain those areas outside the project that are affected by the work, such as haul routes, detour routes, structures, material sites, and equipment storage sites during periods of their use.

Do not place foreign objects and debris (FOD) or any debris capable of causing damage to aircraft landing gears or propellers or of being ingested in jet engines on surfaces in active aircraft movement areas. Ensure that all loose material and debris has been removed from the sides of equipment and haul vehicles prior to travel on airport or road surfaces. Keep all active runway, taxiway, and apron areas free of materials spilled by your operations. Clean spilled materials off of closed runways, taxiways, or aprons prior to opening these areas to aircraft. If FOD is spilled on an active runway, taxiway, or apron, remove it immediately. The Engineer reserves the right to suspend all hauling operations until FOD is removed from active aircraft movement areas. Hauling time lost due to the suspended haul will not be considered reason to extend contract time or reason for a claim. The Engineer will allow hauling to continue when the spilled material is cleaned up to his satisfaction. FOD preventive measures and FOD cleanup of runways, taxiways, haul routes, and equipment is subsidiary to the contract and no additional payment will be made.

The Engineer may relieve the Contractor of this maintenance responsibility for specified portions of the project:

a. During a seasonal suspension of work. Approximately one month prior to seasonal suspension of work, the Contractor shall hold a preliminary meeting with the Engineer and Airport Management to outline the work the Contractor expects to complete before shut down and the condition the project is to be left in. The Contractor shall then schedule a field review for acceptance by the Department for winter maintenance. At the field review a punch list shall be prepared for implementation prior to acceptance. In order for the Contractor to be relieved of winter maintenance responsibility, the surface of all embankments shall be properly crowned for drainage, all edge lighting shall be in good working order, and all NAVAIDS installed by the Contractor shall first have been accepted by the FAA. After acceptance for winter maintenance and until the Contractor resumes construction operations, maintenance of the facility agreed upon will be the responsibility of the Department; or

b. Following partial completion (Subsection 50-14); or

c. Following project completion (Subsection 50-15).

The Department is responsible for routine snow removal and ice control only on those portions of the project that the Department accepts for maintenance.

The Contractor shall maintain previously constructed work until a subsequent course, layer, or structure covers that work. The Contractor shall repair damage done to the work as described in Subsection 70-15.

All costs of maintenance work shall be subsidiary to the prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

If in the Engineer's opinion, the Contractor at any time fails to provide adequate maintenance, the Engineer will notify the Contractor of such noncompliance. The notification will specify the areas or structures for which there is inadequate maintenance, the corrective maintenance required, and the time allowed to complete corrective maintenance. If the Contractor fails to take the corrective action within the specified time, the Engineer may:

a. Suspend the work until corrective maintenance is completed;

b. Assess a traffic price adjustment against the Contract Amount when an adjustment rate is specified in the Contract; and

c. Employ others for corrective maintenance and deduct the cost from the Contract amount.

50-14 PARTIAL COMPLETION. The Contractor may submit a written request for partial acceptance of a substantially complete geographically separate portion of the project. The Engineer will accept the portion in writing before project completion and relieve the Contractor of further maintenance responsibility for the completed work, if the Engineer inspects the portion and finds that it is substantially complete to Contract requirements, and acceptance is in the best interest of the State.

Partial completion of the portion neither voids nor alters any Contract terms.

50-15 PROJECT COMPLETION. The Contractor shall notify the Engineer, in writing, upon substantial completion of all work provided for under the Contract. The Engineer will then schedule and conduct the final inspection. If the inspection discloses that any work is incomplete or unsatisfactory, the Engineer will give the Contractor a list of work items that must be completed or corrected to reach substantial completion and to reach final completion. The Contractor shall promptly complete or correct any work determined unsatisfactory by the final inspection and request a re-inspection.

The Engineer will identify the date of substantial completion in a letter of substantial completion. The letter of substantial completion will relieve the Contractor of further maintenance responsibility of the completed work. The letter of substantial completion will not stop Contract time or relieve the Contractor of the obligation to fully complete the work as required by the Contract specifications.

When all physical work and cleanup provided for under the Contract is found to be complete, the Engineer will issue a letter of project completion. Project completion stops the Contract time, but does not relieve the Contractor of any other Contract obligations.

50-16 FINAL ACCEPTANCE AND RECORD RETENTION. The Department will issue the letter of Final Acceptance after all of the following:

a. Project completion;

b. Receipt of all certificates, as-builts, warranties, and other required documents;

c. Receipt of the Contractor's Release, with no exceptions;

d. Certification of payment of payroll and revenue taxes by DOLWD and State Dept. of Revenue; and

e. Final payment under the Contract.

Final Acceptance will release the Contractor from further Contract obligations, except those:

a. Specified under Subsection 70-19;

b. Required by law or regulation; or

c. Continuing obligations established by provisions of this Contract, such as warranty, guaranty, indemnity, insurance, or bond.

The Contractor and the subcontractors shall maintain all books and records relating to performance of the Contract for three years after the date of final payment of the Contract and each subcontract.

50-17 CLAIMS. The Contractor shall notify the Engineer as soon as the Contractor becomes aware of any act or occurrence that may form the basis of a claim for additional compensation or an extension of Contract time or of any dispute regarding a question of fact or interpretation of the Contract. The Engineer has no obligation to investigate any fact or occurrence that might form the basis of a claim or to provide any additional compensation or extension of Contract time unless the Contractor notifies the Engineer in a timely manner of all facts the Contractor believes form the basis for the claim.

If the Contractor believes that he is entitled to an extension of Contract time, the Contractor must state the contract section on which the extension request is based, provide the Engineer with sufficient information to demonstrate that the Contractor has suffered excusable delay, and show the specific amount of time to which the Contractor is claiming entitlement. The Department will not grant an extension of Contract Time if the Contractor does not timely submit revised schedules in accordance with Subsection 80-03.

If the basis of claim or dispute is not resolved by agreement within seven days of the date the Engineer is notified by the Contractor, the Contractor shall within the next fourteen days submit a Contractor Intent to Claim (Form 25D-18) to the Engineer. Failure to submit a Contractor Intent to Claim as required under this section constitutes a waiver of any future claim arising from or relating to the alleged act or occurrence.

If the Contractor believes additional compensation or time is warranted, the Contractor shall immediately begin keeping complete, accurate, and specific daily records concerning every detail of the potential claim including actual costs incurred, and shall give the Engineer access to any such records and furnish the Engineer copies, if requested. Equipment costs must be based on the Contractor's internal rates for ownership, depreciation, and operating expenses and not on published rental rates. In computing damages, or costs claimed for a change order, or for any other claim against the Department for additional time, compensation or both, the contractor must establish actual damages based on internal costs for equipment, labor or efficiencies. Total cost, modified total cost or jury verdict forms of presentation of damage claims are not permitted. Labor inefficiencies must be shown to actually have occurred and can be proven solely based on job records. Theoretical studies are not a permissible means of showing labor inefficiencies. Home office overhead will not be allowed as a component of any claim against the Department.

The Contractor shall submit a written claim to the Contracting Officer within 90 days after the date the Contractor became aware of the basis of the claim or should have known of the basis of the claim, whichever is earlier. Any Claim not filed within this 90-day period will be deemed irrevocably waived by the Contractor, regardless of whether the requested relief is sought for the ultimate benefit of the Contractor or its subcontractor(s). The Contracting Officer will issue a written acknowledgement upon receipt of the claim.

The Contractor waives any right to claim if the Engineer was not notified properly or afforded the opportunity to inspect conditions or monitor actual costs or if the Claim is not filed on the date required.

a. The written Claim must include all of the following:

(1) The act, event, or condition giving rise to the claim;

(2) The Contract provisions that apply to the claim and that provide for the requested relief;

(3) The item or items of Contract work affected and how they were affected;

(4) The specific relief requested, including Contract time if applicable, and the basis upon which it was calculated;

(5) Revised progress schedules under Subsection 80–03; and

(6) A certification signed by the Contractor that to the best of the contractor's knowledge and belief, the data submitted is accurate, complete, and current and is the actual cost to the contractor or additional time for performing the additional work or supplying the additional materials.

b. The claim, in order to be considered, must show:

(1) That the Contractor suffered damages or delay;

(2) The damages or delay were caused by the act, event, or condition listed in the claim; and

(3) That the Contract entitled the Contractor for relief due to the act, event, or condition specified in the Claim.

The Department may request the Contractor to provide additional information relating to the claim at any time before issuing a decision. The Contractor shall provide the Department with the requested additional information within 30 days of receiving a request. Failure to furnish the additional information may be regarded as a waiver of the claim.

The Contracting Officer will issue a decision within 90 days of receipt of all information relating to the claim. The time for the Contracting Officer to issue a decision may be extended according to AS 36.30.620.

The Contracting Officer's decision is final and conclusive unless the Contractor delivers a notice of appeal to the Commissioner within 14 days of receipt of the decision. The Contractor shall also serve a copy of the notice of appeal on the Contracting Officer.

Appeals from a Contracting Officer’s decision shall be decided according to the State Procurement Code’s appeal procedures, including AS 36.30.625, AS 36.30.627, AS 36.30.630, and AS 36.30.631.

Criminal and civil penalties authorized under AS 36.30.687 (including, but not limited to, forfeiture of all claimed amounts) may be imposed on the Contractor if the Contractor makes or uses a misrepresentation in support of a claim, or defrauds or attempts to defraud the Department at any stage of prosecuting a claim under this Contract.

SECTION 60
CONTROL OF MATERIALS

60-01 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS. The Contractor shall furnish all materials required to complete the work except those specified to be furnished by the Department. The Contractor shall supply materials that are new and that meet Contract requirements. All manufactured materials shall be delivered and stored in their original containers and shall show the manufacturer's name, brand, and identifying number.

The Contractor shall furnish airport lighting equipment that conforms to the requirements of cited materials specifications. In addition, where an FAA specification for airport lighting equipment is cited in the Plans or Specifications, the Contractor shall furnish such equipment that is certified and listed under AC 150/5345-53, *Airport Lighting Equipment Certification Program*.

The Contractor shall notify the Engineer of proposed sources of materials at least 30 days before shipment, and shall submit to the Engineer and to the Department's State Materials Engineer a complete list of materials to be purchased from suppliers sufficiently in advance of fabrication or shipment to permit the Department to inspect the materials.

The Department’s inspectors may inspect any materials, including those originating outside Alaska, at the supply source or other locations. Materials may be conditionally approved at the supply source or other location, but are subject to field inspection and may be ordered removed under Subsection 50-11 if they do not conform to Contract requirements. Inspectors are authorized to reject materials that do not conform to specifications until any issues can be referred to and decided by the Engineer. Inspectors will report their actions to the Engineer.

The Contractor shall submit a manufacturer’s certificate of compliance for each item listed on the Material Certification List. The Engineer may authorize the use of materials based on a manufacturer’s certificate of compliance, see Subsection 60-05. Materials incorporated into the project on the basis of a manufacturer’s certificate of compliance may be tested at any time, whether in place or not, and, if they do not conform to Contract specifications, they may be rejected and ordered removed under Subsection 50-11.

The Engineer may authorize the use of materials listed in the Department's *Qualified Products List*. Materials incorporated into the project on the basis of the *Qualified Products List* may be tested at any time, whether in place or not, and, if they do not conform to Contract specifications, they may be rejected and ordered removed under Subsection 50-11.

The Contractor may request substitution of specified materials with equivalent materials. Requests for substitution shall be submitted to the Engineer, and shall include a manufacturer's statement that certifies, for each lot delivered:

a. Conformance to the specified performance, testing, quality or dimensional requirements; and

b. Suitability for the use intended in the Contract work.

The Engineer will determine the acceptability of a proposed substitute for use in the project. If a substitute is approved, a Change Order will be executed. The Department is never required to accept substitution. The Contractor shall not incorporate substitute materials into the project without written approval from the Engineer. The Engineer may test substitute materials at any time, whether in place or not, and, if the substitute materials do not meet Contract specifications, they may be rejected and ordered removed under Subsection 50-11.

60-02 MATERIAL SOURCES.

a. General. The Contractor shall:

(1) Utilize Useable Excavation according to Subsection 40-04 before using material sources listed in Subsection 60-02.d. When there is insufficient useable excavation furnish additional required materials from sources of the Contractor's choice, except that the Contractor shall use a mandatory source when identified in the Contract;

(2) Produce a sufficient quantity of materials meeting the specifications to complete the project;

(3) As a subsidiary cost: clear and grub, strip, drill and blast, excavate, crush, sort, blend, screen, wash, stockpile, haul, and rehandle material as needed to produce and deliver the specified product;

(4) Determine the type of equipment and methods to be used;

(5) Expect variations in material quality within the deposits, and procure material only from acceptable portions of the deposit, regardless of source ownership; and

(6) Prevent erosion, sedimentation, and pollution within a materials source.

The Contractor agrees that:

(7) The costs to explore and develop material sources, including all production effort, are subsidiary to the cost of providing the specified material;

(8) The Engineer may order the Contractor to procure material only from certain portions of the source and may reject material from other portions of the source that does not conform to the specifications; and

(9) All material required may not be procurable from any one source and the Contractor may need to change between sources. That contingency is to be factored into the unit bid price for the Contract Item.

b. Inspection and Acceptance. The Contractor shall perform sampling and testing during materials processing and placement according to its Quality Control Plan (Subsection 60-03.a.) and shall obtain acceptable material samples from locations designated within the source.

The Department will sample and test materials to determine the quality of the source, at its expense, as part of its Acceptance Testing (Subsection 60-03.b.). The Department will reject materials when the samples do not meet specifications. The Department may reject a proposed materials site when samples do not meet specifications.

c. Awareness Training. The operator of the Contractor's sand and gravel surface mine or other similar materials source shall provide Site-Specific Hazard Awareness Training in compliance with 30 CFR 46.11 for all the Engineer's personnel before beginning operations. All other workers shall be given training in compliance with 30 CFR 46 before exposure to mine hazards. The training must be offered at each surface mine that will be used to supply processed aggregates. A qualified person must provide the training. The training shall be according to the operator's written training plan approved by the Mine Safety and Health Administration, covering the following items:

(1) Site-specific health and safety risks;

(2) Recognition and avoidance of hazards;

(3) Restricted areas;

(4) Warning and evacuation signals;

(5) Evacuation and emergency procedures;

(6) Other special safety procedures; and

(7) A site tour.

The Contractor shall require the Engineer's personnel to sign the *Visitor's Log Book* upon completion of the training to indicate that training was provided. Training is a subsidiary cost.

d. Type of Sources.

When there is insufficient Useable Excavation, as defined in Subsection 40-04, the Contractor shall supply additional required material from one or more of the following sources:

(1) Contractor-Furnished Sources. For a material source that is a commercial plant as defined in Subsection 80-01.d.(1) the Contractor shall:

(a) Acquire the necessary rights and permits to obtain material from a commercial plant;

(b) Pay as subsidiary costs all related costs to obtain and use material from the source; and

(c) Be solely responsible for the quality and quantity of materials.

For all Contractor-Furnished sources that are not a commercial plant, the Contractor shall:

(d) Acquire the necessary rights and permits to take materials from the sources including state-owned sources that are not under the Department's control;

(e) Pay as subsidiary:

1. all related costs to obtain, develop, and use the sources, including but not limited to permit costs and mineral royalties;

2. the material costs identified in the Material Sales Agreement you obtain for State owned sources where an existing or draft Material Sales Agreement is not included in the contract; and

3. the material costs identified in the Material Sales Agreement for material obtained from State owned sources for which an existing or draft Material Sales Agreement is included in the contract;

(f) Be solely responsible for quality and quantity of materials; and

(g) Obtain all necessary rights, permits, and plan approvals before clearing or disturbing the ground in the material source. The contractor shall certify in writing to the Engineer that all permits and clearances relating to the use of the material source have been obtained prior to any clearing or ground disturbance in the materials source.

No equitable adjustment or other compensation will be made for any additional costs, including increased length of haul, if the Contractor:

(h) Chooses to change material sources for any reason;

(i) Is unable to produce a sufficient quantity or quality of materials from Contractor-Furnished sources; or

(j) Encounters unexpected, unforeseen, or unusual conditions within Contractor-Furnished sources.

(2) Mandatory Sources. The Department may identify material sources in the Contract from which the Contractor is required to take a specified quantity of material. No other source will be

permitted for that portion of material unless prior approval is obtained from the Engineer. The Contract will specifically define these sources as Mandatory Sources and define rights and stipulations for each site. The Department will provide a materials report for these sources.

The Contractor acknowledges that samples from within a source may not be representative of the entire source. The Contractor must expect variations of quality and quantity within the source and shall factor that contingency into the unit bid price for the material. No equitable adjustment will be paid for variations encountered within the source.

When using a Mandatory Source, if it is found that the quality or quantity of material producible from the Mandatory Source does not meet project requirements and a change of source is necessary for that reason alone, a Change Order with equitable adjustment will be made.

(3) Designated Sources. The Department may identify material sources in the Contract which are available to the Contractor but which the Contractor is not required to use. The Contract will specifically define these sources as Designated Sources and define rights and stipulations for each site. The Department will provide a materials report for these sources.

The Contractor acknowledges that samples from within a source may not be representative of the entire source. The Contractor must expect variations of quality and quantity within the source and shall factor that contingency into the unit bid price for the material. No equitable adjustment will be paid for variations encountered within the source.

If the Contractor elects to use a Designated Source, and it is found that the quality or quantity of material producible from the Designated Source does not meet project requirements and a change of source is necessary for that reason alone, a Change Order with equitable adjustment will be made. If the Contractor chooses to change between or among sources for any other reason than quantity or quality of material, no equitable adjustment will be paid.

(4) Available Sources. The Department may identify other material sources that are available for use for the project by the Contractor. The Contract will specifically define these sources as Available Sources. The Department makes no guarantee as to quality or quantity of material in Available Sources. The Contractor is responsible for determining the quality and quantity of material, and if additional sources are needed. The Contractor shall be responsible for identifying the rights and stipulations for each site with the owner of the site.

When the Department furnishes copies of existing boring logs, test results, or other data in its possession concerning Available Sources, the Contractor is responsible for determining the accuracy and completeness of this data, for any assumptions the Contractor makes based on this data, and for exploring all Available Sources to the Contractors satisfaction.

The Department makes no representation, guarantees, or warranty whatsoever, expressed or implied, as to:

(a) The quality or quantity of materials producible from an Available Source, even if such information is indicated in a Materials Report or Soils Investigation Report;

(b) Whether boring logs, test results or data reliably represent current existing subsurface conditions;

(c) Whether interpretations of the boring logs, test results, or other data are correct;

(d) Whether moisture conditions and indicated water tables vary from those found at the time borings were made;

(e) Whether the ground at the location of the borings was physically disturbed or altered after the boring was made; and

(f) The condition, materials, or proportions of the materials between borings, regardless of any subsurface information the Department may make available.

The availability of subsurface information from the Department shall not relieve the Contractor from any risks, or of any duty to make on-site examinations and investigations, or of any other responsibility under the Contract or as may be required by law.

No equitable adjustment will be made if the quality and quantity of material available from an Available Source is not as represented in any information provided by the Department, nor if a change of source is necessary for any other reason whatsoever. The use of Available Sources is entirely at the Contractor's option and the Contractor bears all risk associated with their decision to use an Available Source.

(5) Excluded Material Sources. Department owned, managed, or permitted material sources not identified in the Contract are excluded from use for the project. This exclusion does not prevent the Contractor from considering material sources as provided for under Subsection 60-02.d.(1) Contractor-Furnished Sources, nor does it prevent post-award consideration of other material sources as provided under Subsection 40-08.

e. Rights, Permits and Plan Approvals for Material Sources. Before disturbing the site of a material source, the Contractor shall acquire and pay for all necessary rights, permits and plan approvals indicated in this subsection and in subsection 70-02. For each material site the Contractor shall:

(1) Acquire approval for a Mining and Reclamation Plan (MRP) or receive an exemption, according to AS 27.19. The MRP shall include:

(a) Plan and cross-sectional views of the site;

(b) Applicable boundaries or property lines;

(c) Areas and depths to be developed;

(d) Locations of access roads, stripping, sorting, and waste piles, crushing and plant sites, stockpile sites, drainage features, erosion and pollution control features; and

(e) Condition the Contractor will leave the site after the materials extraction is completed, including reseeding.

(2) Submit a SWPPP as required by Item P-641.

f. Reclamation. After completing work in a materials source, the Contractor shall finish and grade work areas to a neat, acceptable condition according to the approved MRP. Reclamation of a Contractor-furnished source will be in accord with the Contractor's MRP.

60-03 TESTING AND ACCEPTANCE. Materials are subject to inspection and testing by the Department at any time before, during, or after they are incorporated into the project. Use of untested materials is at the Contractor's risk. The Contractor shall remove and replace unacceptable material according to Subsection 50-11.

a. QUALITY CONTROL. The Contractor is responsible for the quality of construction and materials used in the work. Quality control is process control, and includes all activities that ensure that a product meets Contract specifications. Contractor quality control is subsidiary to the applicable items unless a contract item for Quality Control is established on the bid schedule.

The Contractor shall implement a Quality Control Program in conformance with Section 100, Contractor Quality Control Program.

b. ACCEPTANCE TESTING. The Department has the exclusive right and responsibility for determining the acceptability of the construction and incorporated materials.

The Department will sample materials and perform acceptance tests at its expense. Copies of tests will be furnished to the Contractor upon request. When material is sampled by other than DOT&PF personnel or their agent(s), the sampling must be witnessed by, and possession of the sample immediately transferred to, DOT&PF personnel or their agent(s).

The Contractor shall not rely on the Department's acceptance testing for its quality control. The Department's acceptance testing is not a substitute for the Contractor's quality control. The Engineer may retest materials that have failed the Department's acceptance test, but is not required to do so.

Acceptance sampling and testing frequencies may be located in the Appendix to these Specifications, and are incorporated into the Contract.

60-04 PLANT INSPECTION. The Department may periodically inspect manufacturing methods, manufactured lots and materials at the source of production. The Department may approve, conditionally approve, or reject them.

The Contractor shall:

a. Notify the Department of the production and fabrication schedule at least 30 days before beginning work on any item requiring inspection, and notify the Department 48 hours before beginning production or fabrication;

b. Give the inspector full and safe access to all parts of the plant used to manufacture or produce materials; and

c. Cooperate fully and assist the inspector during the inspection.

Materials may be rejected if the Department requests a plant inspection and the materials are produced or fabricated without a plant inspection. The materials may be tested at any time before final acceptance, whether in place or not and whether approved at a plant inspection or not. If the materials do not meet Contract specifications, they may be rejected and ordered removed under Subsection 50-11. If rejected materials are incorporated into the project, the Department may require those materials to be removed and replaced at the Contractor's expense under Subsection 50-11.

60-05 CERTIFICATES OF COMPLIANCE. The submittal requirements of this subsection are in addition to the submittal requirements of Subsection 60-09 Buy American Steel and Manufactured Products.

The Engineer may authorize the use of certain materials or assemblies based on either a manufacturer's certificate of compliance or based on a Contractor's summary sheet with applicable documentation attached.

a. If by manufacturer's certification, the certificate must include the project name and number, the signature of the manufacturer, and must include information that clearly demonstrates the material or assembly fully complies with the Contract requirements.

b. If by Contractor's summary sheet, the summary sheet must include the project name and number, the signature of the contractor, and must include attached documentation that clearly demonstrates the material or assembly fully complies with the Contract requirements.

Electronic submittals that are submitted by email from the Contractor's email account are considered signed.

The Contractor shall submit additional certificates of compliance or test data if required by the Contract or by the Engineer. The Engineer may refuse permission to incorporate materials or products into the project based on a certificate of compliance that does not meet the Contract requirements.

60-06 STORAGE OF MATERIALS. Materials shall be stored to preserve their quality and fitness for the work, and so they can be readily inspected. Materials inspected before storage may be inspected again, before or after being incorporated into the project. The Contractor shall:

a. Use only approved portions of the project site for storage of materials and equipment or plant operations;

b. Provide any additional space needed for such purposes without extra compensation;

c. Restore Department-owned or controlled storage and plant sites to their original condition without extra compensation;

d. Obtain the landowner's or lessee's written permission before storing material on private property, and furnish copies of the permission to the Engineer, if requested; and

e. Restore privately owned or leased storage sites, without extra compensation from the Department, to their original condition or as agreed to between the Contractor and the private owner.

60-07 DEPARTMENT-FURNISHED MATERIAL. Material furnished by the Department will be made available to the Contractor at a state yard or delivered at the locations specified in the Special Provisions.

The Contractor shall include the cost of handling and placing all materials after they are delivered in the Contract price for the item in connection with which they are used. The Contractor is responsible for all material delivered to the Contractor. Deductions will be made from any monies due the Contractor to make good shortages and deficiencies from any cause whatsoever, for any damage that may occur after delivery, and for demurrage charges.

60-08 SUBMITTAL PROCEDURE. The Contractor shall complete a Submittal Register, and shall submit it to the Engineer on forms provided by the Department or similar forms of the Contractor's choice as approved by the Engineer. The intent of the Submittal Register is to provide a blueprint for the smooth flow of specified project documents. The Contractor shall fill it out sequentially by bid item and allow at least three spaces between bid items. The Submittal Register shall list all working drawings, schedules of work, and other items required to be submitted to the Department by the Contractor including but not limited to: Progress Schedule, anticipated dates of material procurement, SPCD, TCP, SWPPP, Quality Control Program, Utility Progress Schedule, Blasting Plan, Mining Plan, annual EEO reports, DBE payment documentation and subcontracts.

The Contractor shall submit materials (product) information to the Engineer for review, as required by the Contract.

Unless otherwise specified, provide all submittals in an electronic format acceptable to the Engineer.

If the Contract has a duration of 180 days or less, the Contractor shall, within fifteen days after the date of the Notice to Proceed, submit to the Department for review all submittals and the submittal register. If the Contract has a duration greater than 180 days, the Contractor shall, within fifteen days after the date of the Notice to Proceed, submit to the Department for review, an anticipated schedule for transmitting submittals.

Each submittal shall include a Submittal Summary sheet. The Contractor shall sign submittals and submit them to the Engineer. Electronic submittals that are submitted by email from the Contractor's email account are considered signed. The Department will return submittals to the Contractor as either: approved, conditionally approved with the conditions listed, or rejected with the reasons listed. The Contractor may resubmit a rejected submittal to the Engineer with more information or corrections. The Department's approval of a submittal in no way relieves the Contractor of its responsibility for the means, methods, techniques, sequence, and procedures of construction, safety, and quality control.

The Contractor shall be responsible for timely submittals. Failure by the Department to review submittals within 30 days or as otherwise provided in the applicable subsection may be the basis for a request for extension of Contract time but not for additional compensation.

Payment for a specific contract item will not be made until the Department has received the Submittal Register for all items and approved all required submittals for that specific contract item.

When material invoices, freight bills, and mill certificates are submitted, they shall provide sufficient information for the Engineer to identify: the date, supplier and origin of invoice (bill, certificate); project name and number where material will be incorporated; manufacturer, product number, quantity, cost and bid item.

60-09 BUY AMERICAN PREFERENCE.

a. GENERAL. Except on wholly state-funded projects, the Contractor shall comply with 49 USC Section 50101. The Contractor shall ensure that all steel and manufactured goods used on federally funded projects are wholly produced in the United States and are of 100% U.S. Materials, unless:

(1) The FAA has issued a waiver for the product;

(2) The product is listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation subpart 25.108; or

(3) The product is included in the FAA Nationwide Buy American Waivers Issued list.

b. BID PROPOSAL. The bidder must complete and submit with their bid the Certificate of Buy American Compliance (Form 25D-151 or Form 25D-152) provided in the bid documents. The Department will reject as nonresponsive any bid that does not include a completed Certificate of Buy American Compliance.

c. WAIVER SUBMITTAL. The apparent low bidder who indicates they will request a Type 3 waiver on the Certificate of Buy American Compliance, must complete Form 25D-153 and associated documentation including Form 25D-155 and Form 25D-156. Submit Form 25D-153 and associated documentation within 5 working days after date of notification of apparent low bidder.

An apparent low bidder who fails to submit a completed Type 3 waiver form within the time allowed, must agree to perform the work without a waiver, or they may be declared nonresponsible and may be required to forfeit the bid guaranty. The Department will then consider the next lowest bidder for award of the Contract.

The bidder agrees to refrain from seeking a waiver request after award of the contract, unless extenuating circumstances emerge that the FAA determines justified.

If FAA approves a waiver request, the bidder agrees to provide products in accordance with the waiver. If FAA will not approve a waiver, the bidder agrees to furnish U.S. domestic product for products listed on the waiver request that the FAA rejects.

A successful bidder's refusal to sign the Contract due to denial of a waiver request, will be considered nonresponsible, and will be addressed in accordance with subsection 30-03 Award of Contract.

d. MATERIAL SUBMITTALS. During performance of the Contract, the Contractor must provide a Material Submittal for Buy American Compliance (Form 25D-154), from the supplier for each steel or manufactured good, prior to incorporating any steel or manufactured good into the project. The supplier certifying Form 25D-154 may be the original manufacturer, fabricator, vendor, or subcontractor; provided the supplier has sufficient control and knowledge of the manufacturing process to accept responsibility and certify full and complete conformance with 49 USC Section 50101. Provide mill certificates or other material documentation when required by the Engineer. False statements may result in criminal penalties prescribed under AS 36.30.687 and Title 18 USC Section 1001.

60-10 OPERATION AND MAINTENANCE MANUALS. The Contractor shall provide operation and maintenance manuals for equipment and systems incorporated in the work. The Contractor shall submit one

set of all manuals 60 days prior to substantial completion for review by the Department. The Contractor shall make corrections noted by the Department, and submit 5 complete sets of manuals 14 days prior to substantial completion.

The Contractor shall submit the manuals in neatly bound hard cover loose-leaf three ring binders. Include project name, Contractor's/Subcontractor's name, address and telephone number on each cover. Prepare data in the form of an instruction manual with a table of contents and a tabbed fly leaf for each section.

The Contractor shall provide a separate section for each product or system installed which includes the following:

a. Description of each unit or system and the component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests. Systems shall include:

(1) Heating System

(2) Fuel Oil Storage and Supply System

(3) Runway Lighting System

b. Product data with each sheet marked to clearly identify the specific products, component parts, and data applicable to installation. Delete inapplicable information. Product data shall include:

(1) Lighting Fixtures

(2) Wiring Devices

(3) Electric Power Distribution Components

(4) Runway Lighting System Components

(5) Thaw Wire and Heat Trace System Components

c. Include drawings to supplement product data and illustrate relations of component parts of equipment and systems. Show control and flow diagrams. Provide copies of all approved shop drawings. Drawings shall include:

(1) Equipment Storage Building Plans

(2) Electrical Equipment Enclosure Plans

(3) Runway Lighting One-line Control and Power Diagrams

(4) Electric Power One-line Diagrams

(5) Electric Power Panel Directories

(6) Thaw Wire and Heat Trace Systems

d. Type text as required to supplement product data and show logical sequence of operations for each procedure, incorporating the manufacturer's instructions.

e. Operating procedures to include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include any special operating instructions. Include reprogramming instructions for all programmable equipment. Systems shall include:

(1) Runway Lighting System

(2) Heating System

(3) Fuel Oil Storage and Distribution System

f. Maintenance requirements and repair data. Include routine procedures. Provide a guide for troubleshooting, disassembly, repair, and reassembly. Provide alignment, adjusting, and checking instructions. Maintenance and repair data shall include:

(1) Heating System

(2) Fuel Oil Storage and Distribution System

g. Supplies and replacement parts. For each item of equipment and each system list names, addresses, and telephone numbers of subcontractors and suppliers. Provide local source of supplies and replacement parts with complete nomenclature and commercial number of replacement parts. Provide a copy of manufacturer's recommended spare parts list for applicable equipment. Provide data for:

(1) Lamps for Runway Lighting System

(2) Lamps for Lighting Fixtures

(3) Fuel Oil System

h. Warranties. Include copies of warranties.

i. Tests. Include logs of all tests performed.

60-11 ALASKA AGRICULTURAL/WOOD PRODUCTS. On wholly state-funded projects, agricultural/wood products harvested in Alaska shall be used pursuant to AS 36.15.050 and AS 36.30.322 whenever they are priced no more than seven percent above agricultural/wood products harvested outside the state and are of a like quality as compared with agricultural/wood products harvested outside the state.

The Contractor shall maintain records which establish the type and extent of agricultural/wood products utilized. When such products are not utilized, the Contractor shall document the efforts he made towards obtaining agricultural/wood products harvested in Alaska and include in this documentation a written statement that he contacted the manufacturers and suppliers identified on the Department of Commerce and Economic Development's list of suppliers of Alaska forest products concerning the availability of agricultural/wood products harvested in Alaska and, if available, the product prices. The Contractor shall complete this documentation at a time determined by the Contracting Officer.

The Contractor's use of agricultural/wood products that fail to meet the requirements of this Subsection shall be removed and replaced in accordance with Subsection 50-03, Conformity with Plans and Specifications.

SECTION 70
LEGAL REGULATIONS AND RESPONSIBILITY TO PUBLIC

70-01 LAWS TO BE OBSERVED. The Contractor shall keep fully informed of, observe, and comply with all federal, state, and local laws, ordinances, and regulations, and all orders and decrees of bodies or tribunals having any jurisdiction or authority, that in any manner affect those engaged or employed on the work or which in any way affect the conduct of the work.

The Contractor and the Surety shall defend, indemnify, and hold harmless the state and its representatives against any claim or liability related to violations of any laws, ordinances, regulations, orders, decrees or permits by the Contractor, the Contractor's agents, the Contractor's employees, a subcontractor at any tier, or a supplier or service provider.

The Contractor has the affirmative duty to keep informed of and comply with all laws. The Contractor is not entitled to and shall not rely on any Department employee's interpretation, whether oral or written, of any law, ordinance, regulation, order, or decree, or any permit issued by an agency other than the Department.

The Contractor is responsible for conspicuously displaying required posters in an area readily accessible to workers.

a. For wholly state-funded projects, display all posters listed on the Department of Labor and Workforce Development website at http://labor.alaska.gov/lss/posters.htm.

b. For projects using federal funds, display posters required by law or funding agency including posters listed under Related Information on the FAA website http://www.faa.gov/airports/engineering.

70-02 PERMITS, LICENSES, AND TAXES. The terms, conditions, and stipulations in permits obtained either by the Department or by the Contractor are made a part of this Contract. Permits obtained by the Department for this project are attached to these Specifications as appendices. Contact names and phone numbers for permits obtained by the Department are shown on the individual permits.

The Department will:

a. Secure permits and licenses that the Department determines are required for the construction of the proposed project, and the use of mandatory sources, designated sources and designated waste disposal areas for the proposed project; and

b. Modify Department-acquired permits during the performance of the contract, if deemed necessary by the Engineer.

The Contractor shall:

c. Acquire any permits and licenses required to complete the project that are not acquired by the Department;

d. Provide qualified professionals to collect data or perform studies necessary to acquire permits for the use of sites not previously permitted;

e. Give all notices required for the prosecution of the work;

f. Abide by all permits and licenses whether acquired by the Department or by the Contractor;

g. Notify the Engineer promptly if any activity cannot be performed as specified in the permits, and cease conducting the activity until permit modifications or any required additional permits are obtained;

h. Obtain modifications to permits acquired by the Contractor;

i. Pay all charges, fees and taxes; and

j. Provide proof of payment of all taxes before the Department makes final payment.

k. Provide the information necessary to comply with the Alaska Department of Environmental Conservation, Alaska Pollutant Discharge Elimination System (APDES) to discharge stormwater from the construction site. Requirements for this permit are given under P-641, Erosion, Sediment, and Pollution Control.

The provisions of permits acquired by the Contractor, and of notices and information under this section does not shift or create responsibility for compliance with Federal or State law to the Department, or otherwise impose a duty for oversight or review.

In addition, before using an area on or off project site not previously permitted for use by the Contract, the Contractor shall:

l. Contact all government agencies having possible or apparent permit authority over that area;

m. Obtain all required permits, clearances, and licenses from those agencies;

n. Obtain permission from any property owners or lessees with an interest in the property; and

o. Provide all of the following to the Engineer:

(1) All permits or clearances necessary to use the site for its intended purpose(s);

(2) A written statement that all permits or clearances necessary have been obtained;

(3) Written evidence that the Contractor has contacted all of the relevant agencies and that no additional permits are required on the part of the Contractor, including at a minimum the name of the agency and staff person contacted, the date contacted, and result of coordination; and

(4) A plan that identifies how the site will be finally stabilized and protected.

The Engineer may reject a proposed site if the Contractor fails to provide any of the above information or to demonstrate that a proposed site can be finally stabilized to eliminate future adverse impacts on natural resources and the environment.

70-03 PATENTED DEVICES, MATERIALS AND PROCESSES. If the Contractor employs any design, device, material, or process covered by patent, trademark, or copyright, the Contractor shall obtain and provide the Engineer with a copy of a suitable legal agreement with the patentee or owner.

The Contractor and the Surety shall defend, indemnify, and hold harmless the state and its representatives and any affected third party or political subdivision from any claim, cause of action, and damages for infringement arising from or relating to the Contractor's use of a patented design, device, material, process, trademark, or copyright.

70-04 WAGE RATES. The Contractor and all subcontractors shall pay the current prevailing rate of wages as per AS 36.05.010 and this Contract. On federally funded projects the Contractor and all subcontractors shall pay the higher of the appropriate wage rates published by the Alaska Department of Labor and the U.S. Department of Labor, for each individual job classification. The Contractor and all subcontractors shall file certified payroll with the Alaska Department of Labor and Workforce Development (DOLWD) and with the Engineer for all work performed on the project. Submit signed and certified payrolls electronically to the DOLWD and the Engineer.

Before beginning work the Contractor shall file a Notice of Work with DOLWD and pay all required fees. After finishing work the Contractor shall file a Notice of Completion with DOLWD and pay all additional fees required by increases in the Contract amount.

70-05 FEDERAL PROVISIONS. The Contractor shall:

a. Observe all federal laws, rules, regulations, and requirements applicable to the project; and

b. Allow appropriate federal officials access to inspect the work.

The federal government is not a party to the Contract. The Contractor agrees that federal inspections will not form the basis for any claim against the federal government or the State for interference with the rights of the Contract parties.

70-06 SANITARY, HEALTH, AND SAFETY PROVISIONS. The Contractor shall provide and maintain neat and sanitary accommodations for employees that meet all federal, state and local requirements.

The Contractor shall comply with federal, state, and local laws, rules, and regulations concerning construction safety and health standards, including U.S. Mine Safety and Health Administration rules when the project includes pit or quarry operations.

The Contractor shall not expose the public to, or require any workers to work under, conditions that are unsanitary, hazardous, or dangerous to health or safety.

The Contractor is responsible for ensuring all workers are adequately protected. The Contractor shall have a safety and health management program that complies with AKOSH requirements, and includes:

a. A worksite hazard analysis;

b. A hazard prevention and control plan including personal protective equipment and safe work procedures required for specific tasks;

c. New employee training and periodic worker training regarding safety and health;

d. Regular safety meetings with written documentation of attendance, safety topics discussed, worker safety complaints, and corrective actions taken; and

e. A designated safety officer, employed by the Contractor, who monitors the construction site and is responsible for implementing the safety and health management program.

The Contractor and Surety shall defend, indemnify and hold harmless the State of Alaska from all claims, causes of action and judgments arising from or relating to the Contractor's failure to comply with any applicable federal, state or local safety requirement, regulation or practice, whether or not listed above.

70-07 ARCHAEOLOGICAL OR HISTORICAL DISCOVERIES. When the Contractor's operation encounters prehistoric artifacts, burials, remains of dwelling sites, paleontological remains, shell heaps, land or sea mammal bones, tusks, or other items of historical significance, the Contractor shall:

a. Immediately cease operations at the site of the find;

b. Immediately notify the Engineer of the find; and

c. Not disturb or remove the finds or perform further operations at the site of the finds until directed by the Engineer.

The Engineer will issue an appropriate Change Order if the Engineer orders suspension of the Contractor's operations or orders the Contractor to perform extra work in order to protect an archaeological or historical find.

70-08 PUBLIC CONVENIENCE AND SAFETY, AND RAILWAY PROVISIONS. The Contractor shall control its operations and those of its subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft, airport personnel and vehicular traffic in the AOA, except as specifically provided in this Contract. The Contractor's operations and those of its subcontractors and all suppliers, shall be done according to Subsection 40-05 and shall limit operations for the convenience and safety of the traveling public as specified in Subsection 80-04.

The Contractor shall conduct all operations on or near a railroad according to the Contract, any contract between the Department and the railroad, and any permits issued by the railroad. The Department shall obtain permits for hauling materials across railroad tracks at locations specified in the Contract. If the Contractor desires additional crossings, the Contractor shall obtain any required permits at the Contractor's expense.

70-09 BARRICADES, WARNING SIGNS AND HAZARD MARKINGS. The Contractor shall furnish, erect, and maintain all barricades, warning signs and markings for hazards necessary to protect the public and the work. It shall be the Contractor's responsibility to maintain markers at all times to separate areas closed to aircraft from adjacent areas that are open to aircraft.

For public vehicular and pedestrian traffic, the Contractor shall furnish, erect, and maintain barricades, warning signs, lights and other traffic control devices in conformity with the *Manual on Uniform Traffic Control Devices for Streets and Highways* (published by the United States Government Printing Office) and the *Alaska Traffic Manual Supplement*, and according to the approved TCP.

When the work requires closing an airport operations area of the airport or portion of such area, the Contractor shall furnish, erect and maintain temporary markings and associated lighting conforming to the requirements of AC 150/5340-1, *Standards for Airport Markings*, and according to the CSPP and SPCD.

For work within the airport property, the Contractor shall furnish, erect, and maintain markings and associated lighting of open trenches, excavations, temporary stockpiles, and parked construction equipment that may be hazardous to the operation of emergency, fire-rescue, maintenance or support vehicles on the airport in conformance to AC 150/5370-2, *Operational Safety on Airports During Construction*.

The Contractor shall identify each motorized vehicle or piece of construction equipment in conformance to AC150/5370-2 and 150/5210-5.

The Contractor shall furnish and erect all barricades, warning signs, and markings for hazards prior to commencing work that requires such erection and shall maintain the barricades, warning signs, and markings for hazards until their removal is directed by the Engineer.

Open-flame type lights shall not be permitted within the air operations areas of the airport.

70-10 USE OF EXPLOSIVES. The Contractor shall obey all laws, regulations and permits applicable to using, handling, loading, transporting, or storing explosives. When using explosives, the Contractor shall take utmost care not to endanger life, property, new construction, or existing portions of the project and facilities that are to remain in place after the project is complete.

The Contractor shall provide notice to property owners, the traveling public, and utility companies in the vicinity before using explosives. The Contractor shall provide a minimum of three working days' notice to the Federal Aviation Administration and the airport manager. The Contractor shall notify police and fire authorities in the vicinity before transporting or using explosives. The Contractor shall provide notice sufficiently in advance to enable all potentially affected parties to take whatever steps they may deem necessary to protect themselves and their property from injury or damage. The Contractor shall not use explosives on or near airport property until a Notices to Airmen (NOTAMs) has been issued. Each new use of explosives may require a separate NOTAMs to be issued. The Contractor shall not use electric blasting caps within 1,000 feet of the airport property.

The Contractor is liable for all property damage, injury, or death resulting from the use of explosives on the project. The Contractor and Surety shall indemnify, hold harmless, and defend the State of Alaska from all

claims related to the use of explosives on the project, including claims from government agencies alleging that explosives were handled, loaded, transported, used, or stored improperly.

70-11 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE.

a. Restoring Areas. Areas used by the Contractor, including haul routes, shall be restored to their original condition after the Contractor's operations are completed. The original condition of an area shall be determined as follows: Prior to commencement of operations, the Engineer and the Contractor shall inspect each area and haul route that will be used by the Contractor and take photographs to document their condition. After construction operations are completed or prior to seasonal suspension of work, the condition of each area and haul route will be compared to the earlier photographs. Prior to demobilization or seasonal suspension of work, the Contractor shall repair damages attributed to its operations. The Contractor agrees that all costs associated with repairs shall be subsidiary to other items of work and will not be paid for directly.

b. Material Disposal Sites. Offsite disposal areas may be at locations of the Contractor's choice, provided the Contractor obtains from the owner of such land written permission for such disposal and a waiver of all claims against the State for any damage to such land which may result therefrom, together with all permits required by law for such disposal. A copy of such permission, waiver of claims, and permits shall be filed with the Engineer before commencing work on private property. The Contractor's selected disposal sites shall also be inspected and approved by the Engineer prior to use of the sites.

c. Property marks. The Contractor shall:

(1) Be responsible for and protect from disturbance all land monuments and property marks until the Engineer has approved the witnessing or otherwise referenced their locations; and

(2) Not move such monuments or marks without the Engineer's approval.

d. Damage to property. The Contractor shall:

(1) Be responsible for all damage to public or private property resulting from any act, omission, neglect, or misconduct in the manner or method of executing the work;

(2) Be responsible for all damage to public or private property resulting from defective work or materials at any time, before, during, or after project completion; and

(3) Restore all such damaged property to a condition similar or equal to that existing before the damage occurred, at no additional cost to the Department.

e. Protection of natural resources. The Contractor shall:

(1) Conduct work in a manner that minimizes disturbance to and protects natural resources in compliance with all federal, state, and local laws and regulations;

(2) When working near designated wetlands, as defined by the Corps of Engineers, place no fill, nor operate equipment outside the permitted area; and

(3) When working in or near designated anadromous fish streams, as defined by AS 41.14.840 and AS 41.14.870, place no fill or dredge material, nor operate equipment, within or on the banks of the stream (including fording) except as permitted by the State Fish Habitat Permit issued for the project.

f. Hazardous materials. Hazardous materials include but are not limited to petroleum products, oils, solvents, paints, lead based paints, asbestos, and chemicals that are toxic, corrosive, explosive, or flammable. Except as otherwise specified in this Contract, the Contractor shall:

(1) Not excavate, nor use for fill, any material at any site suspected of or found to contain hazardous materials or petroleum fuels;

(2) Not raze and remove, or dispose of structures that contain asbestos or lead-based paints;

(3) Not stockpile, nor dispose of, any material at any site suspected of or found to contain hazardous materials or petroleum;

(4) Report immediately to the Engineer any known or suspected hazardous material discovered, exposed, or released into the air, ground, or water during construction of the project;

(5) Report any containment, cleanup, or restoration activities anticipated or performed as a result of such release or discovery;

(6) Handle and dispose of hazardous material with properly trained and licensed personnel who follow an approved Hazardous Material Control Plan as per Item P-641.

g. Protected areas. The Contractor shall not use land from any park, recreation area, wildlife or waterfowl refuge, or any historical site located inside or outside of the project limits for excess fill disposal, staging activities, equipment or material storage, or for any other purposes unless permitted by the Contract or unless all permits and clearances necessary for such work have been obtained by the Contractor as detailed in Subsection 70-02.

h. Solid waste. The Contractor shall remove all debris, trash, and other solid waste from the project site as soon as possible and according to the Alaska Department of Environmental Conservation Solid Waste Program.

70-12 FOREST PROTECTION. The Contractor shall:

a. Comply with all laws and regulations of the United States and the State of Alaska, local governments, or other authorities governing the protection of forests and the carrying out of work within forests;

b. Keep forest areas in an orderly condition;

c. Dispose of all refuse and obtain permits for the construction and maintenance of all construction camps, stores, warehouses, residences, latrines, cesspools, septic tanks, and other structures according to the requirements of the supervising authorities;

d. Take all reasonable precautions to prevent and suppress forest fires;

e. Require workers and subcontractors, both independently and at the request of officials, to do all reasonably within their power to prevent and suppress and to assist in preventing and suppressing forest fires; and

f. Make every possible effort to notify the appropriate forestry agency at the earliest moment of the location and extent of any forest fire.

70-13 RESPONSIBILITY FOR DAMAGE CLAIMS. The Contractor shall indemnify, hold harmless, and defend the State of Alaska and its agents and employees from any and all claims or actions for injuries or damages whatsoever sustained by any person or property that arise from or relate to, directly or indirectly, the Contractor's performance of the Contract; however, this provision has no effect if, but only if, the sole proximate cause of the injury or damage is the Department's negligence.

This Contract does not create a third party benefit to the public or any member of the public, nor does it authorize any person or entity not a party to this Contract to maintain a suit based on this Contract or any term or provision of the Contract, whether for personal injuries, property damage, or any other claim or cause of action.

70-14 OPENING SECTIONS OF THE PROJECT TO TRAFFIC. Unless prohibited by the CSPP, the Engineer may, at his discretion, order the Contractor to open sections of the work to traffic prior to completion of the entire project. Openings under this section shall not constitute (a) acceptance of the opened sections or any other part of the work or (b) a waiver of any other provision of the Contract.

The Engineer may establish a time period for completing any features of the opened section of work that are behind schedule.

The Contractor shall:

a. Maintain the opened portions of the work without additional compensation;

b. Perform all necessary repairs or renewals on the opened sections of the work without additional compensation;

c. Conduct the remainder of the work with minimum interference to traffic; and

d. Maintain barricades and other safety devices required by AC 150/5370-2, *Operational Safety on Airports During Construction*, to provide separation of opened and closed sections of the project.

70-15 CONTRACTOR'S RESPONSIBILITY FOR WORK. The Contractor shall be responsible for implementing all preventative measures necessary to protect, prevent damage, and repair damage to the work from all causes at no additional cost to the Department. This duty continues from the date construction begins until the date specified in a letter of Substantial Completion or Partial Acceptance of a specific section of the project. Where there is a Partial Acceptance, the duty ends only as to the accepted portion of the work. This duty continues during periods of suspended work, except in specific sections the Department has agreed to maintain under Subsection 50-13.a. Seasonal Suspension of Work.

The Contractor shall rebuild, repair, restore, and make good all losses or damages to any portion of the work including that caused by vandalism, theft, accommodation of public traffic, and weather. The Department will only be responsible for loss or damage due to unforeseeable causes beyond the control of and without the Contractor’s fault or negligence, such as Acts of God, the public enemy, and governmental authorities.

In case of suspension of work from any cause, the Contractor shall take such precautions as may be necessary to prevent damage to the work or facilities affected by the work. This will include providing for drainage and erecting any necessary temporary structures, signs, or other facilities and maintaining all living material such as plantings, seedings, and soddings.

70-16 RESERVED.

70-17 FURNISHING RIGHT-OF-WAY. The Department will secure all necessary right-of-way or property in advance of construction. Any exceptions will be indicated in the Contract.

70-18 PERSONAL LIABILITY OF PUBLIC OFFICIALS. There shall be no liability upon the Engineer and their authorized representatives, either personally or as officials of the state, in carrying out any of the provisions of this Contract, or in exercising any power or authority granted to them by or within the scope of the Contract, it being understood that in all such matters the Engineer and their authorized representatives act solely as agents and representatives of the State. The Contractor shall bring no suit related to or arising under this Contract naming as defendants any State officer, employee or representative in either their personal or official capacities, and shall include a prohibition to that effect in all subcontracts entered into for this Project.

70-19 NO WAIVER OF LEGAL RIGHTS. The Department shall not be precluded nor estopped by any measurement, estimate, or certificate made either before or after the completion and acceptance of the work and payment, from showing the true amount and character of the work performed and materials furnished by the Contractor, nor from showing that any measurement, estimate, or certificate is untrue or is incorrectly made, nor that the work or materials do not in fact conform to the Contract.

The Department shall not be precluded nor estopped, notwithstanding any measurement, estimate, or certificate and payment, from recovering from the Contractor or the Contractor's Sureties, or both, such damages as it may sustain by reason of the Contractor's failure to comply with the terms of the Contract.

Neither the acceptance by the Department, or by any representative of the Department, nor any payment for or acceptance of the whole or any part of the work, nor any extension of time, nor any possession taken by the Department, shall operate as a waiver by the Department of any portion of the Contract or of any right of the Department to damages. A waiver by the Department of any breach of the Contract shall not be held to be a waiver of any other subsequent breach.

70-20 GRATUITY AND CONFLICT OF INTEREST. The Contractor shall not extend any loan, gratuity, or gift of money of any form whatsoever to any employee of the Department, nor will the Contractor rent or purchase any equipment or materials from any employee of the Department or to the best of the Contractor's knowledge from any agent of any employee of the Department. The Contractor shall execute and furnish the Department an affidavit certifying that the Contractor has complied with this section before final acceptance.

70-21 FEDERAL AFFIRMATIVE ACTION (RESERVED).

SECTION 80
EXECUTION AND PROGRESS

80-01 SUBCONTRACTING OF CONTRACT. The Contractor shall submit a Contractor Self Certification, Form 25D-042, and, except on wholly state-funded projects, a completed Certification for Tax Delinquency and Felony Convictions, Form 25D-159, for each Subcontractor and each Lower Tier Subcontractor, before the Contractor or any subcontractor subcontracts, sells, transfers, assigns, or otherwise disposes of the Contract or any portion of the Contract. The Department has authority to review subcontracts and to deny permission to subcontract work. The Department may penalize the Contractor for false statements or omissions made in connection with Form 25D-042.

The Contractor shall perform, with the Contractor's own organization, work amounting to at least 30 percent of the difference between the original Contract price and the price of designated Specialty Items. For the purpose of this subsection, work is defined as the dollar value of the services, equipment, materials, and manufactured products furnished under the Contract. The Engineer will determine the value of the subcontracts based on Contract unit prices or upon reasonable value, if entire items are not subcontracted.

The Department’s consent to the subcontracting, sale, transfer, assignment, or disposal of all or a part of the Contract shall not relieve the Contractor and the Surety of responsibility for fulfillment of the Contract or for liability under the bonds regardless of the terms of the transfer or sublet approvals.

a. The Contractor shall ensure that for all subcontracts (agreements):

(1) The Department is furnished with one completed Contractor Self Certification, Form 25D-042, for each subcontract;

(2) The subcontractors have submitted a Bidder Registration, Form 25D-6;

(3) The required prompt payment provisions of AS 36.90.210 are included in all subcontracts:

(4) A clause is included requiring the Contractor to pay the subcontractor for satisfactory performance according to AS 36.90.210 and within eight (8) working days after receiving payment from which the subcontractor is to be paid;

(5) A clause is included requiring the Contractor to pay the subcontractor interest, according to AS 45.45.010(a), for the period beginning the day after the required payment date and ending on the day payment of the amount due is made:

(6) A clause is included requiring the Contractor to pay the subcontractor all retainage due under the subcontract, within eight (8) working days after final payment is received from the Department, or after the notice period under AS 36.25.020(b) expires, whichever is later;

(7) A clause is included requiring the Contractor to pay interest on retainage, according to AS 36.90.250 and AS 45.45.101(a):

(8) Other required items listed in Form 25D-042, including but not limited to Form 25D-55A, are included in the subcontracts;

(9) The subcontractors pay current prevailing rate of wages as per Subsection 70-04 and file signed and certified payrolls with the Engineer and DOLWD for all work performed on the project; and

(10) Upon receipt of a request for more information regarding subcontracts, the requested information is provided to the Department within 5 calendar days.

b. The Contractor shall ensure that for all lower tier subcontracts (agreements between subcontractors and lower tier subcontractors):

(1) The Department is furnished with one completed Contractor Self Certification, Form 25D-042, for each lower tier subcontract;

(2) The required prompt payment provisions of AS 36.90.210 are included in all lower tier subcontracts;

(3) A clause is included requiring the subcontractor to pay the lower tier subcontractor for satisfactory performance according to AS 36.90.210, and within eight (8) working days after receiving payment from which the subcontractor is to be paid;

(4) A clause is included requiring the subcontractor to pay the lower tier subcontractor interest, according to AS 45.45.010(a), for the period beginning the day after the required payment date and ending on the day payment of the amount due is made;

(5) A clause is included requiring the subcontractor to pay the lower tier subcontractor all retainage due under the subcontract, within eight (8) working days after final payment is received, or after the notice period under AS 36.25.020(b) expires, whichever is later;

(6) A clause is included requiring the subcontractor to pay the lower tier subcontractor interest on retainage, according to AS 36.90.250 and AS 45.45.101(a);

(7) Other required items listed in Form 25D-042, including but not limited to Form 25D-55A, are included in the lower tier subcontracts;

(8) The lower tier subcontractors pay current prevailing rate of wages as per Subsection 70-04 and file signed and certified payrolls with the Engineer and DOLWD for all work performed on the project; and

(9) Upon receipt of a request for more information regarding lower tier subcontracts, the requested information is provided to the Department within 5 calendar days.

c. The following will be considered as subcontracting, unless performed by the Contractor:

(1) Roadside Production. Roadside production of crushed stone, gravel, and other materials with portable or semi-portable crushing, screening, or washing plants set up or reopened in the vicinity of the project to supply materials for the project, including borrow pits used exclusively or nearly exclusively for the project.

(2) Temporary Plants. Production of aggregate mix, concrete mix, asphalt mix, other materials, or fabricated items from temporary batching plants, temporary mixing plants, or temporary factories that are set up or reopened in the vicinity of the project to supply materials exclusively or nearly exclusively for the project.

(3) Hauling. Hauling from the project to roadside production, temporary plants, or commercial plants, from roadside production or temporary plants to the project, from roadside production or temporary plants to commercial plants, and all other hauling not specifically excluded in this subsection.

(4) Other Contractors. All other contractors working on the project site under contract with the Contractor are considered subcontractors unless specifically excluded in this subsection.

d. The following will not be considered as subcontracting, but the Contractor shall comply with the prompt payment provisions of AS 36.90:

(1) Commercial Plants. The purchase of sand, gravel, crushed stone, crushed slag, batched concrete aggregates, ready-mixed concrete, asphalt paving mix, and any other material or fabrication produced at and furnished from established and recognized commercial plants that sell to both public and private purchasers.

(2) Hauling. Delivery of materials from a commercial plant to a different commercial plant, and delivery from a commercial plant to the project site by vehicles owned and operated by the commercial plants or by commercial freight companies that have a contract with the commercial plant. Commercial freight companies are trucking or hauling companies that deliver multiple types of materials to multiple clients, both public and private, on an established route and on a recurrent basis.

(3) Contractors' General Business. Work within permanent home offices, branch plants, fabrication plants, tool yards, and other establishments that are part of a contractor's or subcontractor's general business operations.

e. Owner-Operators. Hauling of materials for the project by bona fide truck owner-operators who are listed as such on the signed and certified payroll of the Contractor or approved subcontractor is not considered subcontracting for purposes of AS 36.30.115.

The Contractor shall ensure that the required prompt payment provisions of AS 36.90.210 are included in contracts with owner-operators.

The Contractor shall collect and maintain at the project site current and valid copies of the following to prove that each trucker listed is a bona fide owner-operator:

(1) Alaska Driver's License with appropriate CDL class and endorsements;

(2) Business license for trucking with supporting documents that list the driver as the business owner or corporate officer;

(3) Documents showing the driver's ownership interest in the truck, including copies of:

(a) Truck registration; and

(b) Lease (if truck is not registered in driver's name or in the name of the driver's company).

The Contractor shall maintain legible copies of these records for a period of at least three years after final acceptance of the project.

Owner-operators must qualify as independent contractors under the current Alaska Department of Labor’s criteria. Owner-operators may be required to show:

(4) The owner-operator’s right to control the manner in which the work is to be performed;

(5) The owner-operator’s opportunity for profit or loss depending upon their managerial skill;

(6) The owner-operator’s investment in equipment or materials required for their task, or the employment of helpers;

(7) Whether the service rendered requires a special skill;

(8) The degree of permanence of the working relationship; and

(9) Whether the service rendered is an integral part of the owner-operator’s business.

The status of owner-operators is subject to evaluation throughout the project period. If the criteria for an independent contractor are not met, the Contractor shall submit amended payrolls listing the driver as an employee subject to all labor provisions of the Contract.

The Contractor shall issue each owner-operator a placard in a form approved by the Engineer that identifies both the truck driver and the vehicle. The placard shall be prominently displayed on the vehicle so that it is visible to scale operators and inspectors.

Notwithstanding the Department's definitions of contracting and subcontracting, the Contractor shall be responsible for determining and complying with all federal and state laws and regulations regarding contracting, subcontracting, and payment of wages. The Contractor shall promptly pay any fines or penalties assessed for violations of those laws and regulations, and shall promptly comply with the directives of any government agency having jurisdiction over those matters.

80-02 NOTICE TO PROCEED. The Department will issue a Notice to Proceed authorizing construction to begin and indicating the date when Contract time will begin. The Contractor shall not begin construction before the effective date of the Notice to Proceed. The Notice to Proceed may include limits or restrictions on allowable activities. The Department will, in its sole discretion, refuse to pay for construction begun before the effective date of the Notice to Proceed. The Contractor shall notify the Engineer at least 48 hours before construction begins at the project site.

80-03 PROSECUTION AND PROGRESS. The Contractor shall meet with the Engineer at the regional construction office for a preconstruction conference before beginning construction. The Engineer will schedule the Preconstruction Conference no less than five days after the following have been received:

a. A progress schedule, in a format acceptable to the Engineer, showing the order in which the Contractor proposes to carry out the work and the contemplated dates on which the Contractor and the subcontractors will start and finish each of the salient features of the work, including any scheduled periods of shutdown. The schedule shall indicate the anticipated hours of operation and any anticipated periods of multiple-shift work.

b. A list showing anticipated dates for procurement of materials and equipment, ordering of articles of special manufacture, furnishing of plans, drawings and other data required under Subsections 50-02 and 60-08, and for other events such as inspection of structural steel fabrication

c. A list showing all subcontractors and material suppliers

d. A Storm Water Pollution Prevention Plan, a Hazardous Material Control Plan, and a Spill Prevention Control and Countermeasure Plan, with the line of authority and designated field representatives, as required under Item P-641 (see submittal deadlines under P-641-1.3)

e. A letter designating the Contractor's Project Superintendent, defining that person's responsibility and authority, and providing a specimen signature

f. A letter designating an Equal Employment Opportunity Officer and a Disadvantaged Business Enterprise Officer, and designating those person's responsibilities and authority

g. A Quality Control Program, as required under Subsection 60-03 and Section 100

h. An approved Safety Plan Compliance Document (SPCD), as required under Subsection 80-04

i. A Traffic Control Plan, as required under Subsection 70-09 and Item G-710

j. A Utility Repair Plan, as required under Subsection 50-06.e.

Provide suitable proof of filing and subsequent approval of a completed FAA Form 7460-1 Notice of Proposed Construction or Alteration, at least 45 days before the start date of work occurring on the project. Coordinate with the RASSO and Engineer when filing Form 7460-1. The Contractor is encouraged to file the form electronically. The FAA 7460-1 form and the electronic submittal instructions may be found at: https://oeaaa.faa.gov/oeaaa/external/portal.jsp

The Contractor shall provide adequate materials, labor and equipment to ensure the completion of the project according to the Plans and Specifications. The work shall be performed as vigorously and as continuously as weather conditions or other interferences may permit. The Contractor shall take into consideration and make due allowances at the Contractor's expense for foreseeable delays and interruptions to the work such as unfavorable weather, frozen ground, equipment breakdowns, shipping delays, quantity

overruns, utility work, permit restrictions, and other foreseeable delays and interruptions. The Contractor shall identify these allowances on the progress schedule.

The Contractor shall adjust forces, equipment and work schedules as necessary to ensure completion of the work within the Contract time, and shall notify the Engineer at least 24 hours before resuming suspended operations. Upon a substantial change to the work schedule or when directed by the Engineer, the Contractor shall submit a revised progress schedule in the form required, including a written explanation for each revision made in the schedule or methods of operation.

The Engineer's review or approval of the documents, plans, and schedules provided by the Contractor under this section shall not change the Contract requirements, release the Contractor of the responsibility for successful completion of the work or relieve the Contractor of the duty to comply with applicable laws. The Engineer’s review or approval of schedules shall not indicate agreement with any assertions of delay or claims by the Contractor.

It is the Contractor's responsibility to prepare and submit documents that satisfy all applicable contract requirements. By reviewing and approving the Contractor’s documents, the Department does not warrant that following the Contractor’s documents will result in successful performance of the work. The Department's failure to discover defects in the Contractor's documents, the assumptions upon which they are based or conditions that prevent the Contractor from performing the work as indicated in the documents will not entitle the Contractor to additional compensation or time. If the Contractor becomes aware of any act or occurrence that may form the basis of a claim for additional compensation or an extension of time, it must specifically advise the Engineer of these conditions according to Subsection 50-17.

80-04 LIMITATION OF OPERATIONS. The Contractor shall not open up work to the detriment of work already started. The Contractor shall minimize interference with traffic within the project. The Contractor shall not stop or otherwise impede traffic outside the project limits without the Engineer's prior written permission. The Engineer may require the Contractor to finish a section of work in progress before starting additional sections if the Engineer determines it is necessary for the convenience of the public or the Department.

The Contractor shall control its operations and the operations of its subcontractors and all suppliers, so as to provide for the least inconvenience to traffic and the free and unobstructed movement of aircraft in the Air Operations Areas of the airport, except as specifically provided in this Contract. Under all circumstances, safety shall be the most important consideration.

a. Environmental Limitations. The Contractor shall comply with all environmental commitments, permit stipulations, and construction limitations, in the Contract permits and specifications. These may include time periods in which certain construction activities are not allowed. The Contractor shall avoid disturbing wetlands unless permitted to do so. The Contractor shall avoid disturbing threatened and endangered species, historic sites, and hazardous materials sites.

b. Construction Safety.

(1) Construction Safety and Phasing Plan (CSPP). This document is included within the contract documents when attached as an appendix to this document. The CSPP specifies minimum requirements for operational safety during construction activities.

(2) Safety Plan Compliance Document (SPCD). When the contract documents include a CSPP, the Contactor shall submit to the Engineer a SPCD in accordance with the provisions set forth within the current version of AC 150/5370-2, *Operational Safety on Airports During Construction*. The SPCD shall include a general statement that the Contractor has read and will abide by the CSPP and shall include the Contractor’s name, the title of the project CSPP, the approval date of the CSPP, and a reference to any supplemental information (example statement: “I, Name of Contractor, have read the Title of the Project CSPP, approved on Date, and will abide by it as written and with the following additions as noted.”). The supplemental information in the SPCD should be written to match the format of the CSPP indicating each subject by corresponding

CSPP subject number and title. If no supplemental information is necessary for any specific subject, the statement, “No supplemental information,” should be written after the corresponding subject title. The SPCD should not merely duplicate information in the CSPP. No deviations or modifications may be made to the approved CSPP or SPCD unless approved in writing by the Engineer.

The Contractor shall implement all necessary CSPP and SPCD measures prior to commencement of any work activity. The Contractor shall conduct daily checks of its workers, equipment, and construction methods to assure compliance with the CSPP and SPCD measures. The Contractor shall document the checks in writing and sign them. Documented checks shall be available for inspection by the Engineer.

The Contractor is responsible for the conduct of all subcontractors and suppliers it employs on the project. The Contractor shall assure that all subcontractors and suppliers are made aware of the requirements of the CSPP and SPCD, and that the subcontractors and suppliers implement and maintain all necessary safety measures.

The CSPP and SPCD will indicate areas within airport property boundaries that may be used for material stockpile, and will indicate the maximum height of stockpile allowed. The Contractor shall obtain prior approval from the Engineer before using other areas within airport property. The Engineer may limit stockpile heights or equipment heights in any area, either inside or outside of airport property, based on requirements in the ACs or other factors necessary to ensure the free and unobstructed operation of aircraft.

c. Security Plan. When required by the Contract, the Contractor shall control its operations and the operations of its subcontractors and all suppliers so as to provide for the security of the Airport. The Contactor’s operations shall be conducted according to the Security Plan and the provisions set forth within the current version of DOT/FAA/AR-00/52, *Recommended Security Guidelines for Airport Planning and Construction*. No deviations or modifications may be made to the approved Security Plan unless approved in writing by the Engineer.

d. Notification. When the work requires the Contractor to conduct its operations within an Air Operations Area of the airport, the work shall be coordinated in accordance with the requirements of the CSPP. The Contractor shall begin coordination through the Engineer with the Airport Manager, FAA, other project stakeholders, at least 45 days before working in the Air Operations Area. When written correspondence is approved by the Engineer the Contractor shall copy to the Engineer all correspondence with the Airport Manager, the FAA, and other project stakeholders.

The Contractor shall provide information and coordinate with the Airport Manager, through the Engineer, for all required NOTAMs. Begin coordination at least 14 days prior to the date that the NOTAM needs to be issued by. Provide final information on a form provided by the Department, and submit the form through the Engineer to the Airport Manager at least 72 hours prior to: closure or change in the Air Operations Area; or startup, resumption, cessation of, or change in construction activity that affects aircraft operations.

The Contractor shall not begin work for any Phase that requires issuance of a NOTAM until all of the following have been met:

(1) Coordination required by the CSPP and the SPCD has been accomplished;

(2) The NOTAM has been authorized by Airport Manager and its issuance by the FAA has been confirmed;

(3) The necessary temporary marking and associated lighting are accepted;

(4) The necessary NAVAIDS have been modified as specified in the CSPP, SPCD, and Subsection 70-09; and

(5) The Engineer has authorized the Contractor to begin work.

Coordinate all questions to the FAA through the Engineer.

(1) Contact the FAA Systems Operations Control Center at least 45 days prior to:

(a) Closing a runway

(b) Re-opening a closed runway

(c) Interrupting service or removing visual or navigational aids

(d) Displacing a runway threshold

e. Work Procedures and Communications within the Airport Operations Area.

Vehicles, equipment and materials shall never be parked or left standing on runways, runways safety areas, and taxiways open to aircraft. In Air Operations Areas, all vehicles shall be equipped with a functional flashing amber hazard light and all obstructions except stakes or hazard markers shall be removed during non-working hours. The Contractor shall remove construction equipment from and otherwise clear the runway and the designated Runway Safety Areas for operation of regularly scheduled airline flights. The Contractor shall remain continuously informed regarding flight schedule times.

When the contract work requires the Contractor to work within an Air Operations Area of the airport on an intermittent basis (intermittent opening and closing of all or a portion of the Air Operations Area), the Contractor shall maintain constant communications as hereinafter specified, immediately obey all instructions to vacate the Air Operations Area, and immediately obey all instructions to resume work in such Air Operations Area. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the Air Operations Area, with no damages available from the Department, until the satisfactory conditions are provided. The Contractor shall establish and maintain communication or monitor communications with the appropriate radio facility as prescribed in the following:

(1) Airports With Control Towers: At those airports with control towers, the Contractor shall comply with the instructions of the airport controller. The Contractor shall continuously monitor 2-way radio communication on the appropriate ground control frequency. The Contractor shall furnish a liaison radio operator and 2-way radio communication with each work party located within the Air Operations Area

(2) Airports Without Control Towers: At those airports without control towers, the Contractor shall comply with the instructions of a FSS Employee, a pilot, or a pilot's representative. The Contractor shall continuously monitor by 2-way radio, the CTAF published in the current *Alaska Flight Information Supplement*. The Contractor shall furnish a liaison radio operator and 2-way radio communication with each work party located within the Air Operations Area.

80-05 CHARACTER OF WORKERS, METHODS, AND EQUIPMENT. The Contractor shall employ sufficient labor and equipment to complete the work required under the Contract and to complete it on time.

The Contractor shall ensure that all workers on the project have the skills and experience necessary to properly perform their assigned work. Workers engaged in special work or skilled work shall have sufficient experience in that work and in the operation of the equipment required to properly perform that work.

The Contractor shall comply with any written order by the Engineer to remove workers, who, in the opinion of the Engineer, violate operational regulations, violate CSPP requirements, violate SPCD requirements, perform the work in an unskilled manner, create risk of imminent harm for the traveling public, who are intemperate or disorderly, or who fail to perform the work in accordance with the Contract and any and all

applicable federal, state, and local laws, rules, regulations, and ordinances. The Contractor shall allow removed workers to return to the project only with the Engineer's written permission. The Engineer may suspend the work if the Contractor fails to furnish suitable and sufficient personnel necessary to perform the work, or fails to remove any worker at the Engineer's order.

The Contractor shall not use prisoner labor on the project.

The Contractor shall use equipment of the appropriate size and mechanical condition to produce the specified quality and quantity of work by the means specified in the Contract, if any, and shall ensure that the equipment does not damage roadways or property.

The Contractor shall ensure all equipment, materials, and articles incorporated into the work are new and of the specified quality, unless the Contract specifically permits otherwise.

The Contractor shall provide the Engineer with a list of all powered equipment that will be used on the project, showing the make, model, year, capacity, horsepower, and related information. The Contractor shall update this list when equipment is added or removed from the work site, but need not update more frequently than weekly.

When the methods and equipment to be used by the Contractor are not prescribed by the contract, the Contractor is free to use any method, means or equipment that is satisfactory to produce the specified work in conformity with the Contract, except as provided above. At the request of the Engineer, the Contractor shall demonstrate that the method, means and equipment chosen will produce the work specified in the Contract in the time allowed under the Contract. The Contractor shall bear all costs and impacts associated with any means, methods and equipment chosen by the Contractor. No suggestion, statement or observation from the Engineer or other Department representatives shall alter this responsibility.

If the Contract specifies a particular method, means or type of equipment for performance of the work, the Contractor must use that method, means or equipment unless the Contractor first requests, in writing, permission to alter the Contract requirement and receives prior written approval from the Engineer. The written request shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the contract items involved, nor in contract time, as a result of authorizing a change in methods or equipment under this subsection, except as specifically provided under Subsection 40-08.

80-06 CONTRACT TIME, EXTENSION OF CONTRACT TIME AND SUSPENSION OF WORK. Contract time will be specified in Calendar Days, by Completion Date, or both.

a. Calendar Days. When the contract time is specified on a calendar days basis, all work under the Contract shall be completed within the number of calendar days specified. If no starting day is specified in the Contract, the count of Contract time begins on the day following receipt of the Notice to Proceed by the Contractor.

Calendar days shall continue to be counted against Contract time until and including the date of project completion. Calendar days shall not be counted during the period from November 1 through April 30, except for days that the Contractor is working on the project site.

b. Completion Date. When the contract time is specified on a completion date basis, all work under the Contract shall be completed by the specified completion date.

c. Reasons for Suspension of Work and Extension of Contract Time. The Department may order a suspension of work for any reason listed in this subparagraph c., items (1) through (16).

The Department shall not pay additional compensation, but may extend Contract time only, if there are delays in the completion of controlling items of work from unforeseeable causes that are beyond the Contractor's control and are not the result of the Contractor's fault or negligence, including:

(1) Acts of God;

(2) Acts of the public enemy;

(3) Fires;

(4) Floods;

(5) Epidemics;

(6) Quarantine restrictions;

(7) Strikes;

(8) Freight embargoes;

(9) Unusually severe weather;

(10) According to Subsection 50-06.d.(4), delays by utility owners beyond completion dates specified in the Special Provisions for relocating or adjusting utilities and related facilities; or

(11) Delays of subcontractors, suppliers and fabricators from unforeseeable causes beyond the control of the subcontractors, suppliers or fabricators and that are not the fault of the subcontractors, suppliers or fabricators, including those causes listed in this Subparagraph c, Items (1) through (10).

No additional Contract time or additional compensation will be allowed due to delays caused by or suspensions ordered due to:

(12) Failure to correct conditions that create risk of imminent harm for the traveling public, violations of the Contract or any applicable federal, state, and local laws, rules, regulations, and ordinances;

(13) Adverse weather that is not unusually severe;

(14) Failure to carry out Contract provisions;

(15) Failure to carry out orders given by the Engineer; or

(16) Failure to timely obtain materials, equipment, or services.

The Contractor shall notify the Engineer as soon as the Contractor becomes aware of any act or occurrence that may form the basis of a request for a time extension under this section. The Contractor shall submit a request for a time extension to the Engineer within 10 days of the act or occurrence, and if an agreement is not reached, the Contractor may submit a Claim under Subsection 50-17.

The time allowed in the Contract, as awarded, is based on performing the original estimated quantities of work set out in the bid schedule. An assertion that insufficient time was originally specified shall not constitute a valid reason for extension of contract time.

If satisfactory fulfillment of the Contract requires extra work, the Department may extend Contract time according to Subsection 40-02.

d. Suspension of Work. The Engineer will suspend work on the project, in whole or in part, for such periods and for such reasons as the Engineer determines to be reasonable, necessary, in the public interest, or for the convenience of the Department.

(1) The Engineer will issue a written order to suspend, delay, or interrupt all or any part of the work. The Contractor shall not be compensated for the suspension, delay, or interruption if it is imposed for a reasonable time under the circumstances.

(2) Unless another Contract section specifically provides otherwise, the Contractor will be compensated by equitable adjustment for a suspension, delay, or interruption of the work only if:

(a) The period of suspension, delay, or interruption is for an unreasonable time under the circumstances and another Contract section allows compensation in the event of a suspension, delay, or interruption of the work under the circumstances that actually caused the suspension, delay, or interruption; or

(b) The delay, suspension, or interruption results from the Department's failure to fulfill a contractual obligation to the Contractor within the time period specified in the Contract or, if no time period is specified, within a reasonable time.

(3) No equitable adjustment will be made under this subsection for any suspension, delay, or interruption of the work if the Contractor's performance would have been suspended, delayed, or interrupted by any other cause for which:

(a) The Department is not responsible under the Contract, including the Contractor's fault or negligence; or

(b) An equitable adjustment is either provided for or excluded under any other section of this Contract.

(4) Claims for equitable adjustments under this section shall be filed under Subsection 50-17 except that:

(a) The Contractor must give written notice of intent to claim no later than 20 days after the event giving rise to the delay, suspension, or interruption;

(b) The claim may not include any costs incurred more than 20 days before the Contractor files the Contractor's written notice of intent to claim;

(c) The contractor must submit a written request for adjustment within 7 calendar days of receipt of the notice to resume work;

(d) No profit will be allowed on an increase in cost necessarily caused by the suspension, delay, or interruption.

80-07 FAILURE TO COMPLETE ON TIME. For each calendar day that the work is not substantially complete after the expiration of the Contract time or the completion date has passed, the Engineer shall deduct the full daily charge corresponding to the original Contract amount shown in Table 80-1 from progress payments.

For each calendar day that the work is substantially complete but the project is not complete, after the expiration of the Contract time or the completion date has passed, the Engineer shall deduct 20 percent of the daily charge corresponding to the original Contract amount shown in Table 80-1 from progress payments.

If no money is due the Contractor, the Department may recover these sums from the Contractor, from the Surety, or from both. These are liquidated damages and not penalties. These charges shall reimburse the Department for its additional administrative expenses incurred due to the Contractor's failure to complete the work within the time specified.

Table 80-1
DAILY CHARGE FOR LIQUIDATED DAMAGES
FOR EACH CALENDAR DAY OF DELAY

Original Contract Amount		Daily Charge
From More Than	To and Including	
$ 0	500,000	$1,000
500,000	1,000,000	1,500
1,000,000	5,000,000	1,800
5,000,000	10,000,000	2,500
10,000,000	25,000,000	3,800
25,000,000	---------	4,800

Permitting the Contractor to continue work after the durations, dates, and times specified in the Contract have elapsed, or after the Contract time has elapsed or the completion date has passed does not waive the Department's rights to collect liquidated damages under this section.

80-08 DEFAULT OF CONTRACT. The Contracting Officer will give a written Notice of Default to the Contractor and the Surety if the Contractor:

a. Fails to begin work under the Contract within the time specified;

b. Fails to perform the work with sufficient workers, equipment, or materials to ensure the prompt completion of the work;

c. Performs the work unsuitably or neglects or refuses to remove materials or to replace rejected work;

d. Discontinues the prosecution of the work;

e. Fails to resume work that has been discontinued within a reasonable time after notice to do so;

f. Becomes insolvent except that if the Contractor declares bankruptcy, termination shall be according to the Federal Bankruptcy Code. In the event that the Contractor declares bankruptcy, the Contractor agrees that the Contract will be assumed by the Surety in a timely manner so as to complete the Contract by the date specified in the Contract;

g. Allows any final judgment to stand against the Contractor unsatisfied for a period of 60 days;

h. Makes an assignment for the benefit of creditors, without the consent of the Engineer;

i. Fails to comply with applicable minimum wage or civil rights requirements;

j. Is a party to fraud, deceit, misrepresentation, or malfeasance in connection with the Contract; or

k. Fails to perform the work in an acceptable manner for any other cause whatsoever.

The written Notice of Default will include a notice to cure and will establish a date by which the cure must be completed. The Contracting Officer may allow more time to cure than originally stated in the Notice to Default if the Contracting Officer deems it to be in the best interests of the Department. Failure to cure the delay, neglect, or default within the time specified in the Contracting Officer's Notice of Default authorizes the Department to terminate the contract. The Department will provide the Contractor and the Contractor's Surety with a written Notice of Termination.

After the Notice of Termination is issued, the Department may take over the work without further notice; may complete it by itself, by contract or otherwise; and may take possession of and use materials, appliances, equipment, or plant on the work site necessary for completing the work.

The Department may transfer the obligation to perform the work from the Contractor to the Surety. In that event, the Surety shall submit its plan for completion of the work, including any contracts or agreements with third parties for completion, to the Department for approval before beginning work. The Surety must follow the Contract requirements for approval of subcontracts, except that the limitation on percent of work subcontracted will not apply. On receipt of the transfer notice, the Surety shall take possession of all materials, tools, equipment, and appliances at the work site, employ an appropriate work force, and complete the Contract work as specified. The Contract specifications and requirements shall remain in effect, except that the Department will make subsequent Contract payments directly to the Surety. The Contractor forfeits any right to claim for the work and is not entitled to receive any further balance of the amount to be paid under the Contract.

The Contractor and the Contractor's Surety are jointly and severally liable for any damage to the Department resulting from the Contractor's delay, neglect, or default, whether or not the Department terminates the Contractor's right to prosecute the work. The Department's damages include any increased costs incurred by the Department in completing the work or paying for the work to be completed. The Department's rights and remedies are in addition to any other rights and remedies provided by law or under the Contract.

If, after notice of termination of the Contractor's right to proceed under this clause, it is determined that the Contractor was not in default, or that the default was excusable, the rights and obligations of the parties will be determined under Subsection 80-09, Termination for Convenience.

80-09 TERMINATION FOR CONVENIENCE.

a. Notice. The Contracting Officer may terminate the Contract in whole or in part due to:

(1) Executive Orders of the President of the United States or the Governor of the State of Alaska with respect to the prosecution of war or the interest of national defense, or any disaster declaration.

(2) Restraining orders or injunctions by a court of competent jurisdiction affecting prosecution of the work based on acts or omissions of persons or agencies other than the Contractor.

(3) Any reason determined by the Contracting Officer to be in the best interest of the Department.

The Contracting Officer will issue a written Notice of Termination to the Contractor. The Notice of Termination shall state the extent to which performance of work under the Contract is terminated, the effective date of the termination, and for which of the above-listed reasons the Contract is terminated.

b. Required Actions. Unless otherwise directed by the Contracting Officer, upon receipt of a Notice of Termination the Contractor shall immediately:

(1) Stop work as directed in the Notice.

(2) Place no further orders or subcontracts for materials, services, or facilities except as approved to complete work not terminated.

(3) Terminate all orders and subcontracts for the terminated work.

(4) Accomplish either (a) or (b) below as directed by the Contracting Officer:

(a) Assign to the Department all right, title and interest in any terminated orders or subcontracts. The Contracting Officer will settle all claims on the terminated orders or subcontracts.

(b) Settle any outstanding liabilities and claims arising from termination of orders and subcontracts. Settlements must be limited to costs allowed under this section.

(5) Submit to the Contracting Officer a list, certified as to quantity and quality, of all materials acquired or produced for incorporation into the project and that are properly allocable to the terminated portion of the project, exclusive of items disposed of under Subsection 80-09.b.(6), below.

(6) Dispose of materials in the Contractor's possession or control that were acquired or produced but not incorporated into the project as of the termination date as directed by the Contracting Officer under either (a) or (b) below:

(a) Transfer title and deliver the materials to the Department. The Department will pay for the materials at the actual cost delivered to the project or storage site, including transportation charges, to which cost 15% will be added.

(b) Sell the materials. Credit will not have to be extended to prospective purchasers.

The Contractor may acquire the materials if the Contracting Officer approves the sale price and the Contractor meets any other conditions prescribed by the Contracting Officer.

At the sole discretion of the Contracting Officer, the proceeds of any sale, transfer, or disposition of materials may be:

(c) Applied to reduce any payments to be made by the Department under the Contract;

(d) Credited to the cost of the work; or

(e) Paid in any other manner as directed.

(7) Deliver to the Department completed or partially completed plans, drawings, information, and other property required to be furnished under the Contract.

(8) Take all necessary actions and comply with all directives to protect contract-related property in which the Department has or may acquire an interest.

(9) Complete work not terminated.

The Contractor shall proceed immediately with performance of the above obligations notwithstanding any delay in determining or adjusting the amount of any item or reimbursable cost under this clause.

c. Claim. The Contractor shall submit any termination claim to the Contracting Officer within 90 days after the effective date of termination, unless the date for submitting a claim is extended in writing by the Contracting Officer.

(1) Without duplication of any amount paid for under Subsection 80-09.b., the claim may be for the total of:

(a) Costs incurred in performing the terminated work from the date of Contract award to the effective date of the termination subject to the provisions of 80-09.c.(2) regarding reimbursement of equipment costs and 80-09.c.(3) regarding unallowable items.

(b) Payments approved by the Contracting Officer under 80-09.b.(4)(b) to settle the termination claims of suppliers and subcontractors to the extent not covered under 80-09.c.(1)(a).

(c) Reasonably incurred costs for:

(i) Accounting, legal, clerical, and other costs reasonably necessary for preparation of the termination claim and settlement negotiations, excluding costs incurred after the date an appeal is filed with the Appeals Officer under 80-09.h.

(ii) Settling subcontractor and supplier claims, excluding the amounts of those settlements paid under 80-09.c.(1)(b).

(d) Reasonable profit on the costs included in Subsection 80-09.c.(1)(a) based on the Contractor's bid rate for profit or as determined under any other reasonable accounting method. However, if it appears that the Contractor would have sustained a loss on the entire Contract had it been completed, the Contracting Officer will allow no profit and will reduce the settlement to reflect the indicated rate of loss under Subsection 80-09.d. The Department will not pay profit on costs included in Subsections 80-09.c.(1)(b) and 80-09.c.(1)(c).

(2) Equipment claims will be reimbursed as follows:

(a) Contractor-owned equipment usage, based on the Contractor's ownership and operating costs for each piece of equipment as determined from the Contractor's accounting records. Do not base equipment claims on published rental rates.

(b) Idle time for Contractor-owned equipment, based on the Contractor's internal ownership and depreciation costs. Idle equipment time is limited to the actual period of time equipment is idle as a direct result of the termination, not to exceed 30 days. Operating expenses will not be included for payment of idle equipment time.

(c) Rented equipment, based on reasonable, actual rental costs. Equipment leased under "capital leases" as defined in Financial Accounting Standard No. 13 will be considered Contractor-owned equipment. Equipment leased from an affiliate, division, subsidiary or other organization under common control with the Contractor will be considered Contractor-owned equipment.

(3) The following costs are not payable under a termination settlement agreement or Contracting Officer's determination of the termination claim, or on appeal:

(a) Anticipated profits on work that is not performed prior to issuance of the Notice of Termination, or any consequential or compensatory damages.

(b) Unabsorbed home office overhead (also termed "General & Administrative Expense") related to ongoing business operations.

(c) Bidding and project investigative costs.

(d) Direct costs of repairing equipment to render it operable for use on the terminated work.

d. Adjustment for Loss. If the Contractor would have sustained a loss on the entire Contract had it been completed, the Department will not pay the Contractor more than the total of:

(1) The amount due for termination claim costs under Subsection 80-09.c.(1)(c); plus

(2) The remainder of the total allowable claim amount due reduced by multiplying the remainder by the ratio of (a) the total contract price to (b) the remainder plus the estimated cost to complete the entire Contract; minus

(3) All disposals and other credits, all advance and progress payments and all other amounts previously paid under the Contract.

e. Deductions. In arriving at the amount due under this subsection, the Department will deduct:

(1) All previous payments made before termination;

(2) Any claim which the Department may have against the Contractor;

(3) The proceeds of the sale or transfer of any materials, supplies, or other items acquired for the terminated work and not otherwise recovered by or credited to the Department;

(4) All partial payments made under this section; and

(5) Any adjustment for loss determined under Subsection 80-09.d.

f. Agreed Settlement. The Contractor shall make every effort to arrive at a claim settlement with the Contracting Officer that is fair to both parties, that reflects the reasonable and allocable incurred costs allowable under Subsection 80-09.c, that includes a profit under Subsection 80-09.c.(1)(d) or, where appropriate, a loss adjustment under Subsection 80-09.d., and that takes into account the Contractor's reasonable business judgment in performing the work.

The total settlement, whether determined under this Subsection 80-09.f. or under Subsection 80-09.g., exclusive of the costs listed in Subsection 80-09.c.(1)(c), may not exceed the total contract price as reduced by previous payments made and the contract price of work not terminated.

If an agreement is reached in whole or in part, the Department will amend the contract and will pay the agreed amount.

g. Determined Settlement. If the Contractor fails to submit a termination claim within the time allowed, or if an agreement is not reached on the amount due, the Contracting Officer may determine in a Contracting Officer's Decision, the amount due under Subsection 80-09 on the basis of information available to the Department.

h. Right of Appeal. The Contractor may appeal a Contracting Officer's Decision within the time and in the manner specified in Subsection 50-17.

i. Partial Payments. In the sole discretion of the Contracting Officer, the Department may make partial payments against costs incurred by the Contractor in connection with the terminated portion of the Contract. The sum of these partial payments will not exceed the Contracting Officer's estimate of the total amount that will be due as a result of the termination. The estimate will be based on available information. The Contracting Officer may adjust the estimate as additional information becomes available. If the Contracting Officer orders an audit of the Contractor's financial or project records, the Contracting Officer may decline to make partial payments until the audit is completed.

j. No Waiver of Rights. The termination of work by the Department does not affect or extinguish any of the rights of the Department against the Contractor or the Contractor's Surety then existing or which may thereafter accrue. Any retention or payment of monies by the Department due under the terms of the Contract will not release the Contractor or the Contractor's Surety from the contractual obligations or warranties made under Subsection 70-19 or elsewhere in the Contract.

k. Retaining Records. The Contractor shall unless otherwise provided for in the Contract or by applicable statute, keep all books, records, documents, and other evidence bearing on the Contractor's cost and expenses under the Contract and relating to the work terminated for a period of 3 years after final settlement under this Contract. Records must be made available to the Department at the Contractor's office and at all reasonable times.

l. Definitions. In this Subsection 80-09, the term "cost" and the term "expense" mean a monetary amount in U.S. Dollars actually incurred by the Contractor, actually reflected in the Contractor's contemporaneously maintained accounting or other financial records and supported by original source documentation.

m. Cost Principles. The Department may use the federal cost principles at 48 CFR §§ 31.201-1 to 31.205-52 (or succeeding cost principles for fixed price contracts) as guidelines in determining allowable costs under this subsection to the extent they are applicable to airport construction contracts and consistent with the specifications of this Contract. The provisions of this contract control where they are more restrictive than, or inconsistent with, these federal cost principles.

SECTION 90
MEASUREMENT AND PAYMENT

90-01 GENERAL. Wherever the Contract provides that certain work is subsidiary or it is without extra compensation, the payment for that work is included in the payment for other items of work, and no further or additional payment shall be made for that work.

When more than one type of material or work is specified for a pay item, the pay item and the proposal line number are used to differentiate the material or work.

Lump sum items will not be measured for payment. The Contractor shall accept the bid amount for a lump sum item as complete payment for all work necessary to complete that item. Quantities shown for lump sum items are approximate. No adjustment in the lump sum price will be made if the quantity furnished is more or less than the estimated quantity unless the Contract specifically states otherwise.

90-02 MEASUREMENT OF QUANTITIES. All work completed under the Contract will be measured using the U.S. Customary system of measure. The Engineer may agree for purposes of making progress payments to use a method of measurement other than the methods described below. However, all final payments for quantities will be calculated using one or more of the methods of measurement described below and in the applicable pay item section. Unless otherwise specified, work will be measured as follows:

a. Acre (43,560 ft^2). Horizontally, unless specified on the ground surface. No deductions will be made for individual fixtures with an area of 500 ft^2 or less.

b. Contingent Sum. Measured as specified in the Contract or Directive authorizing the work. The method of payment may include: (1) a lump sum basis, (2) a price multiplied by the units of work performed, (3) a pay adjustment based on the quality of work, or (4) a deduction from the contract amount.

c. Cubic Yard (yd^3). At the location specified using method (1), below. Methods (2) through (5) may be used with written approval of the Engineer.

1. **Average End Area.** End area is the calculated area between original ground cross section and either the design cross section or at the Engineer's discretion the final cross section. Volume of material is calculated using the average of end areas multiplied by the distance along centerline between end areas. In extreme cases where most of the earthwork lies along a single horizontal curve the Engineer may compute volume using the average of end areas multiplied by the distance along centroid of cross section between end areas.

2. **Three-Dimensional.** Where it is impractical to measure material by cross sectioning due to erratic location of isolated deposits, acceptable methods involving three-dimensional measurements may be used.

3. **Neat Line.** Structures will be measured according to neat lines shown on the Plans or as altered to fit field conditions.

4. **Nominal.** Volume calculated as nominal width times nominal thickness times the average length of each piece.

5. **Weight.** With the Engineer's written approval, material that is specified to be measured by volume may be weighed and converted to volume for payment purposes. The Engineer will determine the appropriate conversion factors. When liquid asphalt is a pay item, ASTM D4311 will be used to convert from weight to volume at 60 °F.

d. Cubic Yard Vehicle Measure (CYVM). Material measured by volume in the hauling vehicle will be measured at the point of delivery. Vehicles may be of any acceptable size or type provided that the volume of the actual contents may be readily and accurately determined. Vehicles shall be loaded to

the measured vehicle volume. If vehicles are not loaded to the measured vehicle volume, the Engineer at their discretion, may apply a percentage of full factor to the measured volume. Loads shall be leveled when directed. No payment will be made for loads that exceed the legal capacity of the vehicle.

e. Linear Foot (LF). From end to end, in place, parallel to the centerline of the item or ground surface on which the items are placed.

f. Thousand Feet Board Measure (MBM). Nominal volume based on nominal widths and thickness times actual extreme length of each piece. One thousand feet board measure = 1,000 ft^2 X 1 inch thick.

g. Thousand Gallon (MGal). By using method (1), below. Methods (2) or (3) may be used with written approval of the Engineer:

1. Measured or calibrated volume tank;

2. Metered volume, using a certified calibrated meter; or

3. Weighed under this subsection and converted to volume, using a specified or approved conversion factor.

h. Mile. From end to end, measured horizontally along centerline.

i. Pound. Using a certified scale or the net weight of packaged material as labeled by the manufacturer. The Engineer will accept nominal weights for standard manufactured items, unless otherwise specified. The Engineer will accept industry-established manufacturing tolerances, unless otherwise specified.

j. Square Foot (ft^2). Parallel to the surface being measured. No deductions will be made for individual fixtures with an area of 1 ft^2 or less. Transverse measurement for area computations will be the neat dimensions shown on the Plans or as directed by the Engineer.

k. Square Yard (yd^2). Parallel to the surface being measured. No deductions will be made for individual fixtures with an area of 1 yd^2 or less. Transverse measurement for area computations will be the neat dimensions shown on the Plans or as directed by the Engineer.

l. Station (100 feet). Horizontally, parallel to centerline.

m. Ton (2,000 pounds). By using method (1) or (2), below. Method (3), below, may be used with written approval of the Engineer:

1. Commercial Weighing System. Permanently installed and certified commercial scale that meets the requirements for the project weighing system.

2. Project Weighing System. Approved automatic digital scale and scale house. All scales are subject to approval according to the Weights and Measures Act, AS 45.75.

Spring balances and belt conveyor scales shall not be used to determine pay weight.

The Contractor may use proportioning (batch) scales for weighing material for payment when the batching equipment includes an approved and certified automatic weighing, cycling, and monitoring system.

Weigh scales used with a storage silo may be used to weigh the final product for payment, provided the scales are approved and certified.

Vehicle scales shall be maintained with the platform level and rigid bulkheads at each end. The platform must be long enough to permit simultaneous weighing of the hauling vehicle including coupled vehicles, in a single draft. Double draft weighing is not allowed.

(a) Scale Requirements. The Contractor shall:

(1) Ensure that vehicle scale(s) are installed and maintained to the standards listed in the National Institute of Standards and Technology (NIST), Handbook 44, Specifications, Tolerances and other Technical Requirements for Commercial Weighing and Measuring Devices, as adopted by AS 45.75.050(d);

(2) Contact the Division of Measurement Standards/Commercial Vehicle Enforcement (MSCVE) to coordinate scale inspections before use, at required intervals or as directed by the Engineer and for clarification or possible exceptions to this section;

(3) Ensure that a weatherproof housing is provided to protect the scale indicating/recording equipment and allows the scale operator convenient access to the weigh indicator, scale computer, ticket printer, and sequential printer;

(4) Use competent personnel to operate the scale system;

(5) Furnish and maintain on-site, NIST Class-F cast iron test weights in denominations of 500-lb and/or 1000-lb. The required minimum for vehicle scales is 4000-lb; the required minimum for hopper scales is 2000-lb. Test weights shall have a recognized calibration certificate on file which is dated no more than two years from date of Notice to Proceed. Test weights will be used as directed by the Engineer or MSCVE for initial accuracy calibration testing and may be used for subsequent scale testing or inspection. Projects accessible by direct road access from the communities identified on the dot.alaska.gov/mscve website, 5 days before bid opening, are exempt from the requirement to furnish and maintain on-site test weights;

(6) Provide the following information on any scale used to weigh materials for payment:

i. Owner of the scales and scale locations;
ii. Manufacturer's name, model serial number, maximum capacity, and type of scales (single beam, double beam, self-reading, etc.)
iii. Date(s) the scales were installed and/or adjusted;
iv. Scale service company inspections and accuracy checks (attach copy);
v. Division of Measurement Standards inspections and accuracy checks (attach copy); and
vi. Time and dates of notification of any malfunctions.

(b) Electronic Computerized Weighing System. The Contractor shall use an electronic computerized weighing system (ECWS) with the following minimum capabilities:

(1) Computer. A computer with a self-reading scale system that includes the scale load cell, a sealed direct reading weight indicator, scale computer, ticket printer, and sequential printer, and that can record a complete shift's transaction in an electronic format approved by the Engineer.

The computer must store project numbers, all pay item descriptions for multiple projects and products that are weighed, and the following information for each hauling vehicle used on the project:

i. Vehicle identification number marked on the vehicle;
ii. Tare weight; and
iii. Maximum allowable gross vehicle weight (MAVW).

During weighing operations, the ECWS must compare each vehicle's gross weight to its MAVW. If the vehicle exceeds its MAVW, the system must alert the scale operator that an "overload" exists. The system must not issue a ticket for an overload.

The computer must have a battery backup and protection for power surges or brown outs. The computer system must retain all stored data during a power outage and must operate during a power outage to allow the scale operator to shut down the hard drive without losing information.

(2) Tickets. The ECWS must have a ticket printer that prints a legible, serially numbered weigh ticket for the Engineer with the following information on each ticket in the order listed:

i. Project number;
ii. Item number and description;
iii. Date weighed;
iv. Time weighed;
v. Ticket number;
vi. Vehicle Identification Number;
vii. Maximum allowable gross vehicle weight;
viii. Gross weight;
ix. Tare weight;
x. Net weight;
xi. Subtotal item net weight for each haul unit since start of shift; and
xii. Accumulated item net weight for all haul units since start of shift.

Tickets must show all weights in pounds in accordance to NIST Handbook 44, and in tons reported to two decimal places.

After printing, the weigh ticket must automatically advance to a perforation so it can be torn off and handed to the driver. Each ticket shall be initialed by the scale operator before handoff to the driver.

(3) Sequential Printer. A sequential printer that prints out all transactions (keystrokes) made by the computer concurrently with the ticket printer. For permanent commercial scales, the printer may print at the end of the company's daily shift with the Engineer's approval. The printer must print all scales transactions including tares, voided tickets, and data changes made by the scale operator. The printer must allow for advancing the paper manually so that the scale operator can write notes on the paper when special situations occur, such as voided tickets, incorrect vehicle identification number used, etc. The scale operator shall also note these special situations in the Scales Diary.

The sequential printout shall be submitted to the Engineer at the end of each shift.

(4) Data Files. Submit electronic data files to the Engineer at the end of each shift, with all ticket information produced during the shift recorded. These Data files must be complete and correct without conversion or manipulation.

(5) Scale Diary. The scale operator shall keep a Scale Diary in an electronic format acceptable to the Engineer. The scale operator shall complete the Scale Diary with the following information: dates of action, type of material, source, time the scale opened and time the scale closed, times of scale balance, ticket sequence, time the haul for each material started and stopped, voided ticket numbers, vehicle identification numbers, times of tare and tare weights, and the scale operator's signature. The Scale Diary shall include the following information on any scale used to weigh materials for payment:

i. Owner of the scales and scale locations;
ii. Manufacturer's name, model serial number, maximum capacity, and type of scales (single beam, double beam, self-reading, etc.);
iii. Date(s) the scales were installed and/or adjusted;
iv. Scale service company inspections and accuracy checks (attach copy);
v. Division of Measurement Standards inspections and accuracy checks (attach copy); and
vi. Time and dates of notification of any malfunctions.

The Scale Diary shall be given to the Engineer at the end of each shift. The Scale Diary is the property of the Department.

(c) Weighing Procedures. The scale operator shall tare hauling vehicles and record tare weights at least once daily; perform additional tares and record additional tare weights as directed by the Engineer; perform tares in the presence of the Engineer when requested; and ensure that each hauling truck displays a unique, legible identification mark.

The Engineer will calculate the MAVW for each vehicle and list all vehicles and their MAVW(s) in the scale house. The MAVW is either the maximum allowable legal weight determined by the Engineer when the Contractor cannot haul overloads, or the manufacturer's recommended maximum allowable gross vehicle weight as certified by the Contractor when vehicles are allowed to haul overloads. Only MAVWs that the Engineer has provided in writing shall be used. Tickets may not be issued to a vehicle until the Engineer provides the MAVW.

No payment will be made for any material weighed without using the ECWS, unless the Contractor obtains the Engineer's prior written authorization. If the ECWS malfunctions or breaks down, weights shall be manually weighed and recorded for up to 48 hours as directed by the Engineer. The manual weighing operation shall meet all other Contract requirements.

The system must generate a report either during or at the end of the day or shift that summarizes the number of loads and total net weight for each date, project, and product. The scale operator shall submit the original report to the Engineer at the end of each shift.

No payment for any hauled material on a given date will be made until the following are delivered to the Engineer:

(1) Sequential printout;

(2) Daily data; and

(3) Scale Diary.

The Contractor will not receive payment for any material hauled in a vehicle that does not conform to the requirements of Subsection 50-12, Load Restrictions, and this Subsection. The Contractor shall dump material from non-conforming vehicles until they conform, then reweigh the vehicles.

When a weighing device indicates less than true weight, the Contractor will not receive additional payment for material previously weighed and recorded. When a weighing device indicates more than true weight, all material received after the last previously correct weighing accuracy test will be reduced by the percentage of error that exceeds 0.5 percent.

If the Engineer incurs extra construction engineering expenses from checking non-machine data entries or other data irregularities, the total value of those expenses will be deducted from the value of the Contract item before payment.

The Contractor shall accept natural variations in the specific gravity of aggregates, without adjustment in Contract unit price.

3. **Invoices.** Supplier's invoice with net weight or volume converted to weight for bulk material that is shipped by truck or rail and is not passed through a mixing plant. Periodic check weighing may be required. Net certified weights or volumes of asphalt materials are subject to correction for temperature and foaming. All materials are subject to correction for material that is lost, wasted, or otherwise not incorporated into the work, for computing quantities.

   All aggregate paid by weight shall be less than 2% over optimum moisture, or as approved by the Engineer.

90-03 SCOPE OF PAYMENT. The Department will make payment at the Contract price or prices for each item shown on the bid schedule or as modified by change order with specified price adjustments. The Contractor shall accept the Contract prices as full and complete payment for (a) furnishing all equipment, materials, tools, and labor necessary to complete the work in a complete and acceptable manner, and for (b) all of the Contractor's risk, loss, damage, or expense of whatever character arising from or relating to the work and performance of the work.

90-04 COMPENSATION FOR ALTERED QUANTITIES. Payment to the Contractor for unit price items shall be made only for the actual quantities of work performed and accepted or materials furnished, in conformance with the Contract. When the accepted quantities of work or materials vary from the quantities stated in the bid schedule, the Contractor shall accept payment at the original Contract unit prices for the quantities of work and materials furnished, completed and accepted as payment in full. Payment at the Contract unit price shall compensate the Contractor for all costs, expenses, and profit that the Contractor is entitled to receive for the altered quantities, except as provided below:

a. When the final quantity of a Major Contract Item varies more than 25 percent above or below the bid quantity, either party to the Contract may receive an equitable adjustment, excluding anticipated profits, in the Contract unit price of that item. If the final quantity of work is:

(1) Greater than 125 percent of the bid quantity, the equitable adjustment will be made only for those units that are in excess of 125 percent of the bid quantity.

(2) Less than 75 percent of the bid quantity, the equitable adjustment will be made for those units of work done and accepted, except that the total payment for the item shall not exceed 75 percent of the total amount bid for the item.

Except as provided above and in Subsection 40-02, no allowance shall be made for any increased expenses, expected reimbursement, or anticipated profits suffered or claimed, either directly from alterations in quantities or indirectly from unbalanced allocations among the contract items on the part of the bidder and subsequent loss of expected reimbursements, or any other causes.

90-05 COMPENSATION FOR EXTRA WORK ON TIME AND MATERIALS BASIS. When the Engineer orders extra work to be performed on a time and materials basis, compensation will be computed as follows:

a. Labor. Based on the sum of **(1)** through **(6)**:

(1) Total hours worked times the straight time rate of pay. The rates of pay are those indicated on the certified payroll for all labor and foremen in direct charge of the specific operations. Rates shall not exceed those for comparable labor currently employed on the project, and shall not include general superintendence.

(2) Overtime hours worked times the difference between the overtime rate and the straight time rate. No markup is allowed.

(3) **Fringe benefit rate times the total hours worked.** Fringe benefits include Health and Welfare, Pension Fund, etc., when such amounts are required by collective bargaining agreement or other employment contracts generally applicable to the classes of labor employed on the project.

(4) **Workers' Compensation Insurance at 8 percent of (1).** The actual net rate may be used if it exceeds 10 percent and if proof of rates is furnished within 30 days of the completion of the extra work.

(5) **Either subsistence and travel allowances or prorated camp costs.** If an employee is due and receives subsistence or camp privileges on their days off, divide that cost by the number of days worked that week and add to their daily subsistence entitlement. If the employee did not work an entire day on time and materials work, prorate the entitlement for the hours worked on time and materials.

(6) **Markup at 35 percent of the sum of (1), (3), (4), and (5).** This includes and shall fully compensate the Contractor for all overhead and profit, including general superintendence, additional bond, property damage liability insurance, unemployment insurance contributions, social security and other taxes, administrative overhead costs, and profit.

b. Materials. Actual invoiced material and delivery costs plus 15 percent markup. The material must be approved and incorporated into the work. The Contractor shall furnish to the Engineer proof of payment for materials used in the work plus applicable transportation charges. For Contractor-produced materials, certify in writing the Contractor's actual direct costs, the quantities used, and attach cost spreadsheets and production documentation to verify the costs.

c. Equipment. Includes machinery and special equipment (other than small tools) necessary for the work and authorized by the Engineer. No additional compensation will be made for overhead, profit, maintenance, service, repairs, fuels, lubricants, or replacement parts.

(1) **Hourly Rental Rate.** Based on rental rates in the current edition and appropriate volume of the *Rental Rate Blue Book,* by EquipmentWatch, Penton Media, Inc.

The regular hourly rental rate is equal to the equipment rate plus the estimated hourly operating cost. These rates apply for equipment used during the Contractor's regular shift of 10 hours per day. No markup is allowed.

The equipment rate is equal to the age adjusted monthly rate for the basic equipment plus the age adjusted monthly rate for applicable attachments, both divided by 176, and multiplied by the regional adjustment factor. The equipment rate is per hour.

The age adjusted monthly rate is that resulting from application of the age adjustment formula, to eliminate replacement cost allowances in machine depreciation and contingency cost allowances.

Only the attachments required for the time and materials work will be included.

(2) **Hourly Overtime Rate.** Half of the equipment rate plus the full estimated hourly operating cost. The overtime rate will apply to hours the equipment is used in excess of 10 hours per day, either on the Contractor's normal work or on time and materials, and either on single or multiple shifts. No markup is allowed.

(3) **Hourly Stand-by Rate.** Half of the equipment rate, for equipment ordered on stand-by during the Contractor's normal work shift, not to exceed eight hours per day. No operating costs or markup is allowed.

(4) **Unlisted Equipment.** For equipment not listed in The Blue Book, the Contractor and the Engineer may agree to a rate before extra work is begun. If agreement is not reached, the

Engineer has authority to establish a rate based on similar equipment in the Rental Rate Blue Book or prevailing commercial rates. No markup is allowed.

(5) Leased or Rented Equipment. Equipment that must be rented or leased specifically for work required under this section and authorized in writing by the Engineer shall be paid at invoice price plus 15 percent markup.

Equipment rented or leased for other work under the Contract and used for work under this section shall be paid based on c.(1), (2), and (3). (above) with no markup, except that the adjusted monthly rate is the monthly rate determined directly from the submitted rental or lease agreement.

(6) Transportation of Equipment. The actual cost of moving equipment to and from the work site. To receive reimbursement for transportation of equipment, the Contractor shall obtain the equipment from the nearest approved source and use the equipment exclusively for time and materials work. Payment for move-out will not exceed the amount of the move-in. No markup is allowed, except on operator's wages.

Basis of payment:

(a) If by common carrier: paid freight bill or invoice.

(b) If hauled with the Contractor's own resources: hourly rental rate for hauling unit plus operator wages.

(c) If equipment must be moved under its own power: half of the normal hourly rental rate plus operator's wages.

d. Work by a Subcontractor or Owner-Operator. For time and materials work performed by an approved subcontractor or owner-operator under items **a.** through **c.** above, the Contractor will receive a 5 percent markup for administrative costs. No percentage will be paid on work covered under bid items in the original Contract. No percentage over the amount covered above will be paid for work done by a lower tier subcontractor.

e. Work by a Specialty Subcontractor. The Contractor shall obtain the Engineer's advance agreement that the specialty item needed is beyond the Contractor's ability or expertise or that of the Contractor's other subcontractors. For work on a specialty item performed by an approved specialty subcontractor, the Contractor will receive the approved invoice cost of work or service plus a 15 percent markup for administrative costs.

f. Records. The Engineer will maintain a daily record of labor, equipment and materials utilized in the extra work. The Engineer will present this record to the Contractor at the end of each day's work for verification and signature.

g. Compensation. Payment for time and materials work will be made in the progress estimate following receipt of the verified daily records and all required supporting information from the Contractor. If, at any time, a unit price or lump sum basis of compensation is agreed to for work being performed under this subsection, that compensation will be set forth in writing as a Change Order.

90-06 PROGRESS PAYMENTS. The Department will make monthly progress payments to the Contractor based on estimates of the value of work performed and materials on hand under Subsection 90-07. At the Departments discretion, a progress payment may be made twice monthly if the value of the estimate exceeds $10,000.

Contractor's failure to pay subcontractors, or subcontractor's failure to pay lower tier subcontractors, according to prompt payment provisions required under Subsection 80-01 is considered unsatisfactory performance.

The Department will not withhold payment as retainage but may withhold payment for unsatisfactory performance. If satisfactory progress is being made and subcontractors are paid according to Subsection 80-01 and AS 36.90.210, the Engineer will authorize 100 percent payment for the estimated value of work accomplished, less any authorized deductions.

If the Engineer finds that satisfactory progress is not being made or payment for satisfactory work by a subcontractor or lower tier subcontractor is not paid according to Subsection 80-01, the Engineer may withhold up to 100 percent of the total amount earned from subsequent progress payments. The Engineer may withhold up to 200 percent of the estimated cost to complete final punch list items for unsatisfactory performance until those items are complete. The Engineer will notify the Contractor in writing within eight (8) working days of a request for a progress payment of the reasons why part or all of the payment is being withheld for unsatisfactory performance and what actions may be taken by the Contractor to receive full payment.

Payments of withheld amounts will be made in accordance with AS 36.90.200. No interest will be paid to the Contractor for amounts withheld for unsatisfactory performance except if the Department fails to pay the amount withheld within twenty one (21) calendar days after the Contractor satisfactorily completes the remedial actions identified by the Engineer, as provided in AS 36.90.200(e).

The Contractor shall pay interest on retainage withheld from subcontractors, and at an interest rate according to AS 36.90.250 and AS 45.45.010(a).

90-07 PAYMENT FOR MATERIAL ON HAND.

a. Partial Payment. The Engineer will make partial payment for materials designated for incorporation into the work. The material shall:

(1) Meet Contract requirements;

(2) Be delivered and stockpiled at the project or other approved location;

(3) Be supported by invoices, freight bills, and other required information; and

(4) Not be living or perishable.

b. Payment Requests. The Contractor shall make each payment request in writing and:

(1) List stockpiled items, quantities of each, and stockpile location(s);

(2) Certify that materials meet the applicable Contract specifications;

(3) For purchased materials, attach copies of invoices, freight bills, and manufacturer’s published storage recommendations;

(4) For Contractor-produced materials, attach production statements showing quantities and dates produced and copies of process quality control test results; and

(5) Include other information requested by the Engineer.

c. Storage Conditions. The Contractor shall protect material from damage or loss while in storage. The Contractor shall:

(1) Physically separate stockpiled materials from other materials at the storage location;

(2) Clearly label materials with the project name and number; and

(3) Store materials per the manufacturer's recommendations.

If storage conditions become unsatisfactory, liens are filed on any materials, or the storage location is changed without approval, the Engineer will deduct any previous payments made for such materials.

d. Method of Payment. The Engineer will include payments for acceptably stockpiled materials in the progress estimate following receipt of the Contractor's written request and all required documentation. The Engineer will:

(1) Pay for materials purchased by the Contractor at the delivered cost but not to exceed 85% of the Contract amount for those items.

(2) Pay for materials produced by the Contractor at up to 50% of the Contract amount for those items.

(3) Deduct the Department's cost to inspect materials stored off the limits of the project.

(4) Deduct partial payment quantities as they are incorporated into the project.

The Contractor shall release and discharge the Department from any liability for damages or delays related to the storage or transport of, and to the payment for, material on hand.

The Department's payment for material on hand will not constitute final acceptance by the Department.

90-08 FINAL PAYMENT. When the project has been completed as provided in Subsection 50-15, the Engineer will prepare the final estimate of the quantities of the various classes of work performed. All prior progress estimates and payments shall be subject to correction in the final estimate and payment. The final estimate will not be processed until the Alaska Department of Labor and Workforce Development has verified that final payment can be released. The Department will not process the final estimate until the Contractor completes Items **a** through **d** in the first paragraph of Subsection 50-16.

If the Contractor certifies the final estimate, or does not file a claim within 90 days of receiving the final estimate, the estimate shall be processed for final payment. Final payment shall consist of the entire sum found to be due after deducting all previous payments and all amounts to be retained or deducted under the provisions of the Contract. Failure to file a claim within 90 days of receiving the final estimate is a waiver of any and all claims relating to or arising from the final estimate.

When the Contractor executes the Certification of Final Estimate (Form 25D-116) and the Contractor's Release (Form 25D-117), final payment will be processed.

The Contractor may reserve any unresolved claims that were timely filed according to Subsection 50-17 by listing those claims as exceptions on the Contractor's Release. Any claims listed as exceptions that were not filed before the Contractor executes the final estimate will be considered null and void. Any claims filed in a timely manner but not listed on the Contractor's Release are waived and deemed released.

If the Contractor fails or declines to approve the final estimate within 90 days but does not file any claims, the Department will consider the estimate approved and process the estimate for final payment. Any subsequently raised claims will be considered null and void.

On federally funded projects, if DOLWD Wage and Hour Administration notifies the Department of a pending prevailing wage investigation, and that the investigation is preventing the closing out of the project, the Contractor may place the notified amount in escrow under Wage and Hour for the exclusive purpose of satisfying unpaid prevailing wages. Upon receipt of notice from Wage and Hour that the contractor has satisfactorily transferred the necessary funds into escrow, the Department will proceed to issue final payment.

90-09 ELIMINATED ITEMS. When the Contractor is notified of the elimination of a minor Contract item, the Contractor will be reimbursed for actual work performed and all direct costs incurred before notification. In no case will any payment be made for anticipated profits or overhead.

Should it become necessary to eliminate a major Contract item, an equitable adjustment will be made and the Contract modified in writing accordingly.

90-10 CONSTRUCTION WARRANTY.

a. In addition to all other warranties or remedies, express or implied, available to the Department under this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.

b. This warranty shall continue for a period of one year from the date of final acceptance of the work. If the Department takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one year from the date the Department takes possession. However, this will not relieve the Contractor from corrective items required by the final acceptance of the project work.

c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Department real or personal property, when that damage is the result of:

(1) The Contractor's failure to conform to contract requirements; or

(2) Any defect of equipment, material, workmanship, or design furnished by the Contractor.

d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.

e. The Engineer will notify the Contractor, in writing, within seven (7) days after the discovery of any failure, defect, or damage.

f. If the Contractor fails to remedy any failure, defect, or damage within 14 days after receipt of notice, or longer timeframe approved by the Engineer, the Department shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall: (1) Obtain all warranties that would be given in normal commercial practice; (2) Require all warranties to be executed, in writing, for the benefit of the Department, as directed by the Engineer, and (3) Enforce all warranties for the benefit of the Department.

h. The provisions of this section shall not limit the Department's rights with respect to latent defects, gross mistakes, or fraud.

90-11 PROJECT CLOSEOUT. Approval of final payment to the Contractor is contingent upon completion and submittal of the items listed below. The final payment will not be approved until the Engineer approves the Contractor's final submittal. The Contractor shall:

a. Provide two (2) copies of all manufacturers warranties specified for materials, equipment, and installations;

b. Provide weekly payroll records (not previously received) from the general Contractor and all subcontractors;

c. Complete final cleanup in accordance with Subsection 40-07, Cleanup;

d. Complete all punch list items identified during the Final Inspection;

e. Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the DBE subcontractors and/or suppliers associated with the project;

f. When applicable per state requirements, return copies of sales tax completion forms;

g. Manufacturer's certifications for all items listed in the MCL;

h. All required record drawings, as-built drawings or as-constructed drawings;

i. Project Operation and Maintenance (O&M) Manual;

j. Security for Construction Warranty, when required;

k. Equipment commissioning documentation submitted, if required.

SECTION 100
CONTRACTOR QUALITY CONTROL PROGRAM (CQCP)

100-01 GENERAL. The Contractor shall assure that all materials and completed construction conform to contract Plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. The Contractor shall establish, provide, and maintain an effective Contractor Quality Control Program (CQCP) that details the methods and procedures that will be used. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The Contractor shall establish a CQCP that will:

a. Provide qualified personnel to develop and implement the CQCP.

b. Adequately provide for the production of acceptable quality materials.

c. Provide sufficient information to assure that the specification requirements can be met.

d. Document the CQCP process.

The Contractor shall be prepared to discuss and present, at the preconstruction conference, their understanding of the quality control requirements. The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the CQCP has been reviewed and accepted by the Engineer. No partial payment will be made for materials subject to specific quality control (QC) requirements until the CQCP has been reviewed and accepted.

The QC requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the acceptance testing requirements. Acceptance testing requirements are the responsibility of the Engineer.

A Quality Control (QC)/Acceptance Testing workshop with the Engineer, Contractor, subcontractors, and testing laboratories shall be held prior to start of construction. The workshop shall address QC and acceptance testing requirements of the project specifications. The Contractor shall coordinate with the Engineer on time and location of the QC/Acceptance Testing workshop.

100-02 DESCRIPTION OF PROGRAM.

a. General Description. The Contractor shall establish a CQCP to perform inspection and testing of each item of work for which it is required by the technical specifications, including those performed by subcontractors. This CQCP shall ensure conformance to applicable specifications and Plans with respect to materials, workmanship, construction, finish, and functional performance. The CQCP shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of QC.

b. Contractor Quality Control Program (CQCP). The Contractor shall describe the CQCP in a written document. The written CQCP and plan for QC testing laboratory shall be submitted to the Engineer for review at least 5 calendar days before the preconstruction conference. The Contractor's CQCP and QC testing laboratory must be accepted by the Engineer prior to the start of any production, construction, or off-site fabrication.

The CQCP shall be organized to address, as a minimum, the following items:

a. QC organization;

b. Project progress schedule;

c. Submittals schedule;

d. Inspection requirements;

e. QC testing plan;

f. Documentation of QC activities and distribution of QC reports;

g. Requirements for corrective action when QC and/or acceptance criteria are not met; and

h. Material quality and construction means and methods. Address all elements applicable to the project that affect the quality of the pavement structure including subgrade, subbase, base, and surface course. Some elements that must be addressed include, but is not limited to mix design, aggregate grading, stockpile management, mixing and transporting, placing and finishing, quality control testing and inspection, smoothness, laydown plan, equipment, and temperature management plan.

The Contractor shall add any additional elements to the CQCP that are necessary to adequately control all production and/or construction processes required by this contract.

100-03 QUALITY CONTROL ORGANIZATION. The Contractor's CQCP shall be implemented by the establishment of a separate QC organization. An organizational chart shall be developed to show all QC personnel and how these personnel integrate with other management/production and construction functions and personnel.

The organizational chart shall identify all QC staff by name and function, and shall indicate the total staff required to implement all elements of the CQCP, including inspection and testing for each item of work. If necessary, different technicians can be utilized for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the CQCP, the personnel assigned shall be subject to the qualification requirements of Subsections 100-03.a. and 100-03.b. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

The QC organization shall consist of the following minimum personnel:

a. Program Administrator. The Contractor Quality Control Program Administrator (CQCPA) shall be a full-time employee of the Contractor, or a consultant engaged by the Contractor. The CQCPA shall have a minimum of 5 years of experience in QC pavement construction with prior QC experience on a project of comparable size and scope as the contract.

Included in the 5 years of paving/QC experience, the CQCPA shall meet at least one of the following requirements:

(1) Professional engineer with 1 year of airport paving experience acceptable to the Engineer.

(2) Engineer-in-training with 2 years of airport paving experience acceptable to the Engineer.

(3) National Institute for Certification in Engineering Technologies (NICET) Civil Engineering Technology Level IV with 3 years of airport paving experience.

(4) An individual with 4 years of airport paving experience acceptable to the Engineer, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.

The CQCPA shall have full authority to institute any and all actions necessary for the successful implementation of the CQCP to ensure compliance with the contract Plans and technical specifications. The CQCPA authority shall include the ability to immediately stop production until materials and/or processes are in compliance with contract specifications. The CQCPA shall report

directly to a responsible officer of the construction firm. The CQCPA may supervise the CQCP on more than one project provided that person can be at the job site within 2 hours after being notified of a problem.

b. QC Technicians. A sufficient number of QC technicians necessary to adequately implement the CQCP shall be provided. These personnel shall be either engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field equivalent to NICET Level II in Civil Engineering Technology or higher, and shall have a minimum of 2 years of experience in their area of expertise.

The QC technicians shall report directly to the CQCPA and shall perform the following functions:

(1) Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by paragraph100-06, and.

(2) Performance of all QC tests as required by the technical specifications and Subsection 100-07.

Certification at an equivalent level of qualification and experience, by a state or nationally recognized organization will be acceptable in lieu of NICET certification, including WAQTC qualification in any modules for which testing will be performed.

c. Staffing Levels. The Contractor shall provide sufficient qualified QC personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The CQCP shall state where different technicians will be required for different work elements.

100-04 PROJECT PROGRESS SCHEDULE. Critical QC activities shall be shown on the project schedule as required by Section 80, paragraph 80-03, *Prosecution and Progress*.

100-05 SUBMITTALS SCHEDULE. The Contractor shall submit a detailed listing of all submittals (e.g., mix designs, material certifications) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include as a minimum:

a. Pay item number;

b. Item description;

c. Description of submittal;

d. Specification Subsection requiring submittal; and

e. Scheduled date of submittal.

100-06 INSPECTION REQUIREMENTS. QC inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by paragraph 100-09.

Inspections shall be performed as needed to ensure continuing compliance with contract requirements until completion of the particular feature of work. Inspections shall include the following minimum requirements:

a. During plant operation for material production, QC test results and periodic inspections shall be utilized to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment utilized in proportioning and mixing shall be inspected to ensure its proper operating condition. The CQCP shall detail how these and other QC functions will be accomplished and utilized.

b. During field operations, QC test results and periodic inspections shall be utilized to ensure the quality of all materials and workmanship. All equipment utilized in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The CQCP shall document how these and other QC functions will be accomplished and utilized.

100-07 CONTRACTOR QC TESTING FACILITY.

a. For projects that include Item P-401, meet paragraph401-3.2 Job Mix Design (JMD) Laboratory.

b. For projects that include Item P-501, meet paragraph 501-3.2 Concrete Mix Laboratory.

100-08 QC TESTING PLAN. As a part of the overall CQCP, the Contractor shall implement a QC testing plan, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by the technical specification for the Pay Item, as well as any additional QC tests that the Contractor deems necessary to adequately control production and/or construction processes.

The QC testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:

a. Pay item number (e.g., P401.010.0010);

b. Item description (e.g., Hot Mix Asphalt, Type I, Class A);

c. Test type (e.g., gradation, grade, asphalt content);

d. Test standard (e.g., ASTM or AASHTO test number, as applicable);

e. Test frequency (e.g., as required by technical specifications or Material Sampling and Testing Frequency table when requirements are not stated);

f. Responsibility (e.g., plant technician); and

g. Control requirements (e.g., target, permissible deviations).

The QC testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples according to ASTM D3665. The Engineer shall be provided the opportunity to witness QC sampling and testing.

All QC test results shall be documented by the Contractor as required by paragraph 100-09.

100-09 DOCUMENTATION. The Contractor shall maintain current QC records of all inspections and tests performed. These records shall include factual evidence that the required QC inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

These records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the Engineer daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the CQCPA.

Contractor QC records required for the contract shall include, but are not necessarily limited to, the following records:

a. Daily Inspection Reports. Each Contractor QC technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations on a form acceptable to the

Engineer. These technician's daily reports shall provide factual evidence that continuous QC inspections have been performed and shall, as a minimum, include the following:

(1) Pay item number and description;

(2) Compliance with approved submittals;

(3) Proper storage of materials and equipment;

(4) Proper operation of all equipment;

(5) Adherence to Plans and technical specifications;

(6) Summary of any necessary corrective actions; and

(7) Safety inspection.

The daily inspection reports shall identify all QC inspections and QC tests conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible QC technician and the CQCPA. The Engineer shall be provided at least one copy of each daily inspection report on the work day following the day of record. When QC inspection and test results are recorded and transmitted electronically, the results shall be archived.

b. Daily Test Reports. The Contractor shall be responsible for establishing a system which will record all QC test results. Daily test reports shall document the following information:

(1) Pay item number and description;

(2) Test designation;

(3) Location;

(4) Date of test;

(5) Control requirements;

(6) Test results;

(7) Causes for rejection;

(8) Recommended remedial actions; and

(9) Retests.

Test results from each day's work period shall be submitted to the Engineer prior to the start of the next day's work period. When required by the technical specifications, the Contractor shall maintain statistical QC charts. When QC daily test results are recorded and transmitted electronically the results shall be archived.

100-10 CORRECTIVE ACTION REQUIREMENTS. The CQCP shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action shall include both general requirements for operation of the CQCP as a whole, and for individual items of work contained in the technical specifications.

The CQCP shall detail how the results of QC inspections and tests will be used for determining the need for corrective action and shall contain clear rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the technical specifications, the Contractor shall establish and utilize statistical QC charts for individual QC tests. The requirements for corrective action shall be linked to the control charts.

100-11 INSPECTION BY THE ENGINEER. All items of material and equipment shall be subject to inspection by the Engineer at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate QC system in conformance with the requirements detailed herein and the applicable technical specifications and Plans. In addition, all items of materials, equipment and work in place shall be subject to inspection by the Engineer at the site for the same purpose.

Inspection by the Engineer does not relieve the Contractor of performing QC inspections of either on-site or off-site Contractor's or subcontractor's work.

100-12 NONCOMPLIANCE.

a. The Engineer will notify the Contractor in writing of any noncompliance with the CQCP. The Contractor shall, after receipt of such notice, take corrective action.

b. When QC activities do not comply with either the CQCP or the contract provisions, or when the Contractor fails to properly operate and maintain an effective CQCP, and no effective corrective actions have been taken after notification of non-compliance, the Engineer may:

(1) Order the Contractor to replace ineffective or unqualified QC personnel or subcontractors, and /or.

(2) Order the Contractor to stop operations until appropriate corrective action is taken.

SECTION 110
METHOD OF ESTIMATING
PERCENTAGE OF MATERIAL WITHIN SPECIFICATION LIMITS (PWL)

110-01 GENERAL. All statistical Quality Level Analysis (QLA) is computed using the Engineer's Price Adjustment program. The program calculates all intermediate values to 16 decimal places. Pay factors are rounded to the nearest 0.001. The basis of payment for production lots of selected pay items is adjusted using statistical analysis of acceptance test results.

Analysis is based on an Acceptable Quality Level (AQL) of 90 percent. The AQL is the minimum Percent Within Limits (PWL) at which the material is considered fully acceptable and receives a 1.000 pay factor.

As an incentive to produce quality material, a pay factor greater than 1.000 is possible. The maximum pay factor obtainable is 1.050.

110-02 METHOD FOR COMPUTING PWL. The computational sequence for computing PWL is as follows:

The procedure for estimating the PWL uses the number (*n*), the arithmetic mean ($\overline{X}$) and the sample standard deviation (*s*), of acceptance test results as shown below. If the sample standard deviation is less than 0.001, then it is set at 0.001.

a. The arithmetic mean is computed:

$$\overline{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

Where: X_i = test result for sublot i.

$\sum_{i=1}^{n}$ = sum of values from sublot 1 to n.

b. The sample standard deviation is computed:

$$s = \sqrt{\frac{\sum_{i=1}^{n} (X_i - \overline{X})^2}{(n-1)}}$$

The upper specification limit (USL) and lower specification limit (LSL) are equal to the Target Value (TV) plus and minus the allowable tolerances as defined in the pay item specification.

Quality Indexes are computed as shown below. The maximum Quality Index obtainable is 10.000.

c. The Upper Quality Index (Q_U) is computed:

$$Q_U = \frac{USL - \overline{X}}{s}$$

d. The Lower Quality Index (Q_L) is computed:

$$Q_L = \frac{\overline{X} - LSL}{s}$$

The computed Q_U and Q_L are used with AASHTO R 9 to determine the Percent Within Upper Limits (PWL_U) and Percent Within Lower Limits (PWL_L).

e. The PWL used in pay factor determination is:

$$PWL = (PWL_U + PWL_L) - 100$$

When material requirements are one-sided, with only an upper or lower limit, then the PWL is equal to the percent within the side that has a limit. For example, if a material only has an upper specification (maximum) limit, then PWL= PWL_U. Also, two-sided specification limits with one side that cannot be exceeded (like 100% passing) will be analyzed as if they are one-sided.

f. The pay factor (PF) is:

$$PF = 0.55 + \frac{PWLo}{200}$$

Where: PWL varies from 50.000 to 100.000.

When PWL is less than 50.000, pay factor (PF) = zero.

PART II TECHNICAL SPECIFICATIONS

DRAINAGE ITEMS

ITEM D-701 PIPE FOR STORM DRAINS AND CULVERTS

DESCRIPTION

701-1.1 This item shall consist of the construction of pipe culverts 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
Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains	ASTM A760
Galvanized Steel Corrugated Structural Plates and Fasteners for Pipe, Pipe-Arches, and Arches	ASTM A761
Polymer Precoated Corrugated Steel Pipe for Sewers and Drains Post-Coated and Lined (Bituminous or Concrete)	ASTM A762
Corrugated Steel Sewer and Drainage Pipe	ASTM A849
Corrugated Aluminum Alloy Culvert Pipe	ASTM B745
Non-Reinforced Concrete Pipe	ASTM C14
Reinforced Concrete Pipe	ASTM C76
Reinforced Concrete D-Load Pipe	ASTM C655
Reinforced Concrete Arch Pipe	ASTM C506
Reinforced Concrete Elliptical Pipe	ASTM C507
Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers	ASTM C1433
Corrugated Polyethylene (PE) Pipe and Fittings	ASTM F667
Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter	ASTM F714
Poly (Vinyl Chloride) Ribbed Drain Pipe & Fittings Based on Controlled Inside Diameter	ASTM F794
Polyethylene (PE) Large Diameter profile Wall Sewer and Drain Pipe	ASTM F894
Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings	ASTM F949
Steel Reinforced Polyethylene (PE) Corrugated Pipe	ASTM F2435
Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage	ASTM F2562
Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe	ASTM F2736
Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications	ASTM F2764
Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications.	ASTM F2881
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 D3034
Corrugated Polyethylene Drainage Tubing	AASHTO M 252
Corrugated Polyethylene Pipe, 300 mm to 1500 mm Diameter	AASHTO M 294
Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings	

701-2.3 CONCRETE. Concrete for pipe cradles shall have a minimum compressive strength of 2,000 pounds per square inch (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 C443. Rubber gaskets for PVC pipe and polyethylene pipe shall conform to the requirements of ASTM F477. Rubber gaskets for zinc-coated steel pipe and precoated galvanized pipe shall conform to the requirements of ASTM D1056, for the ``RE'' closed cell grades. Rubber gaskets for steel reinforced thermoplastic ribbed pipe shall conform to the requirements of ASTM F477.

701-2.5 JOINT MORTAR. Pipe joint mortar shall consist of one part by volume of 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. CONTROLLED LOW-STRENGTH MATERIAL (CLSM). Controlled low-strength material shall conform to the requirements of Item P-153. When CLSM is used all joints shall have gaskets.

701-2.9 CULVERT MARKER POSTS. Provide posts made of durable glass fiber and resin reinforced material flexible to -40°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.

701-2.10 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-299 Aggregate Surface Course (when included in this contract).

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

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 18 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 8 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. Compact all bedding to 95% of the maximum density determined by ATM 207 or ATM 212.

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.

Class C bedding shall consist of bedding the pipe in its natural foundation material to a depth of not less than 10% of the pipe’s vertical diameter. The bed shall be shaped to fit the pipe 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.
1/2	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 concrete pipes shall be placed with the manufacturer's reference lines designating the top of pipe 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 A760 for steel pipe and AASHTO M 36 for aluminum pipe.

c. **PVC, Polypropylene, and Polyethylene Pipe.** Joints for PVC, polypropylene, and polyethylene pipe shall conform to the requirements of ASTM D3212 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. Fittings for polypropylene pipe shall conform to the requirements of ASTM F2881, ASTM F2736, or ASTM F2764.

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-299, 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 without displacing the pipe. Material shall be brought up evenly on both sides of the pipe for the full length 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, polypropylene, 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.

It shall be the Contractor’s responsibility to protect installed pipes and culverts from damage due to construction equipment operations. The Contractor shall be responsible for installation of any extra strutting or backfill required to protect pipes from the construction equipment.

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

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. All trench excavation and backfill associated with pipe installation is subsidiary to item D-701a.

701-4.2 CONCRETE. The volume of concrete for pipe cradles to be paid for will be the number of cubic yards of concrete which is completed in place and accepted.

701-4.3 ROCK. The volume of rock to be paid for will be the number of cubic yards of rock excavated. No payment will be made for the cushion material placed for the bed of the pipe.

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

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; at the contract unit price per cubic yard of concrete for pipe cradles; and at the contract unit price per cubic yard for rock excavation. Culvert marker posts will not be paid for directly, but will be subsidiary to pipe items.

Payment will be made under:

Item D701.010.0018	CS Pipe, 18-inch – per linear foot
Item D701.070.0000	Concrete for Pipe Cradles – per cubic yard
Item D701.080.0000	Rock Excavation – per cubic yard

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 1500 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 A760	Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
ASTM A761	Steel Galvanized, Corrugated Structural Plates and Fasteners for Pipe, Pipe-Arches, and Arches
ASTM A762	Precoated (Polymeric) Galvanized Steel Sewer and Drainage Pipe
ASTM A849	Post-Coated and Lined (Bituminous or Concrete) Corrugated Steel Sewer and Drainage Pipe
ASTM B745	Corrugated Aluminum Alloy Culvert Pipe
ASTM C14	Concrete Sewer, Storm Drain, and Culvert Pipe
ASTM C1433	Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers, 3 – 24 in
ASTM C76	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C443	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C506	Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe

ASTM C655	Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
ASTM C700	Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
ASTM D1056	Flexible Cellular Materials--Sponge or Expanded Rubber
ASTM D3034	Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F667	Corrugated Polyethylene Pipe and Fittings
ASTM F714	Polyethylene (PE) Plastic Pipe (DR PR) Based on Outside Diameter
ASTM F794	Poly (Vinyl Chloride) Ribbed Drain Pipe & Fittings Based on Controlled Inside Diameter
ASTM F894	Polyethylene (PE) Large Diameter profile Wall Sewer and Drain Pipe
ASTM F949	Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
ASTM F2435	Steel Reinforced Polyethylene (PE) Corrugated Pipe
ASTM F2562	Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage
ASTM F2736	Polypropylene (PP) Corrugated Singe Wall Pipe and Double Wall Pipe
ASTM F2764	Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications
ASTM F2881	Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

ITEM D-702 SLOTTED DRAINS

DESCRIPTION

702-1.1 This item shall consist of the construction of steel slotted drains according to these Specifications and in reasonably close conformity with the lines and grades shown on the Plans. Typical details shall be shown on the Plans.

MATERIALS

702-2.1 GENERAL. All slotted drains shall meet the requirements shown on the Plans and specified below. All slotted drains shall meet specified hydraulic design requirements and shall support the loadings specified.

Standard details can be found in the American Association of State Highway and Transportation Officials (AASHTO)-AGC-ARTBA publication "A Guide to Standardized Highway Drainage Products." All products used shall meet the most demanding aircraft loading and tire pressure requirements, as well as maintenance and equipment loadings.

702-2.2 PIPE.

a. Steel slotted Drain. Pipe shall be metallic coated (galvanized or aluminized steel type II) corrugated steel type I meeting the requirements of AASHTO M 36. Pipe diameter and gage shall be as shown on the Plans. The corrugated steel pipe shall have a minimum of two rerolled annular ends.

b. Not Used.

702-2.3 GRATES AND CASTINGS.

a. Steel Slotted Drain. Grates shall be manufactured from ASTM A36 or ASTM A1011, Grade 36 steel. Spacers and bearing bars (sides) shall be 3/16-inch material. The spacers shall be welded to each bearing bar with four 1-1/4-inch long by 3/16-inch wide fillet welds on each side of the bearing bar at spacings not exceeding 6 inches. The grates shall be 6 inches high or as shown on the Plans and shall have a maximum 1-3/4-inch opening in the top.

Grates shall be galvanized according to AASHTO M 111 except with a 2 ounces per square foot galvanized coating.

The grates shall be fillet welded to the corrugated steel pipe with a minimum weld 1 inch long on each side of the grate at every other corrugation. Weld areas and the heat affected zones where the slot is welded to the corrugated pipe shall be thoroughly cleaned and painted with a zinc-rich paint according to repair of damaged coatings in AASHTO M 36.

Each 20-foot length of drain delivered to the job site shall be within the following tolerances: vertical bow ± 3/8-inch, horizontal bow ± 5/8-inch, twist ± 1/2-inch.

b. Not used.

702-2.4 CONCRETE. Plain or reinforced concrete used for steel slotted shall conform to the requirements of Section P-610 Concrete for Miscellaneous Structures.

CONSTRUCTION METHODS

702-3.1 EXCAVATION. The width of the trench shall be sufficient to permit satisfactory installation and jointing of the slotted drain and placing of a concrete backfill material under and around the drain, but shall not be less than the external pipe diameter plus 6 inches on each side. The depth of the trench shall be a minimum of 2 inches below the invert for steel slotted drain.

702-3.2 INSTALLATION. Slotted drains shall be laid in sections joined firmly together with coupling bands or as shown on the Plans. The top of all drains shall be held firmly in place to the proper grade, to preclude movement during the backfilling operation.

702-3.3 JOINING. Slotted steel drain joints shall be firmly joined by modified hugger type bands, or as indicated, to secure the pipe and prevent infiltration of the backfill. When the slotted steel drain is banded together, the adjacent grates shall have a maximum 3-inch gap.

702-3.4 BACKFILLING. Slotted drains shall be inspected before any backfill is placed. Damaged drains shall be aligned or replaced at the expense of the Contractor.

The trench holding the slotted drain assembly shall be backfilled with concrete that will easily flow under and around the drain and the trench wall. The opening in the top of grates shall be covered to prevent unwanted material from entering the drain during the backfilling and subsequent surfacing operations.

METHOD OF MEASUREMENT

702-4.1 The length of slotted drain will be measured in linear feet of slotted drain in place, completed, and approved. It will be measured along the centerline of the drain from end or inside face of structure to the end or inside face of structure, whichever is applicable. The classes, types, and sizes will be measured separately. All fittings will be included in the length as typical pipe sections being measured.

BASIS OF PAYMENT

702-5.1 Payment will be made at the contract unit price per linear foot for each kind of slotted drain type and size designated and at the contract unit price per cubic yard of concrete for backfill.

Payment will be made under:

Item D702.010.0000	Slotted Drain, 18-inch, 14 Gauge Pipe – per linear foot
Item D702.020.0000	Concrete for Backfill – per cubic yard
Item D702.030.0000	Trench Drain – per linear foot

MATERIAL REQUIREMENTS

AASHTO M 36	Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
AASHTO M 111	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A36	Structural Steel
ASTM A1011	Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low Alloy, High Strength Low Alloy with Improved Formability, and Ultra High Strength
Information	*A Guide to Standardized Highway Drainage Products* disseminated under the sponsorship of the American Association of State Highway and Transportation Officials, Associated General Contractors, and the American Road and Transportation Builders Association

ITEM D-705 PIPE UNDERDRAINS FOR AIRPORTS

DESCRIPTION

705-1.1 This item shall consist of the construction of pipe drains according to these Specifications and in reasonably close conformity with the lines and grades shown on the Plans.

MATERIALS

705-2.1 GENERAL. Materials shall meet the requirements shown on the Plans and specified below.

705-2.2 PIPE. The pipe shall be of the type called for on the Plans or in the bid and shall be according to the following appropriate requirements.

Perforated Concrete Pipe	ASTM C444
Porous Concrete Pipe	ASTM C654
Corrugated Steel Pipe, Metallic Coated for Sewers and Drains	ASTM A760
Polymer Precoated Perforated Corrugated Steel Pipe	ASTM A762
Perforated Corrugated Aluminum Alloy Pipe	AASHTO M 196
Smooth-Wall Perforated PVC Pipe	ASTM F758
Poly Vinyl Chloride (PVC) Ribbed Drain Pipe & Fittings Based on Controlled Inside Diameter	ASTM F794
Poly Vinyl Chloride (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings	ASTM F949
Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage	ASTM F2562
Perforated Corrugated Steel Pipe	AASHTO M 36
Bituminous-Coated Perforated Corrugated Aluminum Alloy Pipe	AASHTO M 196 and M 190
Corrugated Polyethylene Drainage Tubing	AASHTO M 252
Corrugated Polyethylene Pipe, 300 to 1500 mm Diameter	AASHTO M 294
Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter	AASHTO M 304
Steel Reinforced Polyethylene (PE) Ribbed Pipe, 12 to 36 inch Diameter	AASHTO MP 20

705-2.3 JOINT MORTAR. Pipe joint mortar shall consist of one part by volume of 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.

705-2.4 ELASTOMERIC SEALS. Elastomeric seals shall conform to the requirements of ASTM F477.

705-2.5 POROUS BACKFILL. Porous backfill shall be free of clay, humus, or other objectionable matter, and shall conform to the gradation in Table 1 when tested according to ATM 304.

TABLE 1. GRADATION OF POROUS BACKFILL

Sieve Designation (square openings)	Percentage by Weight Passing Sieves	
	No. 1	No. 2
1-1/2 in.		100
1 in.		90 - 100
3/8 in.	100	25 - 60
No. 4	95 - 100	5 - 40
No. 8	---	0 - 20
No. 16	45 - 80	---
No. 50	10 - 30	---
No. 100	0 - 10	---

When two courses of porous backfill are specified in the Plans, the finer of the materials shall conform to particle size in Table 1, Gradation of Porous Backfill, for porous backfill No. 1. The coarser granular material shall meet the gradation given in Table 1, Gradation of Porous Backfill, for porous backfill No. 2.

705-2.6. GRANULAR MATERIAL. Granular material used for bedding and backfill shall be fine, readily compactable soil, or granular material selected from the excavation or a source of the Contractor's choosing. It shall not contain frozen lumps, chunks of highly plastic clay, or other objectionable material. Material for backfill shall be 100% passing a 2-inch sieve, 95-100% passing a 1/2-sieve, and 0-5% passing a No. 4 sieve.

705-2.7. FILTER FABRIC. The filter fabric shall conform to the requirements of AASHTO M 288, Class 2, except as modified by Table 2.

TABLE 2. FILTER FABRIC PROPERTIES

Fabric Property	Test Method	Test Requirement
Apparent Opening Size	ASTM D4751	40-100
Permittivity	ASTM D4491	0.80
Accelerated Weathering (UV Stability) (Strength Retained - %)	ASTM D4355 *(500 hrs exposure)	70

CONSTRUCTION METHODS

705-3.1 EQUIPMENT. All equipment necessary and required for the proper construction of pipe underdrains shall be on the project, in good working condition, and approved by the Engineer before construction is permitted to start.

705-3.2 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 shall not be less than the external diameter of the pipe plus 6 inches on each side of the pipe. The trench walls shall be approximately vertical.

Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 4 inches. 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 granular material for the full trench width. The Engineer will determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

Excavated material not required or acceptable for backfill shall be disposed of by the Contractor as directed by the Engineer. The excavation shall not be carried below the required depth; if this occurs, the trench shall be backfilled at the Contractor's expense with material approved by the Engineer and compacted to the density of the surrounding material.

The pipe bed shall be so shaped that at least the lower quarter of the pipe shall be in continuous contact with the bottom of the trench. Spaces for the pipe bell shall be excavated to allow the pipe barrel to support the entire weight of the pipe.

The Contractor shall do trench bracing, sheathing, or shoring necessary to perform and protect the excavation as required for safety and conformance to Federal, state, and local laws. Unless otherwise provided, the bracing, sheathing, or shoring shall be removed by the Contractor after the backfill has reached at least 12 inches over the top of the pipe. The sheathing or shoring shall be pulled as the granular backfill is placed and compacted to avoid any unfilled spaces between the trench wall and the backfill material. The cost of bracing, sheathing, or shoring, and the removal of same, shall be included in the unit price bid per linear foot for the pipe.

705-3.3 LAYING AND INSTALLING PIPE.

a. Concrete or Clay Pipe. The laying of the pipe in the finished trench shall be started at the lowest point and laid upgrade. When bell and spigot pipe is used, the bells shall be laid upgrade. If tongue and groove pipe is used, the groove end shall be laid upgrade. Holes in perforated pipe shall be placed down, unless otherwise shown on the Plans. The pipe shall be firmly and accurately set to line and grade so that the invert will be smooth and uniform. Pipe shall not be laid on frozen ground.

Pipe which is not true in alignment, or which shows any settlement after laying, shall be taken up and relaid by the Contractor at no additional expense.

b. Metal and Fiber Pipe. The metal pipe shall be laid with the separate sections joined firmly together with bands, with outside laps of circumferential joints pointing upgrade, and with longitudinal laps on the sides. Any metal in the pipe or bands which is not protected thoroughly by galvanizing shall be coated with a suitable asphaltum paint.

The sections of bituminized-fiber pipe shall be securely fastened together with suitable fittings. When the fiber couplings are tapered, they shall provide a tight, driven fit.

During installation, the asphalt-protected pipe shall be handled without damaging the asphalt coating. Any breaks in the bitumen or treatment of the pipe shall be refilled with the type and kind of bitumen used in coating the pipe originally.

c. PVC or Polyethylene Pipe. PVC or polyethylene pipe shall be installed according to the requirements of ASTM D2321 or AASHTO Standard Specification for Highway Bridges Section 30. Perforations shall meet the requirements of AASHTO M 252 or M 294 Class 2, unless otherwise indicated on the Plans. The pipe shall be laid accurately to line and grade.

d. All Types of Pipe. The upgrade end of pipelines, not terminating in a structure, shall be plugged or capped as approved by the Engineer.

Unless otherwise shown on the Plans, a 4-inch bed of granular backfill material shall be spread in the bottom of the trench throughout the entire length under all perforated pipe underdrains.

Pipe outlets for the underdrains shall be constructed when required or shown on the Plans. The pipe shall be laid with tight-fitting joints. Porous backfill is not required around or over pipe outlets for underdrains. All connections to other drainage pipes or structures shall be made as required and in a satisfactory manner. If connections are not made to other pipes or structures, the outlets shall be protected and constructed as shown on the Plans.

e. **Filter Fabric.** The filter fabric shall be installed according to the manufacturer's recommendations, or according to AASHTO M 288 APPENDIX, unless otherwise shown on the Plans.

705-3.4 MORTAR. The mortar shall be of the desired consistency for caulking and filling the joints of the pipe and for making connections to other pipes or to structures. Mortar that is not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted.

705-3.5 JOINTS IN CLAY OR CONCRETE PIPE. When open or partly open joints are required or specified, they shall be constructed as indicated on the Plans. The pipe shall be laid with the ends fitted together as designed. If bell and spigot pipe is used, mortar shall be placed along the inside bottom quarter of the bell to center the following section of pipe.

The open or partly open joints shall be surrounded with granular material meeting requirements of porous backfill No. 2 in Table 1 or as indicated on the Plans. This backfill shall be placed so its thickness will be not less than 3 inches nor more than 6 inches, unless otherwise shown on the Plans.

When the original material excavated from the trench is impervious, commercial concrete sand or granular material meeting requirements of porous backfill No. 1 shall surround porous backfill No. 2, as shown on the Plans or as directed by the Engineer.

When the original material excavated from the trench is previous and suitable, it may be used as backfill in lieu of porous backfill No. 1, when indicated on the Plans or as directed by the Engineer.

705-3.6 BACKFILLING.

a. **Earth.** All trenches and excavations shall be backfilled soon after the pipes are installed, unless additional protection of the pipe is directed. The backfill material shall be selected material from excavation or borrow and shall be approved by the Engineer. The select material shall be placed on each side of the pipe out to a distance of the nominal pipe diameter and 1 foot over the top of the pipe and shall be readily compacted. It shall not contain stones retained on a 3-inch sieve, frozen lumps, chunks of highly plastic clay, or any other material which is objectionable to the Engineer. The material shall be moistened or dried, as required to aid compaction. Placement of the backfill shall not cause displacement of the pipe. Special care shall be taken in placing the backfill. Great care shall be used to obtain thorough compaction under the haunches and along the sides to the top of the pipe.

   The backfill shall be placed in loose layers not exceeding 6 inches in depth under and around the pipe, and not exceeding 8 inches over the pipe. Successive layers shall be added and thoroughly compacted by hand and pneumatic tampers, approved by the Engineer, until the trench is completely filled and brought to the proper elevation. Backfilling shall be done to avoid damaging top or side pressures on the pipe.

   In embankments and other unpaved areas, the backfill shall be compacted per Item P-152 to the density required for embankments in unpaved areas. Under paved areas, the subgrade and any backfill shall be compacted per Item P-152 to the density required for embankments for paved areas.

b. **Granular Material.** When granular backfill is required, its placement in the trench and about the pipe shall be as shown on the Plans. The granular backfill shall not contain an excessive amount of foreign matter, nor shall soil from the sides of the trench or from the windrow be allowed to filter into the granular backfill. When required by the Engineer, a template shall be used to properly place and keep separate the two sizes of backfill. The backfill shall be placed in loose layers not exceeding 6 inches in depth. The granular backfill shall be compacted by hand and pneumatic tampers to the requirements as given for embankment. Backfilling shall be done to avoid damaging top or side pressure on the pipe. The granular backfill shall extend to the elevation of the trench, as shown on the Plans.

When perforated pipe is specified, granular backfill material shall be placed along the full length of the pipe. The position of the granular material shall be as shown on the Plans. If the original material excavated from the trench is pervious and suitable, it shall be used in lieu of porous backfill No. 1.

If porous backfill is placed in paved or adjacent to paved areas before grading or subgrade operations is completed, the backfill material shall be placed immediately after laying the pipe. The depth of the granular backfill shall be not less than 12 inches, measured from the top of the underdrain. During subsequent construction operations, a minimum depth of 12 inches of backfill shall be maintained over the underdrains. When the underdrains are to be completed, any unsuitable material shall be removed exposing the porous backfill. Porous backfill containing objectionable material shall be removed and replaced with suitable material. The cost of removing and replacing any unsuitable material shall be at the Contractor's expense.

If a granular subbase blanket course is to be used which extends several feet beyond the edge of paving to the outside edge of the underdrain trench, the granular backfill material over the underdrains shall be placed in the trench up to an elevation of 2 inches above the bottom surface of the granular subbase blanket course. Immediately prior to the placing of the granular subbase blanket course, the Contractor shall blade this excess trench backfill from the top of the trench onto the adjacent subgrade where it can be incorporated into the granular subbase blanket course. Any unsuitable material which remains over the underdrain trench shall be removed and replaced. The subbase material shall be placed to provide clean contact between the subbase material and the underdrain granular backfill material for the full width of the underdrain trench.

c. Controlled low-strength material (CLSM). Controlled low-strength material shall conform to the requirements of Item P-153.

d. Deflection Testing. The Engineer may at any time, notwithstanding previous material acceptance, reject or require re-installation of pipe that exceeds 5% deflection when measured according to ASTM D2321, including Appendices.

705-3.7 CONNECTIONS. When the Plans call for connections to existing or proposed pipe or structures, these connections shall be watertight and made so that a smooth uniform flow line will be obtained throughout the drainage system.

705-3.8 CLEANING AND RESTORATION OF SITE. After the backfill is completed, the Contractor shall dispose of all surplus material, soil, and rubbish from the site. Surplus soil may be deposited in embankments, shoulders, or as directed by the Engineer. Except for paved areas of the airport, the Contractor shall restore all disturbed areas to their original condition.

METHOD OF MEASUREMENT

705-4.1 The length of pipe to be paid for will be the number of linear feet of pipe underdrains in place, completed, and approved; 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 sizes will be measured separately. All fittings will be included in the length as typical pipe sections in the pipeline being measured.

705-4.2 The quantity of porous backfill to be paid for will be the number of cubic yards of porous backfill No. 1 and No. 2, complete in place and accepted, and will be determined from the dimensions given on the Plans by typical trench sections indicating the placement of porous backfill or dimensions ordered by the Engineer.

705-4.3 The quantity of filter fabric to be paid for will be the number of square yards of filter fabric in place, completed, and approved; and will be determined from the dimensions given on the Plans by typical trench sections indicating the placement of filter fabric or dimensions directed by the Engineer.

BASIS OF PAYMENT

705-5.1 Payment will be made at the contract unit price per linear foot for pipe underdrains of the type, class, and size designated.

705-5.2 POROUS BACKFILL.

a. Porous backfill No. 1 shall be made at the contract unit price per cubic yard.

b. Porous Backfill No. 2 shall be made at the contract unit price per cubic yard.

705-5.3 FILTER FABRIC. Filter fabric shall be made at the contract unit price per square yard (square meter) for filter fabric.

705-5.4 PIPE UNDERDRAINS, COMPLETE. Pipe underdrains, complete (including porous backfill and filter fabric) shall be made at the contract unit price per linear foot.

These prices shall be full compensation for furnishing all materials and for all preparation, excavation, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item D705.010.0004	Underdrain, HDPE, 4-inch – per linear foot
Item D705.030.0000	Porous Backfill No. 1 – per cubic yard
Item D705.040.0000	Porous Backfill No. 2 – per cubic yard
Item D705.050.0000	Filter Fabric – per square yard

TESTING REQUIREMENTS

ATM 304	Sieve Analysis of Aggregates & Soils
AASHTO MP 20	Steel Reinforced Polyethylene (PE) Ribbed Pipe, 12 – 36 in Diameter

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 190	Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M 196	Corrugated Aluminum Alloy Culverts and Underdrains
AASHTO M 252	Corrugated Polyethylene Drainage Tubing
AASHTO M 288	Geotextile Specification for Highway Applications
AASHTO M 294	Corrugated Polyethylene Pipe, 300 to 1500 mm Diameter
AASHTO M 304	Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO	*Standard Specifications for Highway Bridges*
ASTM A760	Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
ASTM A762	Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM C444	Perforated Concrete Pipe
ASTM C654	Porous Concrete Pipe
ASTM D2321	Underground Installation of Flexible Thermoplastic Sewer Pipe

ASTM D3034	Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
ASTM F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F758	Smooth-Wall Poly Vinyl Chloride (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
ASTM F949	Poly Vinyl Chloride (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F2562	Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage

ITEM D-751 MANHOLES, CATCH BASINS, INLETS, AND INSPECTION HOLES

DESCRIPTION

751-1.1 This item shall consist of construction of manholes, catch basins, inlets, and inspection holes, according to these Specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the Plans or required by the Engineer.

MATERIALS

751-2.1 BRICK. The brick shall conform to the requirements of ASTM C32, Grade MS.

751-2.2 MORTAR. Mortar shall consist of one part by volume 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.

751-2.3 CONCRETE. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Item P-610.

751-2.4 PRECAST CONCRETE PIPE MANHOLE RINGS. Precast concrete pipe manhole rings shall conform to the requirements of ASTM C478. Unless otherwise specified, the risers and offset cone sections shall have an inside diameter of not less than 36 inches nor more than 48 inches. There shall be a gasket between individual sections and sections cemented together with mortar on the inside of the manhole. Gaskets shall conform to the requirements of ASTM C443.

751-2.5 CORRUGATED METAL. Corrugated metal shall conform to the requirements of AASHTO M 36.

751-2.6 FRAMES, COVERS, AND GRATES. The castings shall conform to one of the following requirements:

- **a.** Gray iron castings shall meet the requirements of ASTM A48, Class 30B and 35B.
- **b.** Malleable iron castings shall meet the requirements of ASTM A47.
- **c.** Steel castings shall meet the requirements of AASHTO M 103.
- **d.** Structural steel for grates and frames shall conform to the requirements of ASTM A283, Grade D.
- **e.** Ductile iron castings shall conform to the requirements of ASTM A536.
- **f.** Austempered ductile iron castings shall conform to the requirements of ASTM A897.

All castings or structural steel units shall conform to the dimensions shown on the Plans and shall be designed to support the loadings, aircraft gear configuration and/or direct loading, specified.

Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of AASHTO M 111.

751-2.7 STEPS. The steps or ladder bars shall be gray or malleable cast iron, injection-molded polypropylene, or galvanized steel. The steps shall be the size, length, and shape shown on the Plans and those steps that are not galvanized shall be given a coat of asphalt paint, when directed.

751-2.8 PRECAST INLET STRUCTURES. Manufactured in accordance with and conforming to ASTM C913.

CONSTRUCTION METHODS

751-3.1 UNCLASSIFIED EXCAVATION.

a. **Limits of Excavation.** The Contractor shall excavate for structures and structure footings to the lines and grades or elevations, shown on the Plans, or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. The elevations of the bottoms of footings, as shown on the Plans, shall be considered as approximately only; and the Engineer may direct, in writing, changes in dimensions or elevations of footings necessary for a satisfactory foundation.

b. **Excavation.** Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the Engineer. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. Where concrete will rest on a surface other than rock, the bottom of the excavation shall not be disturbed, and excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

c. **Shoring.** The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

d. **Shoring Removal.** All bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall not damage or disturb finished masonry. The cost of removal shall be included in the unit price bid for the structure.

e. **Engineer's Approval.** After excavation is completed for each structure, the Contractor shall notify the Engineer. No concrete or reinforcing steel shall be placed after the Engineer has approved the depth of the excavation and the character of the foundation material.

751-3.2 BRICK STRUCTURES.

a. **Foundations.** A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and placed according to the requirements of Item P-610.

b. **Laying Brick.** All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar that is not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it which can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set, shall be removed, cleaned, and relaid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where possible, and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.

c. **Joints.** All joints shall be filled with mortar at every course. Exterior faces shall be laid up in advance of backing. Exterior faces shall be plastered or parged with a coat of mortar not less than 3/8 inch thick before the backing is laid up. Prior to parging, all joints on the back of face courses shall be cut flush. Unless otherwise noted, joints shall be not less than 1/4 inch nor more than 1/2 inch wide and the selected joint width shall be maintained uniform throughout the work.

d. **Pointing.** Face joints shall be neatly struck, using the weather struck joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.

e. **Cleaning.** Upon completion of the work all exterior surfaces shall be thoroughly cleaned by scrubbing and washing with water. If necessary to produce satisfactory results, cleaning shall be done with a 5% solution of muriatic acid which shall then be rinsed off with liberal quantities of water.

f. **Curing and Cold Weather Protection.** The brick masonry shall be protected and kept moist for at least 48 hours after laying the brick. Brick masonry work or pointing shall not be done when there is frost on the brick or when the air temperature is below 50 °F unless the Contractor has on the project ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 60 °F for the duration of the curing period.

751-3.3 CONCRETE STRUCTURES. Concrete structures which are to be cast-in-place within the project boundaries shall be built on prepared foundations, conforming to the dimensions and shape indicated on the Plans. The construction shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the Plans and shall be approved by the Engineer before the concrete is placed.

All invert channels shall be constructed and shaped accurately so as to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be sloped to the outlet.

751-3.4 PRECAST CONCRETE STRUCTURES. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another third party certification program approved by the Engineer.

Precast concrete structures shall conform to ASTM C478. Precast concrete structures shall be constructed on prepared or previously placed slab foundations conforming to the dimensions and locations shown on the Plans. All precast concrete pipe sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily. Joints between precast concrete risers and tops shall (1) be full-bedded in cement mortar or (2) utilize a rubber gasket per ASTM C443. The top of the upper precast concrete section shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal, injection molded polypropylene, or metal encapsulated steps which are embedded or built into the side walls shall be aligned and placed in accordance to ASTM C478. When a metal ladder replaces the steps, it shall be securely fastened into position.

751-3.5 CORRUGATED METAL STRUCTURES. Corrugated metal structures shall be prefabricated. All standard or special fittings shall be furnished to provide pipe connections or branches with the correct dimensions and of sufficient length to accommodate connecting bands. The fittings shall be welded in place to the metal structures. The top of the metal structure shall be designed so that either a concrete slab or metal collar may be attached to allow the fastening of a standard metal frame and grate or cover. Steps or ladders shall be furnished as shown on the plans. Corrugated metal structures shall be constructed on prepared foundations, conforming to the dimensions and locations as shown on the plans. When indicated, the structures shall be placed on a reinforced concrete base.

751-3.6 INLET AND OUTLET PIPES. Inlet and outlet pipes shall extend through the walls of the structures a sufficient distance beyond the outside surface to allow for connections. They shall be cut off flush with the wall on the inside surface of the structure, unless otherwise directed. For concrete or brick structures, mortar shall be placed around these pipes so as to form a tight, neat connection.

751-3.7 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES, AND FITTINGS. All castings, frames, and fittings shall be placed in the positions indicated on the Plans or as directed by the Engineer, and shall be set true to line and elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

When frames or fittings are placed on previously constructed masonry, the bearing surface of the masonry shall be brought true to line and grade and shall present an even bearing surface in order so the entire face

or back of the unit will come in contact with the masonry. The unit shall be set in mortar beds and anchored to the masonry as indicated on the Plans or as directed by the Engineer. All units shall set firm and secure.

After the frames or fittings have been set in final position, the concrete or mortar shall be allowed to harden for 7 days, before the grates or covers are placed and fastened down.

751-3.8 INSTALLATION OF STEPS. The steps shall be installed as indicated on the Plans or as directed by the Engineer. When the steps are to be set in concrete, they shall meet the requirements of ASTM C478. The steps shall be placed and secured in position before the concrete is placed. When the steps are installed in brick masonry, they shall be placed as the masonry is being built. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least 7 days. After 7 days, the steps shall be cleaned and painted, unless they have been galvanized.

When steps are required with precast concrete pipe structures, they shall be cast into the sides of the sections at the time the sections are manufactured or set in place after the structure is erected by drilling holes in the concrete and cementing the steps in place.

When steps are required with corrugated metal structures, they shall be welded into aligned position at a vertical spacing of 12 inches.

Instead of steps, prefabricated ladders may be installed. For brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes. For metal structures, the ladder shall be secured by welding the top support to the structure and grouting the bottom support into drilled holes in the foundation or as directed by the Engineer.

751-3.9 BACKFILLING. After a structure has been completed, the area around it shall be backfilled with approved material, in horizontal layers not to exceed 8 inches in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited evenly around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the Plans or as directed by the Engineer.

Backfill shall not be placed against any structure until approved by the Engineer. For concrete structures, approval shall not be given until the concrete has been in place 7 days, or until tests establish that the concrete has attained sufficient strength to withstand any pressure created by the backfill and placing methods.

METHOD OF MEASUREMENT

751-4.1 Manholes, catch basins, inlets, and inspection holes will be measured by the unit.

BASIS OF PAYMENT

751-5.1 The accepted quantities of manholes, catch basins, inlets, and inspection holes will be paid for at the contract unit price per each, complete and in place. This price shall be full compensation for furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the Plans.

All excavation and backfill required to complete the items of this section shall not be measured for payment, and shall be considered as a subsidiary obligation of the Contractor, included in the contract unit price for the structure involved.

Payment will be made under:

ItemD751.010.0048	Manholes Type I, 48-inch - per each
ItemD751.020.0000	Catch Basins - per each
ItemD751.030.0000	Inlets - per each
ItemD751.040.0000	Inspection Holes - per each

MATERIAL REQUIREMENT

AASHTO M 36	Zinc Coated (Galvanized) Corrugated Iron or Steel Culverts and Underdrains
AASHTO M 45	Aggregate for Masonry Mortar
AASHTO M 85	Portland Cement
AASHTO M 103	Steel Castings, Carbon, for General Application
AASHTO M 111	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A47	Malleable Iron Castings
ASTM A48	Gray Iron Castings
ASTM A283	Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes, and Bars
ASTM A536	Ductile Iron Castings
ASTM A897	Austempered Ductile Iron Castings
ASTM C32	Sewer and Manhole Brick
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
ASTM C478	Precast Reinforced Concrete Manhole Sections
ASTM C913	Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers

ITEM D-752 CONCRETE CULVERTS, HEADWALLS, AND MISCELLANEOUS DRAINAGE STRUCTURES

DESCRIPTION

752-1.1 This item shall consist of plain or reinforced concrete culverts, headwalls, and miscellaneous drainage structures constructed according to these Specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the Plans or required by the Engineer.

MATERIALS

752-2.1 CONCRETE. Concrete shall meet the requirements of Item P-610.

CONSTRUCTION METHODS

752-3.1 UNCLASSIFIED EXCAVATION.

a. Trenches and foundation pits for structures or structure footings shall be excavated to the lines and grades or elevations shown on the Plans. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. The elevations of the bottoms of footings, as shown on the Plans, shall be considered as approximate only; and the Engineer may order, in writing, changes in dimensions or elevations of footings necessary to secure a satisfactory foundation.

b. Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the Engineer. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation, and excavation to final grade shall not be made until immediately before the concrete or reinforcing steel is to be placed.

c. The Contractor shall do all bracing, sheathing, or shoring necessary to perform and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for excavation.

d. All bracing, sheathing, or shoring shall be removed by the Contractor after the completion of the structure. Removal shall not disturb or mar finished concrete. The cost of removal shall be included in the unit price bid for excavation.

e. After each excavation is completed, the Contractor shall notify the Engineer. No concrete or reinforcing steel shall be placed until the Engineer has approved the depth of the excavation and the character of the foundation material.

752-3.2 BACKFILLING.

a. After a structure has been completed, backfill with approved material, in horizontal layers not to exceed 8 inches in loose depth, and compact. The field density of the compacted material shall be at least 95% of the maximum density. The maximum density shall be determined according to ATM 207 or ATM 212. The field density and moisture content shall be determined according to ATM 213.

b. No backfilling shall be placed against any structure until approved by the Engineer. For concrete, approval shall not be given until the concrete has been in place 7 days, or until tests establish that the concrete has attained sufficient strength to withstand any pressure created by the backfill or the placement method.

c. Fill placed around concrete culverts shall be deposited on each side at the same time and to approximately the same elevation. All slopes bounding or within the areas to be backfilled shall be stepped or serrated to prevent wedge action against the structure.

d. Backfill will not be measured for direct payment. Performance of this work shall be considered as a subsidiary obligation of the Contractor, covered under the contract unit price for "unclassified excavation for structures."

752-3.3 WEEP HOLES. Weep holes shall be constructed as shown on the Plans.

752-3.4 NOT USED.

METHOD OF MEASUREMENT

752-4.1 Unclassified excavation for structures will be measured in original position, between vertical planes 18 inches outside of and parallel to the neat lines of the footings.

752-4.2 Concrete will be measured by the dimensions shown on the Plans or approved by the Engineer, complete in place and accepted. No measurements or other allowances will be made for forms, false work, cofferdams, pumping, bracing, expansion joints, or finishing of the concrete. No deductions will be made for the volumes of reinforcing steel or embedded items.

752-4.3 Reinforcing steel will be measured by the theoretical weight 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, as the case may be, of equal nominal size.

BASIS OF PAYMENT

752-5.1 Payment will be made at the contract unit price per cubic yard for unclassified excavation for structures; at the contract unit price per cubic yard for concrete for the structures; and at the contract unit price per pound for reinforcing steel.

Payment will be made under:

Item D752.010.0000	Unclassified Excavation for Structures – per cubic yard
Item D752.020.0000	Structural Concrete – per cubic yard
Item D752.030.0000	Reinforcing Steel – per pound
Item D752.040.0000	Trench Drain – per linear foot

TESTING REQUIREMENTS

ATM 212	Standard Density of Coarse Granular Materials Using the Vibratory Compactor
ATM 207	Moisture-Density Relations of Soils
ATM 213	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods

ITEM D-754 CONCRETE GUTTERS, DITCHES, AND FLUMES

DESCRIPTION

754-1.1 This item shall consist of portland cement concrete gutters, ditches, and flumes constructed according to these Specifications at the specified locations according to the dimensions, lines, and grades as shown on the Plans.

MATERIALS

754-2.1 CONCRETE. Plain and reinforced concrete shall meet the requirements of Item P-610.

754-2.2 JOINTS. Joint filler materials and premolded joint material shall conform to Item P-610.

CONSTRUCTION METHODS

754-3.1 PREPARING SUBGRADE. Excavation shall be made to the required width and depth, and the subgrade upon which the item is to be built shall be compacted to a firm uniform grade. All soft and unsuitable material shall be removed and replaced with suitable approved material. When required, a layer of approved granular material, compacted to the thickness indicated on the Plans, shall be placed to form a subbase. The underlying course shall be checked and accepted by the Engineer before placing and spreading operations are started.

754-3.2 PLACING. The forms and the mixing, placing, finishing, and curing of concrete shall conform to the requirements of Item P-610 and the following requirements.

The concrete shall be tamped until it is consolidated and mortar covers the top surface. The surface of the concrete shall be floated smooth and the edges rounded to the radii shown on the Plans. Before the concrete is given the final finishing, the surface shall be tested with a 12-foot straightedge, and any irregularities of more than 1/4 inch in 12 feet shall be eliminated.

The concrete shall be placed with dummy-grooved joints not to exceed 25 feet apart, and no section shall be less than 4 feet long.

Expansion joints of the type called for in the Plans shall be constructed to replace a dummy groove at spacings of approximately 100 feet. When the gutter is placed next to concrete pavement, expansion joints in the gutter shall be located opposite expansion joints in the pavement. When a gutter abuts a pavement or other structure, an expansion joint shall be placed between the gutter and the other structure.

Forms shall not be removed within 24 hours after the concrete has been placed. Minor defects shall be repaired with mortar containing 1 part cement and 2 parts fine aggregate.

Depositing, compacting, and finishing the item shall be conducted to build a satisfactory structure. If any section of concrete is found to be porous, or is otherwise defective, it shall be removed and replaced by the Contractor without additional compensation.

754-3.3 BACKFILLING. After the concrete has set sufficiently, the spaces adjacent to the structure shall be refilled to the required elevation with material specified on the Plans and compacted by mechanical equipment to at least 90 percent of the maximum density as determined by ATM 207 or ATM 212, except that base course for adjacent paved surfaces will be compacted as specified in Item P-209. The in-place density and moisture content shall be determined according to ATM 213.

METHOD OF MEASUREMENT

754-4.1 Concrete will be measured by the dimensions shown on the Plans or ordered by the Engineer. No deductions will be made for the volume occupied by reinforcing steel, anchors, conduits, weep holes, or piling.

754-4.2 Reinforcing steel will be measured by the theoretical weight shown on the Plans or ordered by the Engineer. No allowance will be made for clips, wire, or other material used for fastening reinforcement in place.

BASIS OF PAYMENT

754-5.1 The accepted quantities of structural concrete will be paid for at the contract unit price per cubic yard, complete in place.

754-5.2 The accepted quantities of reinforcing steel will be paid for at the contract price per pound, complete in place.

Payment will be made under:

Item D754.010.0000	Structural Concrete – per cubic yard
Item D754.020.0000	Reinforcing Steel – per pound

TESTING REQUIREMENTS

ATM 212	Standard Density of Coarse Granular Materials Using the Vibratory Compactor
ATM 207	Moisture-Density Relations of Soils
ATM 213	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods

ITEM D-760 THAW PIPE AND THAW WIRES

DESCRIPTION

760-1.1 Furnish, fabricate, and install thaw pipes or electric thaw wire.

MATERIALS

760-2.1 THAW PIPE. Use materials that conform to the following:

Pipe	ASTM A53, galvanized per AASHTO M 111
Fittings	ASTM A234, galvanized according to AASHTO M 111
Pipe Hangers	ASTM A47, galvanized per AASHTO M 111
Braces for Standpipe	ASTM A36, galvanized per AASHTO M 111
Bolts and Nuts	ASTM A307, galvanized per AASHTO M 232

760-2.2 THAW WIRE. Provide materials, devices, fittings, and hardware meeting NEMA standards and bearing the approval of a third party certification, meeting ANSI Z 34.1.

Deliver all warranties and guarantees provided by the manufacturer to the Engineer before acceptance of this work.

a. Conduit and Fittings.

(1) Use conduit, couplings, elbows, and nipples that are rigid, hot-dip galvanized steel meeting ANSI C80.1. Install them as indicated on the applicable drawings. Use threaded type couplings, elbows, and nipples.

(2) Use fittings and miscellaneous conduit hardware that are vapor-proof, galvanized cast iron or steel meeting ANSI/NEMA FB-1 and are compatible with the rigid conduit furnished and installed. Use threaded type fittings.

b. Heat Cable. Use heat cable that meets the following standards:

(1) Parallel-circuit, 120, 208, or 240 Volts of Alternating Current (VAC,), 16 American Wire Gauge (AWG) minimum copper bus wire, with self-limiting conductive core.

(2) Modified polyolefin inner jacket, tinned copper or nickel-clad metallic braid, and fluoropolymer overjacket.

(3) Rated in conduit at the Watts per foot (W/ft) output as specified on the drawings. If heat trace cable output is not specified, use 8 W/ft. at 50 °F.

(4) Underwriters Laboratories (UL) Listed or Factory Mutual (FM) approved specifically as a culvert deicing system in conduit.

All connection components shall be rated for the areas in which they are installed. Use power connections and seals specifically designed for use with the particular type and size of heat cable.

c. Controls.

(1) Use a thermostat that is heavy duty, single stage, line voltage type. Operating temperature range: 25 to +125 °F. Provide capillary bulb for remote sensing.

(2) Use a contactor that is electrically held, 30 Amperes rated, lighting type.

(3) Use a switch that is heavy duty hand-off-auto type with a gloved hand selector switch knob.

(4) Components listed in this section shall be provided in enclosures of the types specified on the drawings. If enclosure types are not specified on the drawings, provide enclosures rated for the areas in which the components are to be installed. Reference NEMA enclosure types and NEC Table 110.28.

d. Conductors. Use copper conductors with insulation rated for 300 Volt minimum where the impressed voltage is 100 Volts or less and 600 Volt where the impressed voltage is between 100 and 600 Volts. 75°C -rated conductor insulation shall be used if indicated on the drawings.

(1) Service and Feeder Cables. Use No. 8 AWG, or larger, with type USE, THWN, THHN, or XHHW insulation.

(2) Underground Wire. Use No. 6 AWG with type XHHW or USE insulation where buried in conduit.

(3) Branch Circuit Wire. Use No. 12 AWG with type USE or XHHW insulation.

(4) Control Wire. Use No. 16 AWG with stranded conductor with type SIS insulation within control panels.

(5) Splices for Copper Conductors. Use solderless, preinsulated, compression set type only with heat-shrink tubing jacket. When making splices between power leads and heat cable cold leads, use splicing kits designed specifically for that purpose.

(6) Terminations. Use compression set or bolted type.

e. Device, Junction, and Pull Boxes.

(1) Boxes Installed Above Grade. Use boxes that are hot dipped galvanized cast iron or corrosion resistant alloy complete with conduit hubs. Use boxes designed for damp or wet locations.

(2) Boxes Installed below Grade (exposed to earth). Use concrete boxes as required or shown in the drawings. Provide covers constructed of ribbed cast metal alloy.

(3) Cast Thermoplastic or Fiberglass Boxes. Use where indicated in the drawings.

f. Receptacles, Remote Power. Use remote power receptacles that are 2-pole, 3-wire grounding, male, 30 Amperes, 120 or 240 VAC, NEMA L6-30.

g. Circuit Breakers. Provide 1- or 2-pole circuit breakers as scheduled in the drawings. Multiple breakers must operate all poles simultaneously. Use circuit breakers that operate manually for normal ON-OFF switching and automatically for overload and short-circuit conditions. Ensure that the operating mechanism will not prevent trip action when held in the ON position. Provide 10,000-Ampere symmetrical interrupting capacity minimum. Provide breakers with higher symmetrical interrupting capacity ratings if indicated on the drawings. Provide bolt-in type with a molded case.

Use Ground Fault Interrupter (GFI) circuit breakers that sense ground fault current, that trip at 30±1 milliamperes within 2 cycles, and that have the following:

(1) Internal circuitry to prevent nuisance tripping caused by voltage spikes, radio frequency interference, and electromagnetic interference.

(2) A 'TEST' button that provides approximately 30 milliamperes of simulated ground fault current to verify the operation of the sensing and tripping devices. The button must reset the trip unit within the circuit breaker.

(3) Type b auxiliary contacts to close when the circuit breaker is tripped or shutoff.

h. Grounding.

(1) Electrodes. Use electrodes that are copper-clad steel rods with a minimum diameter of 5/8 inch Increase diameter as required to drive to the necessary depth without being damaged.

(2) Splices and Connections. Use an exothermic weld for all connections and joints in inaccessible locations. Use standard clamps and connectors in accessible locations.

i. Terminal Posts. Use terminal posts that are 6-inch by 8-inch treated wood posts 8 feet long.

j. Branch Circuit Panelboard. Use panelboards that meet the following:

(1) Sized and rated according to the panel schedules in the drawings

(2) Have multiple lugs (as required), a neutral terminal bar, and a ground terminal bar if ground conductors are terminated in the panelboard

(3) Use panelboards that are braced for 10,000 Root-Mean-Square (RMS) Amperes minimum, or higher if specified on the drawings.

(4) With copper or aluminum bus bars

CONSTRUCTION REQUIREMENTS

760-3.1 THAW PIPE.

a. Pipe Hangers. Drill or field punch the bolt holes and then ream them. Ensure that the diameter of the hole does not exceed the diameter of the bolt by more than 1/8 inch. Draw the bolt heads and nuts tightly against the pipe.

b. Pipe Jointing. Remove all scale from the pipe. After cutting, ream all pipe. Assemble all pipe and fittings using an application of pipe compound.

c. Installation. Prevent dirt or other foreign matter from entering the pipe. After the thaw pipe is fully assembled and installed, flush it thoroughly with water.

Repair damage to galvanized coatings per AASHTO M 36.

760-3.2 THAW WIRE. Meet all applicable requirements and recommendations of the NEC and the NESC.

Furnish the Engineer with circuit and wiring diagrams.

When required on the plans, install a post and meter combination for each individual thaw wire or a single post and meter combination for any group of thaw wires as specified and paid for under Item L-160.

a. Conduit and Fittings.

(1) Use Galvanized Rigid Steel (GRS) conduit for direct burial at depths required by NEC Articles 300 and 426, unless noted otherwise. Repair damage to galvanized coatings per AASHTO M 36. Unless otherwise specified on the drawings, route power conductors to each heat trace circuit in minimum 2-inch conduit.

(2) Provide bituminous asphalt coating for all ferrous conduit installed directly in earth. Apply 2 coats after conduit is completely assembled. Use conduit with factory-applied protective coating in lieu of asphalt if suitable touch-up materials are used to seal couplings and repair injuries to the factory-applied coat.

(3) Cut and ream all conduit squarely at the ends. Make fittings tight.

(4) Route concealed conduit in a direct path with a minimum number of bends. Use bends of long radii where possible.

(5) Keep all bends free from dents or flattening.

(6) Install conduit mechanically and electrically continuous from termination to termination. Connect securely to cabinets, junction boxes, and device boxes using a locknut on the outside and a grounding bushing on the inside. Bushings and locknuts are not required where conduits are screwed into threaded connections.

(7) Before the installation of conductors, use caps or corks to keep foreign material out of open conduits.

b. Heat Cable. Install per manufacturer's instructions and as indicated on the electrical plans. Install in GRS conduit as indicated on the electrical plans. Use conduit size as specified on the drawings. If size is not specified, use a minimum of 3/4 inch and a maximum of 1-1/2 inches, ensuring conduit fill does not exceed the fill allowed by the NEC. Do not splice heat cable. Do not exceed the manufacturer's published maximum heat trace cable length per circuit.

c. Controls. Install the controls in the load center along with the panelboard as indicated on the electrical plans. Refer to the detail drawings.

d. Conductors.

(1) Install all conductors in conduit.

(2) Clean all conduit before installing conductors.

(3) Install conductors continuously from box to box. Splice only at device or junction boxes.

(4) Circuit all feeder and branch circuits as shown in the drawings.

(5) Install all conductors in a single raceway at one time so that conductors do not cross one another while being pulled into place. Leave sufficient conductor length at all fittings and boxes.

(6) Stay within the pulling tensions specified by the manufacturer or as noted elsewhere in this division.

(7) Maintain bending radii in excess of those allowed by the manufacturer.

(8) Use lubricants according to UL, the conductor, and raceway manufacturers' requirements.

(9) Neatly bundle and form conductors to fan into terminals at regular intervals inside panels.

(10) Coordinate conductor insulation temperature rating and ampacity rating with the temperature and ampacity rating of the circuit protection devices.

(11) Unless otherwise specified on the drawings, the heat trace power conductors shall be sized to limit the voltage drop on the branch circuit conductors to no more than 3%, or to limit the total voltage drop on the feeder and branch circuit conductors to no more than 5%.

e. Color Coding.

(1) Color all conductors #6 AWG and smaller continuously. Conductors larger than #6 may be either continuously colored or marked at each end and at every accessible point with appropriately colored paint, tape, or adhesive labels.

(2) Mark or color grounding conductors according to the NEC.

(3) Mark or color grounded conductors according to paragraph d. and according to the NEC.

(4) Mark or color ungrounded conductors according to the following convention:

Nominal Voltage/Phase	Grounded	Ungrounded
120 or 208-Volt, single phase, 2 wire	White	Black
120/240-Volt, single phase 3 wire	White	Black/Red

f. Device, Junction, and Pull Boxes.

(1) Anchor device boxes to structural members so there is no apparent movement when the device is operated.

(2) Install junction and pull boxes in permanently accessible locations only. Size boxes according to NEC, Article 314.

(3) Mount all boxes square and plumb.

g. Grounding.

(1) General. Create an equipotential ground plane for the installation as shown on the drawing and as required at the service meter/disconnect cabinet. Connect the following items to the service entrance ground bar:

(a) The grounded neutral conductor for the utility service.

(b) Ground electrode(s).

(c) All non-current-carrying electrical equipment, conduit, and enclosures.

(d) Metal culvert and/or end sections.

(e) Heat cable metal sheath.

(2) Resistance. Ensure that the resistance between the service entrance ground electrode and earth ground, as measured using a multiple ground rod method and a ground resistance tester, is as close to zero as possible with the design shown in the drawings. Give the resistance measurement to the Engineer in writing. Include the environmental conditions during testing. Ground resistance testing shall be performed per IEEE 81, Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.

(3) Conductors. Size conductors according to the drawings or, if not shown on drawings, as required by NEC Article 250. Grounding electrode conductors shall be sized per Table 250.66 and equipment grounding conductors shall be sized per Table 250.122. Protect conductors from physical damage.

(4) Electrodes. The grounding electrode system installation shall comply with NEC Article 250.50. Drive ground rods at least 8 feet deep.

h. Controls. Install the controls in the load center along with the panelboard as indicated on the electrical plans. Refer to the detail drawings.

i. Branch Circuit Panelboard.

(1) Mounting. Mount panelboard interiors inside load center cabinet after the enclosure has been installed as shown on the plans and as described under Item L-160.

(2) Circuit Breakers. Install circuit breakers in the order specified in the drawing panelboard schedules. Type the circuit directory with circuit descriptions as they are shown in the drawing panelboard schedules. Make the directory configuration identical to the circuit breaker configuration.

METHOD OF MEASUREMENT

760-4.1 The length of thaw pipe to be paid for will be the number of linear feet of thaw pipe in place, completed and approved; measured along the line and grade of the pipe, or by each complete and approved unit.

760-4.2 The length of thaw wire installation to be paid for will be the number of linear feet of heated sections in place, completed and approved, or by each complete and approved unit.

BASIS OF PAYMENT

760-5.1 All fittings, including standpipes, are subsidiary.

Payment will be made under:

Item D760.010.0010	Thaw Pipe, 0.5-inch – per linear foot
Item D760.020.0010	Thaw Pipe, 0.5-inch – per each
Item D760.030.0000	Thaw Wire Installation – per linear foot
Item D760.040.0000	Thaw Wire Installation – per each

MATERIAL REQUIREMENTS

AASHTO M 36	Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
AASHTO M 111	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
AASHTO M 232	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A36	Carbon Structural Steel
ASTM A47	Ferritic Malleable Iron
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A234	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A307	Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ANSI C80.1	Rigid Steel Conduit, Zinc Coated (GRC)
ANSI Z 34.1	Third-Party Certification Programs for Products, Processes, and Services
ANSI/NEMA FB-1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable

ITEM D-765 EDGE DRAINS

DESCRIPTION

765-1.1 This item consists of the construction of edge drain and outlet pipes in accordance with these Specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

765-2.1 Use AKWADRAIN™ Highway Edge Drain from American Wick Corporation, DRAIN AWAY™ Highway Edge Drain from Drainage Products, Inc., or an approved equal meeting the following requirements:

a. FABRIC. Use fabric that conforms to the following.

Grab Tensile Strength	110 lbs	ASTM D4632
Puncture Strength	65 lbs	ASTM D4833
Mullen Burst Strength	215 psi	ASTM D3786
Elongation at Break	60%	ASTM D4632
AOS	70-100 sieve	ASTM D4751
Permeability	0.2-0.3 cm/sec	ASTM D4491
Flow Rate	150-170 gal/min/ft^2	ASTM D4491
UV Resistance, (after 500 hrs.)	70%	ASTM D355

b. CORE. Use core material that conforms to the following.

Thickness	1-inch	ASTM D1777
Inplane Flow Capacity*	21 gal/min/ft width	ASTM D4716
Compressive Strength	6,000-9,000 lbs/ft^2	ASTM D1621(mod.)
Shear Strength	6,000-9,000 lbs/ft^2	ASTM D1621(mod.)
Peel Strength	38 lbs/ft^2	ASTM D1876
Fungus Resistance (Core)	No Growth	ASTM G21

* Hydraulic gradient = 0.1, loading = 10 psi

c. PIPE. Use pipe in accordance with the plans and in conformance with the following.

Corrugated Polyethylene Drainage Tubing	AASHTO M 252

CONSTRUCTION METHODS

765-3.1 EXCAVATION. Excavate a trench of sufficient width to permit satisfactory jointing of the edge drain, outlet pipes and thorough tamping of the material under and around the edge drain and pipe. Excavate to form trench walls that are approximately vertical. Do not excavate until the embankment has been completed to a height above the top of the edge drain as shown on the plans.

765-3.2 BACKFILLING & COMPACTION. Use the material removed during trenching for backfill. Place the first layer of backfill to a depth no more than one half of the structures depth, and to hold the edge drain tightly against the side of the trench. Compact this layer before placement of the second layer without causing damage to the structure. Place the second layer of backfill to a depth that, when compacted, is 2 inches below the top edge of the drainage structure. Perform operations in a manner that prevents damage to the structure by surface equipment.

765-3.3 OUTLET PIPE. Splice the outlet pipes into the core material per manufacturer recommendations. Locate pipes and extend pipes past the toe of the embankment to prevent erosion as shown on the plans or as directed by the Engineer.

765-3.4 JOINING PIPE. Use coupling bands to join pipes as per manufacturer recommendations or as directed by the Engineer.

METHOD OF MEASUREMENT

765-4.1 EDGE DRAIN. The length of edge drain will be measured by the linear foot in place, completed, and approved. It will be measured along the centerline of the drain from end of structure to the end of structure. All fittings, outlet pipes and associated hardware will be included in the length of the pipe being measured.

BASIS OF PAYMENT

765-5.1 Payment will be made at the contract unit price per linear foot.

Payment will be made under:

Item D765.010.0000	Edge Drain – per linear foot
Item D765.020.0000	Conduit Drain – per linear foot
Item D765.030.0000	Dry Well – per each

MATERIAL REQUIREMENTS

AASHTO M 252	Corrugated Polyethylene Drainage Tubing
ASTM D1621	Compressive Properties Of Rigid Cellular Plastics
ASTM D1876	Peel Resistance of Adhesives (T-Peel Test)
ASTM D3786	Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method
ASTM D4355	Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
ASTM D4491	Water Permeability of Geotextiles by Permittivity
ASTM D4632	Grab Breaking Load and Elongation of Geotextiles
ASTM D4716	Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
ASTM D4751	Determining Apparent Opening Size of a Geotextile
ASTM D4833	Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM G21	Determining Resistance of Synthetic Polymeric Materials to Fungi

FENCING ITEMS

ITEM F-160 WIRE FENCE WITH WOOD POSTS (CLASS A AND B FENCES)

DESCRIPTION

160-1.1 This item covers the requirements for furnishing materials and constructing wire fences and gates with wood posts according to the details included herein and as shown on the Plans. The class of fence to be erected shall be either Class A, woven wire fencing topped by 2 strands of barbed wire, or Class B, 4 strands of barbed wire, as specified.

MATERIALS

160-2.1 WIRE.

a. **Woven Wire (Zinc-coated).** Woven wire fabric shall meet AASHTO M 279, Design Number 726-6-12 ½, Grade 60, Coating Type Z, and Coating Class 3.

b. **Barbed Wire (Zinc-coated).** Barbed wire shall meet AASHTO M 280, Design Number 12-4-5-14R, Standard Grade, Coating Type Z, and Coating Class 3.

c. **Barbed Wire (Aluminum-coated).** Barbed wire shall meet AASHTO M 280, Design Number 12-4-5-14R, Standard Grade, Coating Type ZA, and Coating Class 60.

d. **Bracing Wire (Zinc-coated).** Wire used for bracing shall be smooth galvanized wire, and shall meet AASHTO M 181, Tension Wire, except it may be 9-gage thickness.

160-2.2 GATES AND HARDWARE. Gate frames shall be constructed of hot-dip galvanized steel tubing conforming to AASHTO M 181, Type 1, Grade 1 or Grade 2, and shall be the size shown on the Plans. Heavily galvanized hinges and latches for wood posts shall be furnished with each gate. Either a bolt or lag screw hinge shall be used, and either a wing or butterfly latch shall be furnished.

160-2.3 POSTS.

a. **Species.** All posts shall be one of the following species of wood, unless otherwise specified.

Group I	Group II
Cedar	Douglas-Fir
Chestnut	Gum, Red
Cypress, Southern	Larch, Western
Locust, Black	Pine, Southern Yellow
Osage-orange	Pine, Lodgepole
Redwood	Tamarack
Yew, Pacific	Ash
Honey locust	Maple, Sugar
Oak, White	Oak, Red
Mulberry	Spruce
Live Oak	

b. **Quality.** Posts shall be peeled, sound, straight-grained, and free from decay, cracks, and splits; shakes shall not be in excess of 1/4 inch wide and 3 feet long. Checks (lengthwise separations of the wood in a generally radial direction) are permitted, provided they are not harmful.

c. **Dimensions.** All posts shall be of the length shown on the Plans. Posts shall have the minimum top diameters shown on the Plans or as specified. Sawn and split posts are acceptable instead of round posts if the required diameter round post could be turned from the sawn or split posts.

d. **Manufacture.** Outer bark shall be completely removed from all posts including depressions. Inner bark shall be removed from all post surfaces to be treated, except inner bark may remain in depressions. The amount of wood shaved off in the removal of inner bark shall be held to a minimum.

e. **Treatment.** Apply preservative to all timber posts. Use the preservatives and treatment processes of AASHTO M133 and Best Management Practices for the Use of Treated Wood in Aquatic Environments (BMPs), published by the Western Wood Preservers Institute, 12503 SE Mill Plain Blvd, #205 Vancouver, WA 98684 (Phone 360-693-9958). Products shall be treated according AWPA Standard U1, Commodity Specification A: Sawn Products.

160-2.4 BRACES. Cleats, gate stops, and braces shall be of the size shown on the Plans. They shall be of the same species and quality specified for the posts or approved by the Engineer, and they shall be free from knots larger than one-third the width of the piece. Gate stops shall be made of posts of suitable length. Braces may be made of posts of suitable length or of sawed lumber. All cleats, gate stops, and any braces in contact with the ground and for a distance of at least 6 inches above the ground shall be treated by the hot and cold bath process, specified herein for posts. The wire used in cable for bracing shall conform to paragraph 160-2.1e.

160-2.5 STAPLES. The staples shall be No. 9 galvanized steel wire, 1 inch long for hardwood posts and 1-1/2 inches long for use in softwood posts.

160-2.6 GATE LOCKS. Gate locks shall be provided for each gate and shall be brass, restricted keyway padlocks with a shackle that is 3/8 inch in diameter having a closed clearance of 2-1/4 inches. The locks shall have control key removable cores and each lock shall have a separate replacement core. All cores shall be keyed differently. The Contractor shall provide 4 keys per lock and 2 core removal keys.

CONSTRUCTION METHODS

160-3.1 GENERAL. The fence shall be constructed according to the details on the Plans and as specified herein. The Contractor shall be responsible for establishing the fence alignment as shown on the Plans. After the fence line has been staked and prior to fence installation, the Contractor shall review the alignment with the Engineer and make required adjustments to avoid conflicts.

When directed, the Contractor shall span the opening below the fence with barbed wire at all locations where it is not practical to conform the fence to the general contour of the ground surface because of natural or manmade features such as drainage ditches. The new fence shall be permanently tied to the terminals of existing fences whenever required by the Engineer. The finished fence shall be plumb, taut, true to line and ground contour, and complete in every detail. When directed by the Engineer, the Contractor shall stake down the woven wire fence at several points between posts.

The Contractor shall arrange the work so construction of the new fence immediately follows the removal of existing fences. The length of unfenced section at any time shall not exceed 300 feet. The work shall progress in this manner, and at the close of the working day, the newly constructed fence shall be tied to the unremoved existing fence.

160-3.2 CLEARING FENCE LINE. The site of the fence shall be sufficiently clear of obstructions, and surface irregularities shall be graded so that the fence will conform to the general contour of the ground. The fence line shall be cleared to a minimum width of 10 feet on each side of the centerline of the fence. This clearing shall consist of the removal of all stumps, brush, rocks, trees, or other obstructions that will interfere with proper construction of the fence. Stumps within the cleared area of the fence line shall be grubbed or excavated. The bottom of the fence shall be placed a uniform distance above ground as specified in the Plans. When shown on the Plans, existing fences which interfere with, the new fence location shall be removed by the Contractor as part of the construction work, unless such removal is listed as a separate item in the bid schedule. All holes remaining after post and stump removal shall be refilled with suitable soil, gravel, or other suitable material and shall be compacted with tampers.

160-3.3 SETTING POSTS. Posts shall be set with large ends down, plumb, and in a straight line on the side on which the wire is to be fastened. Posts shall be set full depth and shall not be cut off to eliminate rock or other excavation. Where rock is encountered, it shall be removed to provide full-depth and full-size holes. The bottoms of all posts shall be cut off square. The diameter of the holes shall be at least 6 inches larger than the diameter of the posts. When cleats are used on posts, the holes shall be dug large enough to accommodate them. After posts are placed and lined, the holes shall be backfilled with suitable material that shall be properly compacted by the use of tampers. The posts adjacent to end, corner, anchor, and gate posts shall be set and braced with braces and wire, as shown on the Plans.

160-3.4 ANCHORING. Corner, end, gate, and adjacent intermediate posts shall be anchored, by gaining and spiking cleats to the sides of the posts, as indicated on the Plans. No cleats will be required on other intermediate posts or on anchor posts.

160-3.5 BRACING. End, corner, anchor, and gate posts shall be braced by using a post of sufficient length or a piece of sawed lumber of the proper size, together with a wire cable. The wooden brace shall be gained and securely spiked into the end, corner, anchor, or gate posts and into the next intermediate posts about 6 inches from the top of the respective posts. A cable made of a double strand of galvanized soft wire shall be looped around the end, corner, anchor, or gate post near the ground and around the next intermediate post about 12 inches from the top. After the cable has been stapled in this position, it shall be twisted until tight. The staples used to hold the cable shall be not less than 1-1/2 inches long. The tool used for twisting the cable shall be left in placed to permit later adjustment of bracing if found necessary. Anchor posts shall be set at approximately 500-foot intervals and braced to the adjacent posts. Posts shall be braced before the wire fencing is placed.

160-3.6 INSTALLING WIRE. The wires shall be placed on the side of the posts away from the airport or as directed. The wire fence shall be placed on the posts at the height indicated on the Plans. Longitudinal wires shall be installed parallel and drawn uniformly taut. The vertical stay wires of the woven wire fencing shall be straight and vertical. At end and gate posts the woven wire and barbed wire shall be wrapped once around the post; each longitudinal wire shall be stapled at least three times and the ends of these wires shall be tied with a snug, tight twist. Each longitudinal wire shall be stapled to each intermediate post with one steel wire staple; at the corner and anchor posts, two or more stapled shall be used. The top strand of barbed wire of all fences shall be stapled with two staples in each post. All staples shall be set diagonally with the grain of the wood and driven up tight. After the fence has been erected, the tops of the wood posts shall be sawed off with a 1-to-3 pitch. The bottom wire of the wire fencing shall clear the ground by not more than 4 inches or less than 1 inch at any place.

160-3.7 SPLICING WIRE. Wire splices in longitudinal wires will be permitted if made with an approved galvanized bolt-clamp splice or a wire splice made as follows: The end of the wires shall be carried 3 inches past the splice tool and wrapped around the other wire away from the tool for at least 6 turns in opposite directions. After the tool is removed, the space occupied by it shall be closed by pulling the ends together. The unused ends of the wires shall be cut off neatly. Woven wire shall be spliced only at posts.

160-3.8 INSTALLING GATES. The gates shall be hung on gate fittings, as shown on the Plans. Fittings on the gate posts shall be clamped, screwed, or bolted to prevent slipping. Gates shall be so erected as to swing in the direction indicated and shall be provided with gate stops, as specified or as shown on the Plans. Gates shall be erected locations shown on the Plans.

160-3.9 EXISTING FENCE CONNECTIONS. Wherever the new fence joins an existing fence, either at a corner or at the intersection of straight fence lines, a corner or anchor post shall be set at the junction and braced and anchored the same as herein described for corner posts.

If the connection is made at other than the corner of the new fence, the last span of the old fence shall contain a brace span.

160-3.10 CLEANING UP. The Contractor shall remove from the vicinity of the completed work all tools, buildings, equipment, etc., used during construction.

METHOD OF MEASUREMENT

160-4.1 Fences will be measured in place from outside to outside of end posts or corner posts and will be the length of fence actually constructed, except for the space occupied by the gates.

160-4.2 Gates will be measured in units for each gate installed and accepted.

BASIS OF PAYMENT

160-5.1 Payment will be made at the contract unit price per linear foot for fence and per each for gates.

Work involved in clearing and disposal of material along the fence line and any required rock excavation are subsidiary.

Payment will be made under:

Item F160.010.0010	Fence, Class A – per linear foot
Item F160.020.0020	Fence, Class B – per linear foot
Item F160.030.0003	Gates, 3-feet Wide – per each
Item F160.040.0003	Walkway Gates, 3-feet Wide – per each

MATERIAL REQUIREMENTS

AASHTO M 279	Metallic-Coated, Steel Woven Wire Fence Fabric
AASHTO M 280	Metallic-Coated (Carbon) Steel Barbed Wire
AASHTO M 181	Chain-Link Fence
Fed. Spec. TT-W-571	Wood Preservation: Testing Practices

ITEM F-161 WIRE FENCE WITH STEEL POSTS (CLASS C AND D FENCE)

DESCRIPTION

161-1.1 This item covers the requirements for furnishing materials and constructing wire fences and gates with steel posts according to the details included herein and as shown on the Plans. The class of fence to be erected shall be either Class C, woven wire fencing surmounted by 2 strands of barbed wire, or Class D, 4 strands of barbed wire, as specified.

MATERIALS

161-2.1 WIRE.

a. **Woven Wire (Zinc-coated).** Woven wire fabric shall meet AASHTO M 279, Design Number 726-6-12 ½, Grade 60, Coating Type Z, and Coating Class 3.

b. **Barbed Wire (Zinc-coated).** Barbed wire shall meet AASHTO M 280, Design Number 12-4-5-14R, Standard Grade, Coating Type Z, and Coating Class 3.

c. **Barbed Wire (Aluminum-coated).** Barbed wire shall meet AASHTO M 280, Design Number 12-4-5-14R, Standard Grade, Coating Type ZA, and Coating Class 60.

d. **Bracing Wire (Zinc-coated).** Wire used for bracing shall be smooth galvanized wire, and shall meet AASHTO M 181, Tension Wire, except it may be 9-gage thickness.

161-2.2 FENCE POSTS, GATES, RAILS, BRACES, AND ACCESSORIES. These items shall be hot-dip galvanized steel, conforming to AASHTO M 181, Type 1, Grade 1 or Grade 2, and shall be the size shown on the Plans.

161-2.3 CONCRETE. Concrete shall be of a commercial grade with a minimum 28-day compressive strength of 2,500 pounds per square inch (psi) or an approved, pre-mixed, sacked concrete.

161-2.4 GATE LOCKS. Gate locks shall be provided for each gate and shall be brass, restricted-keyway padlocks with a shackle that is 3/8 inch in diameter having a closed clearance of 2-1/4 inches. The locks shall have control key removable cores and each lock shall have a separate replacement core. All cores shall be keyed differently. The Contractor shall provide 4 keys per lock and 2 core removal keys.

CONSTRUCTION METHODS

161-3.1 GENERAL. The fence shall be constructed according to the details on the Plans and as specified herein. The Contractor shall be responsible for establishing the fence alignment as shown on the Plans. After the fence line has been staked, and prior to fence installation, the Contractor shall review the alignment with the Engineer and make required adjustments to avoid conflicts.

When directed, the Contractor shall span the opening below the fence with barbed wire at all locations where it is not practical to conform the fence to the general contour of the ground surface because of natural or manmade features such as drainage ditches. The new fence shall be permanently tied to the terminals of existing fences whenever required by the Engineer. The finished fence shall be plumb, taut, true to line and ground contour, and complete in every detail. When directed, the Contractor shall stake down the woven wire fence at several points between posts.

When directed, in order to keep stock on adjoining property enclosed at all times, the Contractor shall arrange the work so that construction of the new fence will immediately follow the removal of existing fences. The length of unfenced section at any time shall not exceed 300 feet or such length that the stock can be kept in the proper field. The work shall progress in this manner and at the close of the working day the newly constructed fence shall be tied to the existing fence. Any openings in the fence shall be guarded when stock is using the adjoining property.

161-3.2 CLEARING FENCE LINE. The site of the fence shall be sufficiently cleared of obstructions, and surface irregularities. The fence line shall be graded so that the fence will conform to the general contour of the ground. The fence line shall be cleared to a minimum width of 10 feet on each side of the centerline of the fence. This clearing shall consist of the removal of all stumps, brush, rocks, trees, or other obstructions which will interfere with proper construction of the fence. Stumps within the cleared area of the fence shall be grubbed or excavated. The bottom of the fence shall be placed a uniform distance above ground, as specified in the Plans. When shown on the Plans or as directed by the Engineer, the existing fences which interfere with, the new fence location shall be removed by the Contractor as a part of the construction work unless such removal is listed as a separate item in the bid schedule. All holes remaining after post and stump removal shall be refilled with suitable soil, gravel, or other suitable material and compacted with tampers.

161-3.3 INSTALLING POSTS. All posts shall be spaced as shown on the Plans. Corner, brace, anchor, end, and gate posts shall be set in concrete bases as shown on the Plans. The top of the concrete shall be slightly above the ground surface, trowel finished, and sloped to drain. Post holes of full depth and size for the concrete shall be provided. All line posts may be either driven or set in dug holes to a penetration of 3 feet. All post setting shall be done carefully and to true alignment. Dirt removed for placing posts, anchor bars, flanges, etc., shall be replaced, tamped, and leveled. When posts are driven, care shall be exercised to prevent marring or buckling of the posts. Damaged posts shall be replaced at the Contractor's expense.

161-3.4 BRACING. All corner, anchor, end, and gate posts shall be braced as shown on the Plans. Anchor posts shall be set at approximately 500-foot intervals and braced to the adjacent posts.

161-3.5 INSTALLING WIRE. All barbed wire and woven wire shall be placed on the side of the post away from the airport, or as directed by the Engineer, at the height indicated on the Plans. The woven wire shall be carefully stretched and hung without sag and with true alignment. Care shall be taken not to stretch the wire so tightly that it will break in cold weather or pull up corner and brace posts. All horizontal wires shall be fastened securely to each post by fasteners or clips designed for use with the posts furnished. The woven wire shall be wrapped around end, corner, and gate posts, and the ends of all horizontal wires shall be tied with snug, tight twists. The wire shall be secured to prevent slipping up and down the post. Barbed wire strands shall be stretched and each strand secured to each post to prevent slipping out of line or becoming loose. At end, corner, and gate posts the barbed wire shall be securely wrapped and anchored once about the post from outside and secured against slipping by tying the ends with snug, tight twists. However, on spans of less than 100 feet, both ends of the span need not be wrapped around the posts. The bottom wire of the woven wire fencing shall clear the ground by not more than 4 inches or less than 1 inch at any place.

161-3.6 SPLICING WIRE. Splices in barbed and woven wire will be permitted if made with an approved galvanized bolt-clamp splice or a wire splice made as follows: The ends of each wire shall be carried 3 inches past the splice tool and wrapped around the other wire for at least 6 turns in opposite directions. After the tool is removed, the space occupied by it shall be closed by pulling the ends together. The unused ends of the wire shall be cut off neatly.

161-3.7 INSTALLING GATES. The gates shall be hung on gate fittings as shown on the Plans. They shall be attached in such a manner that the gate cannot be lifted off the hinges. Gates shall be erected to swing in the direction indicated and shall be provided with gate stops, as specified or as shown on the Plans. Gates shall be erected at locations shown on the Plans.

161-3.8 EXISTING FENCE CONNECTIONS. Wherever the new fence joins an existing fence, either at a corner or at the intersection of straight fence lines, a corner or anchor post shall be set at the junction and braced and anchored the same as herein described for corner posts.

If the connection is made at other than the corner of the new fence, the last span of the old fence shall contain a brace span.

161-3.9 CLEANING UP. The Contractor shall remove from the vicinity of the completed work all tools, buildings, equipment, etc. used during construction.

METHOD OF MEASUREMENT

161-4.1 Fences, Class C (Steel Posts), or Class D (Steel Posts), shall be measured in place from outside to outside of end posts or corner posts and shall be the length of fence actually constructed, except for the space occupied by the gates.

161-4.2 Vehicle gates and pedestrian gates will be measured in units for each gate installed and accepted.

BASIS OF PAYMENT

161-5.1 Payment will be made at the contract unit price per linear foot for fence and per each for gates.

Work involved in clearing and disposal of material along the fence line and any required rock excavation are subsidiary.

Payment will be made under:

Item F161.010.0010	Fence, Class C – per linear foot
Item F161.020.0020	Fence, Class D – per linear foot
Item F161.030.0003	Gates, 3-feet Wide – per each
Item F161.040.0003	Walkway Gates, 3-feet Wide – per each

MATERIAL REQUIREMENTS

AASHTO M 279	Metallic-Coated, Steel Woven Wire Fence Fabric
AASHTO M 280	Metallic-Coated (Carbon) Steel Barbed Wire
AASHTO M 181	Chain-Link Fence

ITEM F-162 CHAIN-LINK FENCE

DESCRIPTION

162-1.1 This item shall consist of furnishing and erecting a chain-link fence according to these specifications and the details shown on the Plans.

MATERIALS

162-2.1 FABRIC. Chain-link fabric shall meet AASHTO M 181, 9-gage thickness, Type I (zinc-coated steel), Class D coating, and 2-inch mesh.

162-2.2 BARBED WIRE. Barbed wire shall meet AASHTO M 280, Design Number 12-4-5-14R, Standard Grade, Coating Type Z, and Coating Class 3.

162-2.3 POSTS, RAILS AND BRACES. Line posts, rails, and braces shall be galvanized steel pipe, or equivalent galvanized roll-formed sections, and meet AASHTO M 181, Type I, Grade 1 or Grade 2.

The dimensions of the posts, rails, and braces shall be as shown on the Plans.

162-2.4 GATES. Gate frames shall consist of galvanized steel pipe, or equivalent galvanized roll-formed sections, and shall meet AASHTO M 181, Type I, Grade 1 or Grade 2. The fabric shall be of the same type material as used in the fence.

162-2.5 WIRE TIES AND TENSION WIRES. Wire ties for use in conjunction with a given type of fabric shall be of the same material and coating weight identified with the fabric type. Tension wire shall meet AASHTO M 181, Type I, Class 3 coating.

162-2.6 MISCELLANEOUS FITTINGS AND HARDWARE. Miscellaneous steel fittings and hardware shall meet AASHTO M 181, Type I, Grade 1 Barbed wire support arms shall withstand a load of 250 pounds applied vertically to the outermost end of the arm.

162-2.7 CONCRETE. Concrete shall be of a commercial grade with a minimum 28-day compressive strength of 2,500 pounds per square inch (psi) or an approved, pre-mixed, sacked concrete.

162-2.8 MARKING. Each roll of fabric shall carry a tag showing the kind of base metal, kind of coating, the gage of the wire, the length of fencing in the roll, and the name of the manufacturer. Posts, wire, and other fittings shall be identified as to manufacturer, kind of base metal, and kind of coating.

162-2.9 GATE LOCKS. Gate locks shall be provided for each gate and shall be brass, restricted keyway padlocks with a shackle that is 3/8 inch in diameter having a closed clearance of 2-1/4 inches. The locks shall have control key removable cores and each lock shall have a separate replacement core. All cores shall be keyed differently. The Contractor shall provide 4 keys per lock, and 2 core-removal keys.

162-2.10 KEYLESS LOCKS. When specified, a changeable combination lock shall be furnished with pedestrian gates. The keyless lock shall have a 4- or 5-digit mechanism and shall be an Ilco Unican Model 1011 or approved equal. A sign, 12 inches by 12 inches, shall be securely mounted on the inside of the gate. The sign shall be shielded from view from outside of the gate by means of a hinged 12-inch by 12-inch cover or other means approved by the Engineer. The cover shall have the legend “LIFT AND RECORD COMBINATION FOR REENTRY”. The sign shall be aluminum sheet with white reflective coating. Letters shall be black and a minimum of 3/4 inch tall.

CONSTRUCTION METHODS

162-3.1 GENERAL. The fence shall be constructed according to the details on the Plans and as specified herein using new materials. The Contractor shall be responsible for establishing the fence alignment as shown on the Plans. After the fence line has been staked and prior to fence installation, the Contractor shall review the alignment with the Engineer and make required adjustments to avoid conflicts.

The Contractor shall arrange the work so that construction of the new fence will immediately follow the removal of existing fences. The length of unfenced section at any time shall not exceed 300 feet or such length that the stock can be kept in the proper field. The work shall progress in this manner and at the close of the working day the newly constructed fence shall be tied to the existing fence.

162-3.2 CLEARING FENCE LINE. All trees, brush, stumps, logs, and other debris which would interfere with the proper construction of the fence in the required location shall be removed a minimum width of 10 feet on each side of the fence centerline before starting fencing operations.

162-3.3 INSTALLING POSTS. All end posts, corner posts and pull posts shall be set in concrete at the required dimensions and depths and at the spacing shown on the Plans. Line posts may be either set in concrete as shown on the Plans or driven a minimum of 5 feet embedment. Pull posts shall have a maximum spacing of 250 feet.

Posts shall be spaced as shown on the Plans but in no case shall spacing be more than 10 feet. The post holes shall be in proper alignment so that there is a minimum of 3 inches of concrete on all sides of the posts. The concrete shall be thoroughly compacted around the posts by tamping or vibrating and shall have a smooth finish slightly higher than the ground and sloped to drain away from the posts. All posts shall be set plumb and to the required grade and alignment. No materials shall be installed on the posts, nor shall the posts be disturbed in any manner within 7 days after the individual post footing is completed.

Should rock be encountered at a depth less than the planned embedment depth, a hole 2 inches larger than the greatest dimension of the posts shall be drilled to a depth of 12 inches. After the posts are set, the remainder of the drilled hole shall be filled with grout, composed of one part Portland cement and two parts mortar sand. Any remaining space above the rock shall be filled with concrete in the manner described above.

In lieu of drilling, the rock may be excavated to the required embedment depth.

162-3.4 INSTALLING TOP RAILS. The top rail shall be continuous and shall pass through the post tops. The coupling used to join the top rail lengths shall allow for expansion.

162-3.5 INSTALLING BRACES. Horizontal brace rails, with diagonal truss rods and turnbuckles, shall be installed at all terminal posts.

162-3.6 INSTALLING FABRIC. The wire fabric shall be firmly attached to the posts and braced in the manner shown on the Plans. All wire shall be stretched taut and shall be installed to the required elevations. The fence shall generally follow the contour of the ground, with the bottom of the fence fabric no less than 1 inch or more than 4 inches from the ground surface. Grading shall be performed where necessary to provide a neat appearance.

At locations of small natural swales or drainage ditches and where it is not practical to have the fence conform to the general contour of the ground surface, longer posts may be used and multiple strands of barbed wire stretched thereon to span the opening below the fence. The vertical clearance between strands of barbed wire shall be 6 inches or less.

162-3.7 ELECTRICAL GROUNDS. Electrical grounds shall be installed along the fence between gate openings and at intervals not exceeding 500 feet. Electrical grounds shall also be installed where a power line passes over the fence. The ground shall be accomplished with a copper clad rod 8 feet long and a minimum of 5/8 inch diameter driven vertically until the top is 6 inches below the ground surface. A No. 6 solid copper conductor shall be clamped to the rod and to the fence in such a manner that each element of the fence is grounded. The Contractor shall comply with FAA-STD-019, Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment, Paragraph 4.2.3.8, Lightning Protection for Fences and Gates, when fencing is adjacent to FAA facilities.

162-3.8 CLEANING UP. The Contractor shall remove from the vicinity of the completed work all tools, buildings, equipment, etc., used during construction.

METHOD OF MEASUREMENT

162-4.1 Chain-link fence will be measured along the top of the fence from center to center of end posts, excluding the length occupied by gate openings.

162-4.2 Gates will be measured as complete units.

BASIS OF PAYMENT

162-5.1 Payment will be made at the contract unit price per linear foot for fence and per each for gates.

Work and materials involved in clearing and disposal of material along the fence line, rock excavation, and ground rod installation are subsidiary.

Payment will be made under:

Item F162.010.0008	8-feet Chain-Link Fence – per linear foot
Item F162.030.0004	Single Swing Gate, 4-feet Wide – per each
Item F162.040.0020	Double Swing Gate, 20-feet Wide – per each
Item F162.050.0018	Single Cantilever Gate, 18-feet Wide – per each

MATERIAL REQUIREMENTS

AASHTO M 181	Chain-Link Fence
AASHTO M 280	Metallic-Coated (Carbon) Steel Barbed Wire
ASTM A121	Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
ASTM A123	Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A392	Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A491	Aluminum-Coated Steel Chain-Link Fence Fabric
ASTM A572	High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A653	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A824	Metallic-Coated Steel Marcelled Tension Wire for Use With Chain Link Fence
ASTM A1011	Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low Alloy with Improved Formability, and Ultra High Strength
ASTM B117	Operating Salt Spray (Fog) Apparatus
ASTM B221	Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes
ASTM B429	Aluminum-Alloy Extruded Structural Pipe and Tube
ASTM F668	Polyvinyl Chloride(PVC) and Other Organic Polymer Coated Steel Chain-Link Fence Fabric
ASTM F1043	Strength and Protective Coatings on Steel Industrial Fence Framework
ASTM F1083	Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
ASTM F1183	Aluminum Alloy Chain Link Fence Fabric

ASTM F1345	Zinc 5% Aluminum-Mischmetal Alloy Coated Steel Chain-Link Fence Fabric
ASTM G152	Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G154	Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
ASTM G155	Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials
FAA-STD-019	Lighting and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment

ITEM F-170 STEEL BOLLARD

DESCRIPTION

170-1.1 This item consists of replacing and/or installing new steel bollards as shown on the plans or as directed by the Engineer.

MATERIALS

170-2.1 Use materials that conform to the following:

a. Steel Pipe. Use standard weight, Grade B, galvanized, welded, or seamless pipe meeting ASTM A53.

b. Concrete. Use commercial grade concrete with a minimum 28-day compressive strength of 2,500 pounds per square inch (psi) or an approved, pre-mixed, sacked concrete.

c. Paint. Use single component, moisture cure, polyurethane (SC-MC-U) zinc primer. Use single component, moisture cure, aliphatic polyurethane (SC-MC-ALIP-U) safety yellow paint for the top coats.

d. Retroreflective Bands. Use flexible high intensity sheeting, pressure sensitive type, cut to form 6-inch wide reflector bands meeting AASTM D4956, Type III-A. Use sheeting with a smooth sealed outer surface.

CONSTRUCTION REQUIREMENTS

170-3.1 Install bollards plumb, in hand or mechanically dug holes, backfilled with the specified material, and thoroughly compacted to the satisfaction of the Engineer.

170-3.2 PAINTING. Paint bollards with one coat of primer and two top coats of safety yellow. Ensure that the surfaces are free of all oil, grease, dirt, abrasive residues, and all other foreign substances prior to application of coatings. Maintain the surface to be coated at a minimum temperature of 5 ℉ above the dew point for the duration of coating application. Adhere to these preparation requirements in addition to any requirements by the coating manufacturer. Repair any nicks, scratches or other paint damage resulting from shipping and handling at the site.

170-3.3 REFLECTIVE BANDS. Apply a minimum of two white retroreflective bands placed 3-4 inches from the top with a maximum of 6 inches between the bands.

METHOD OF MEASUREMENT

170-4.1

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

b. Unit Prices. By the number of bollards specified, installed and accepted as completed units in place. Where replacement is specified, each unit shall include removal and installation.

BASIS OF PAYMENT

170-5.1 Payment will include all labor, equipment, materials, and personnel to complete the work described in the plans.

Payment will be made under:

Item F170.010.0000	Steel Bollard – per each
Item F170.020.0000	Steel Bollards – per lump sum

ITEM F-171 POWER GATE OPERATORS

DESCRIPTION

171-1.1 Provide a complete and operational power gate operating system, with controls, designed and manufactured to operate as an integral system with the cantilever gate as located and shown on the plans.

MATERIALS

171-2.1 APPROVALS. Obtain approval of all materials or equipment proposed to use or incorporate in the work. Submit to the Engineer five (5) complete listings of materials and equipment specified herein and on the plans. Prepare the list to clearly identify the material or equipment by item, name, or designation used and indicate where specified. Provide submittals neatly bound, clearly indexed, and include applicable catalog numbers, cuts, wiring diagrams, performance data, operation and maintenance manuals, etc., for all material or equipment specified. In addition, whenever 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.

171-2.2 COMPONENTS. Provide major components to include a new load center, gate operator, radio control and keypad system, cable, conduit, circuit breakers, and connectors. Provide NEMA approved electrical components. Provide testing of the gate operators and control systems before shipment from the factory.

a. Gate Operator. 1 horsepower minimum, 240 Volts (V), single phase, capable of instant reversing, and adjustable time delay relay from 1/2 to 180 seconds for closing, UL 325 listed, mechanical braking within NEMA 3R enclosure. Chamberlain Group, Inc. Model SL595 Heavy Duty, Harsh Environment, or approved equal.

b. Key-Pad System. Provide complete keypad systems designed to be impervious to the local environmental conditions. Install at each automated gate. Include any required power supplies and interfaces for a self-contained remote unit capable of handling at least two keypads.

Provide for each gate, 2 each keypads and terminal or interface to be controlled by either the radio or keypad systems. Digital Key Model 1050 Industrial Access or approved equal.

Include time delay relays, adjustable from 1/2 to 180 seconds for each system.

c. Radio-Control System. Provide complete radio-control system. Include any required power supplies and interfaces for self-contained remote units.

Provide radio-receiver system designed to be impervious to local environmental conditions.

Provide system that interfaces with the keypad system and designed to be controlled by either method.

Provide for each gate operator, 12 each adjustable frequency transmitters, Pulsar Control or approved equal.

d. Load Center. Provide enclosure for housing equipment, NEMA 12 lockable type, including an interior panel. Minimum size 36 inches x 24 inches x 10 inches. Hoffman or approved equal. Provide enclosure sized large enough to house panel, radio, keypad interface, power supply, and relays. Size distribution center to accommodate the equipment indicated in the load center wiring diagram on the plans.

Provide panel board rated as shown on the plans, single phase, 3- wire, and sized to provide all circuits and spares indicated. Provide branch breakers of bolt in type. Install panel board in the enclosure.

e. Conductors for secondary systems in conduits. Provide copper, 600 volt-Volt Type XHHW, (X = Cross-Linked Polyethylene, HH = High Heat-Resistance, W = Water Resistance, Temperature Rating: 194° F in dry locations and 167° F in wet locations), black (phase conductors) and, white or yellow (neutral), and green (equipment grounding conductor).

f. **Rigid steel conduit**. Provide standard weight (schedule 40) steel pipe, galvanized on the outside and finished with 40 mil (thousandth of an inch) Polyvinyl Chloride (PVC) exterior coating and with interior finished with a coating of urethane, Robroy Industries or approved equal. Provide fittings that meet the same specifications as the conduit.

g. **Flexible metal conduit.** Provide liquid tight Anaconda Type 'EF' or approved equal.

h. **Marker tape.** Provide yellow polyethylene plastic, printed "Caution Buried Electric Line Below", Allen System or approved equal.

i. **Tapes.**

(1) Pipe Sealing Tape: Scotch No. 48, Teflon pipe sealing tape or approved equal.

(2) Corrosion Preventive Tape: Scotch No. 43 or approved equal.

(3) Electrical Insulating Tape: Scotch No. 88 or approved equal.

j. **Ground conductor**. Provide stranded bare copper, No. 6 AWG.

k. **Ground rods.** Provide 3/4-inch diameter by 10 feet length copper clad steel.

l. **Concrete.** Provide commercial grade concrete with a minimum 28-day compressive strength of 2,500 psi or an approved, pre-mixed, sacked concrete.

m. **Trench Backfill.** Use material of the type shown on the plans.

CONSTRUCTION REQUIREMENTS

171-3.1 GENERAL. Install gate operator and control systems as shown on the plans and in accordance with the manufacturer's instructions. Perform work in conformance with applicable National Fire Protection Association (NFPA) codes and standards, including NFPA 70 National Electrical Code (NEC), and all State and local codes. Locate new gate operators, fixtures, conduit, cables, etc., as shown on the plans and/or as directed by the Engineer.

171-3.2 TRENCHING, EXCAVATION, AND BACKFILLING.

a. **Trenching and Excavation.** Trenches or excavations may be excavated manually or with mechanical equipment of standard manufacture specifically designed for excavating or trenching. Do not use blades of road patrols or graders to excavate the trenches.

Ensure that excavations for the placement or construction of items associated with the electrical work are of sufficient size to permit the placement or construction of the full width, length, and depth of the structure or object and the layer of bedding material, whenever bedding is required. Such items include, but are not limited to, foundations, footings, slabs, pads, manholes, handholes, ducts and/or duct banks, light base assemblies or outing stakes. Use the specified backfill material as shown on the plans.

Excavate the walls of trenches as near vertical as practical with smooth bottom, and free of frost susceptible material, pools of water, trash or debris. Control drainage in the vicinity of the trenches to prevent the runoff of surface water in the trenches. Promptly pump to remove any water accumulated in the trenches.

Provide trenches for burial of cable or conduit of sufficient width to provide a minimum 3 inches of lateral clearance between the conduit and trench walls on both sides or provide the lateral clearance as shown on the plans. Provide sufficient depth so that the top of the cable or conduit is a minimum of 18 inches below finish grade or to the depth indicated on the plans, when installed; and graded to slope as required.

Before placing any conduit in the trenches, remove all rocks or stones larger than 2 inches in diameter from the bottom of the trench. Tamp the trench bottom by filling or cutting away as required, to provide uniform conduit grades, sloping towards outlets, as shown on the plans. Call for inspection of the trenches by the Engineer before placing conduit.

b. Backfilling. Before backfilling, cover the conduit with a 3 to 6 inch layer of approved backfill or bedding material as shown on the plans. Begin backfilling of the trenches after the conduit is installed and inspected and approved for backfilling by the Engineer. Thoroughly tamp the initial cover layer. Backfill the remainder of the trench with approved materials as shown on the plans, placed in 6-inch layers. Compact each layer to the density of the adjacent undisturbed ground and/or to the satisfaction of the Engineer. Backfill completely to the level of the adjacent surface. For trenches and excavations in areas where a surface layer of gravel, rock, or other material differing from subgrade has previously been placed, fill the upper part of the trench with the same material salvaged from the excavating or scripted from the adjoining surface. Provide at least 6 inches of surfacing material in the trench. For trenches in existing asphalt concrete, resurface the trench with a minimum 3-inch depth of an approved, pre-mixed, sacked concrete.

Restore all surface areas disturbed and/or damaged by trenching, excavation, sorting of materials, or any other construction related activities to their original condition except as stated above. Replace surfacing or cover material with new material of the same type of material removed. Accomplish restoration and/or removal and replacement of surfacing as required under this item at no additional cost to the State.

171-3.3 GROUNDING. Install grounding electrodes and grounding conductors as shown on the plans.

171-3.4 TESTING. Furnish all necessary labor, materials, equipment, appliances and power for conducting and performing tests of materials, equipment and/or systems. Begin tests after the work has been inspected and approved by the Engineer. Tabulate, sign, and date all test results on reproducible test sheets. No work will be accepted until all the applicable tests are performed successfully with satisfactory results and test sheets delivered to the Engineer.

Repair and/or remove and replace materials, equipment and/or systems that do not test satisfactorily.

Retest after repair or replacement.

Test and demonstrate to the Engineer the following:

a. Circuits are properly connected in accordance with applicable wiring diagrams.

b. Power and control circuits are continuous and free from short circuits.

c. Circuits are free from unspecified grounds.

d. Resistance to ground of all ungrounded 600-Volt multiple circuit conductors is not less than ten megohms when tested with a 1,000-Volt insulation resistance tester.

e. Circuits are operable. Demonstration to include operation of each control and switch 10 times.

171-3.5 INSPECTION. Notify the Engineer and request inspection at least 48 hours prior to installing cables, conduit, concrete or lighting fixtures, making any splices, or covering any buried or concealed work. Immediately correct any deficiencies found during the inspection.

171-3.6 RECORD DOCUMENTS. Maintain at the project site a complete set of contract plans, Specifications, and approved changes to the contract documents. In addition to the above, maintain a separate complete set of electrical drawings for as-built purposes. Note all changes upon these as-builts along with the date and authority approving the change.

On the as-built drawings, show locations of all items such as lights, conduit, handholes, etc., including any existing active lines encountered. Show dimensions from roadway and taxiway centerlines or other permanent objects. Include complete wiring diagrams, (both power and control), identifying terminals, cables, and connections.

171-3.7 GUARANTEE. Guarantee that all materials or workmanship found defective within one year of final acceptance will be replaced at the your expense, promptly upon notification and to the satisfaction of the Department.

METHOD OF MEASUREMENT

171-4.1 Measured as a complete unit to include radio and keypad system, gate operator, poles, load center with panel, relays, all wire and conduit, grounding rods, ground conductors, concrete footings, excavation, bedding, backfill, marker tape, concrete bases, all testing and all other incidentals necessary for an approved and operational power gate operator system installation.

BASIS OF PAYMENT

171-5.1 At the contract unit price per each for the completed and accepted system.

Payment will be made under:

Item F171.010.0000	Power Gate Operator System – per each
Item F171.020.0000	Relocate Power Gate Operator System – per lump sum
Item F171.030.0000	CCTV Camera – per each
Item F171.040.0000	PoE Switch – per each

ITEM F-174 SINGLE AND DOUBLE POLE SWING GATE

DESCRIPTION

174-1.1 Furnish and install single or double pole swing gates at the locations and according to the details shown on the plans. Include gate foundations, gate assemblies, installation, application of reflective tape, and all materials and incidentals necessary for complete and operational gates.

MATERIALS

174-2.1 STEEL. Provide structural steel that conforms to the requirements of ASTM A36 (Standard specification for carbon structural steel). Use structural steel galvanized in conformance with ASTM A123 (standard specification for hot dipped galvanized zinc coatings on iron and steel products) 2.0 OZ/SF, or in conformance with ASTM A153 (standard specification for hot dip galvanized zinc coatings on iron and steel hardware) as appropriate. Galvanize gates and gate components after fabrication. Make repairs to damaged galvanizing in conformance with ASTM A780 (standard practice for repair of damaged and undercoated areas of hot dip galvanized coatings). Provide high strength bolt, nut and washer material conforming to the requirements of ASTM A325. Provide galvanized heavy hex-type bolts and nuts if components connected are galvanized. Provide galvanized machine bolts conforming to ASTM A307.

174-2.2 CONCRETE. Provide concrete of a commercial grade with a minimum 28-day compressive strength of 2,500 psi or an approved, pre-mixed, sacked concrete.

174-2.3 LOCKS. Provide brass restricted keyway padlocks for each gate with a shackle that is 3/8-inch in diameter and a closed clearance of 2-1/4 inches. Provide locks with control key removable cores and furnish a separate replacement core for each lock. Provide cores that are keyed differently. Provide 4 keys per lock, and 2 core-removable keys.

174-2.4 REFLECTIVE MARKINGS. High intensity reflective sheeting per ASTM D4956.

CONSTRUCTION REQUIREMENTS

174-3.1 FABRICATION. Give 15 days notice before beginning fabrication work at the shop so that inspection may be provided.

Provide workmanship and finish equal to the best practice in modern fabrication shops. Finish portions of the work exposed to view neatly. Perform shearing, flame cutting, and chipping carefully and accurately. Steel or wrought iron may be flame cut, provided a smooth surface is obtained by the use of a mechanical guide. Perform flame cutting by hand only where approved, and smooth the surface by planing, chipping, or grinding. Adjust and manipulate the cutting flame so as to avoid cutting beyond the prescribed lines. Fillet re-entrant cuts to a radius of not less than ¾-inch.

Finishing and Shaping: Provide finished members true to line and free from twists, bends, and open joints. Store structural material, either plain or fabricated, at the fabricating shop above the ground on platforms, skids, or other supports. Keep free from dirt, grease, or other foreign matter, and protect from corrosion.

Perform welding in accordance with AWS D1.1.

174-3.2 INSTALLING POSTS. Set all gate posts in concrete at the required dimensions and depths and at the spacing shown on the plans.

Properly align post holes so that there is a minimum of 3 inches of concrete on all sides of the posts. Thoroughly compact concrete around each post by tamping or vibrating and finish to a smooth surface slightly higher than the surrounding ground and sloped to drain away from the posts. Set all posts plumb and to the required grade and alignment. Do not install materials on the posts or disturb the posts within 7 days after completion of the individual post footing.

Should rock be encountered at a depth less than the planned embedment depth, drill a hole 2 inches larger than the greatest dimension of the post and to a depth of 12 inches below the planned embedment depth. After the posts are set, fill the remainder of the drilled hole with grout, composed of one part Portland cement and two parts mortar sand. Fill any remaining space above the rock with concrete in the manner described above. In lieu of drilling, the rock may be excavated to the required embedment depth.

174-3.3 INSTALLING GATES. Install gates level and plumb with the swing as indicated on the plans. Install reflective sheeting on clean, dry surfaces in accordance with the manufacturer's recommendations.

METHOD OF MEASUREMENT

174-4.1 By the number of gates of each type installed and accepted.

BASIS OF PAYMENT

174-5.1 Payment will be made at the contract unit price for each furnished, installed and accepted item.

Payment will be made under:

Item F174.010.0008	Single Pole Swing Gate, 8-feet Wide – per each
Item F174.010.0012	Single Pole Swing Gate, 12-feet Wide – per each
Item F174.020.0008	Double Pole Swing Gate, 8-feet Wide – per each
Item F174.020.0012	Double Pole Swing Gate, 12-feet Wide – per each

ITEM F-175 BLAST FENCE

DESCRIPTION

175-1.1 Fabricate and erect blast fence (jet blast deflector) complete with concrete foundation as shown on the plans.

DESIGN

175-2.1 GENERAL. Provide a 14-foot nominal height, concave, non-perforated, galvanized, corrugated type blast fence with corrugations running in a horizontal direction and with all components designed to meet the material requirements of this specification. Design the fence to be capable of withstanding loadings of 50 PSF or jet blast velocities of at least 140 mph and capable of deflecting the entire blast envelope upwards at a minimum angle of 60 degrees under no wind conditions. Usage criteria are a B 747 series aircraft, taxi and breakaway power, and tail 35 feet or more distant (outboard engine nozzles 144 feet or more distant) from the leading edge of the deflector. Select an experienced manufacturer that has regularly and continuously designed and manufactured jet blast fences for a period of not less than 3 years. Provide Lynnco, Type G-14NB-6 as manufactured by Blast Deflectors, Inc., 5595 Equity Ave., Reno, Nevada, 89502, Telephone: 775/856-1928, or approved equal.

175-2.2 WORKING DRAWINGS, ENGINEERING CALCULATIONS/DESIGN ANAYLSIS, AND MANUFACTURER'S CERTIFICATIONS. Submit working drawings in accordance with the general contract requirements. Include installation details and design computations. Indicate identification marks, location of units and the work, elevations, fabrication details, connections, dimensions, interspace with adjacent members anchor bolt layout and special handling instructions to cover manufacture, handling and erection.

Prior to purchasing the blast fence, submit manufacturer's certification and design analysis demonstrating that the blast fence meets the requirements of this specification. Submit design analysis showing load and stresses in structural members, deflecting surface and bolted joints, using the maximum anticipated pressures under the conditions previously stated as the average pressure for load calculations.

Should a type of blast fence other than that noted as standard for this work be used, provide the following information and data. Submit for approval a tabulation of results of full scale instrumented field test witnessed and certified by an accredited testing laboratory. Subject the blast fence to the jet blast conditions previously stated. Show tabulation of the maximum pressure in psi, temperature in degrees F., vibration frequency in CPS, vibration amplitude in inches, taken at the centerline of the blast impingement on deflector. Results of all such readings may not be greater than the reading submitted for the blast deflector fencing listed as the standard for this work, for each corresponding item. Submit results of smoke-pot tests behind the deflector, demonstrating that smoke and gases are deflected in a vertical direction, with no evidence of smoke dispersal behind the deflector. Because of thermal shock and cavitation effects that can cause cracking and spalling, concrete deflectors may not be used as an alternate.

175-2.3 WARRANTY. Prior to purchasing the blast fence, provide a 1-year written guarantee from the manufacturer and the Contractor jointly, warranting the blast fence against any defects in the structural integrity, performance, and installation including but not limited to the structural foundation, the anchor bolts, the steel framing, and the corrugated sheets.

175-2.4 EVIDENCE OF SATISFACTORY OPERATION. Prior to purchasing the blast fence, submit evidence of satisfactory operation for at least 3 years in actual field service for continued testing of similar aircraft and jet engines.

MATERIALS

175-3.1 DEFLECTOR SURFACE. Provide deflecting surface of galvanized corrugated steel with minimum 2 oz. per square foot zinc coating per Fed. Spec. WW-P-00405. Provide sheets with a section modulus of not less than 0.0163 inch cubed per inch. Deflecting surfaces with perforations, holes, or other openings are unacceptable.

175-3.2 FRAMING. Fabricate framing members from ASTM A36 steel hot dipped galvanized after fabrication. Provide structural framing shapes, rolled, punched and prefabricated for bolting together at the site. Hot dip galvanize all structural members, parts, and corrugated metal with a minimum coating of 2.0 oz. zinc per square foot of surface.

175-3.3 CONCRETE. Meet the requirements of item P-610.

175-3.4 ANCHOR BOLTS. Use "L" type hot dipped galvanized anchor bolt assemblies for setting in newly placed concrete, tapped oversize, with a fixed square nut.

175-3.5 ASSEMBLY BOLTS. Provide mechanically galvanized bolts, nuts, and washers except where otherwise specified. Provide bolts and cap screws that meet the requirements of ASTM A449. Use all-steel self-locking nuts except on anchor bolts. Provide heat-treated SAE 1038 steel bolts where subject to blast temperatures.

CONSTRUCTION REQUIREMENTS

175-4.1 CONCRETE FOUNDATION. Install concrete foundations according to the dimensions shown on the plans. Place anchor bolts in accordance with the approved working drawings. Tolerance between anchor bolt centers is non-cumulative and must be accurately held in order to prevent assembly difficulty. Use wooden or steel gig in setting of anchor bolts. Do not set anchor bolts freehand. Run anchor bolt nuts tight on threads to locate the grade line. Ground the blast fence by welding one anchor bolt every 20' apart to the vertical reinforcing bars in the foundation slab.

175-4.2 BLAST FENCE. Assemble all components by bolting together with flat washers under bolt heads and half oval washers between nuts and corrugated sheets. Welding, brazing or burning of holes is not permitted. Tighten all nuts and bolts to the torque specified by the manufacturer. Tighten all vane bolts against half oval washer until washer snugs to corrugation. Assemble in accordance with manufacturer installation instructions and approved working drawings. Tighten anchor bolts to the manufacturer's prescribed torque, against an external spline lock washer at final assembly.

175-4.3 FINISH. Painting of galvanized surfaces is not required. White rust or mill markings on galvanized surfaces are not cause for rejection but retouch or regalvanize surfaces showing iron stain, rust, scratches, or marring. Make repairs to damaged galvanizing in conformance with ASTM A780 (standard practice for repair of damaged and undercoated areas of hot dip galvanized coatings) at no additional cost to the Department.

METHOD OF MEASUREMENT

175-5.1 SECTION 90. Measured in place from outside to outside of end posts or corner posts and for the length of blast fence actually constructed.

BASIS OF PAYMENT

175-5.2 At the contract unit price for each furnished, installed, and accepted item. Work and materials associated with construction of the concrete blast fence foundation, excavation, backfill, and grade preparation is subsidiary.

Payment will be made under:

Item F175.010.0000	Blast Fence – per linear foot
Item F175.020.0000	Relocate Blast Fence – per lump sum

ITEM F-180 SCREEN FENCE

DESCRIPTION

180-1.1 Furnish and erect a screen fence as shown on the plans.

MATERIALS

180-2.1 Provide fencing materials as shown on the plans and as follows to include zinc-coated framework, thoroughly color coated with 3-mil minimum polyester layer for protection from corrosion:

Chain-Link Fabric:	
Type:	Polyvinyl chloride extruded over zinc-coated steel wire per ASTM F668 Class 1 or extruded and adhered to zinc-coated steel wire per ASTM F668 Class 2a.
Gauge:	9 gauge galvanized core wire
Mesh:	2 inch
Height:	6 foot
Selvage	Knuckled top and bottom up to 5 feet high, twisted and knuckled 6 feet to 20 feet high, except 1-1/4 inch mesh and smaller knuckled top and bottom.
Colors:	Forest Green
Framework:	
Type 2:	Spectra polyester resin, 3 mils minimum, over galvanized steel ASTM F1043, Group 1C, with a minimum yield strength of 50,000 psi. Protective coating per ASTM F1043, external coating Type B, zinc with organic overcoat, 0.9 ounces per square foot minimum zinc-coated with chromate conversion coating and verifiable polymer film.
Colors:	Forest Green
Top Rail:	
Type 2:	1-5/8 inch O.D. SCH 40 pipe (0.111 inch wall thickness, 1.83 lb./ft.)
Line Posts:	
Type 2:	2-3/8 inch O.D. SCH 40 pipe (0.130 inch wall thickness, 3.12 lb./ft.)
Terminal Posts:	
Type 2:	2-7/8 inch O.D. SCH 40 pipe (0.160 inch wall thickness, 4.64 lb./ft.)
Fittings:	
Tension and Brace Bands:	Polymer coating, 6 mils minimum, over hot-dipped galvanized pressed steel.
Caps, Eye Tops, Rail Ends:	Polymer coating, 6 mils minimum, over hot-dipped galvanized pressed steel.
Sleeves:	Polymer coating, 6 mils minimum, over hot-dipped galvanized pressed steel.
Tie Wires:	Polymer coating, 6 mils minimum, over zinc-coated steel wire.

180-2.2 CONCRETE. Provide commercial grade concrete with a minimum 28-day compressive strength of 2,500 psi or an approved, pre-mixed, sacked concrete.

CONSTRUCTION REQUIREMENTS

180-3.1 GENERAL. Construct the fence in accordance with the details shown on the plans. Establish the fence alignment as shown on the plans.

180-3.2 INSTALLING POSTS. Set all end posts, corner posts, and pull posts at the required dimensions and depths and at the spacing shown in Alaska Standard Plan F-01. Set line posts in concrete as shown on the plans.

Place posts at the intervals shown on the plans but in no case more than 10 feet apart. Thoroughly compact around the posts by tamping or vibrating. Compact backfill to a smooth surface slightly higher than the surrounding ground and sloped to drain away from the posts. Set all posts plumb and to the required grade and alignment.

METHOD OF MEASUREMENT

180-4.1 Measured along the top of the fence from center to center of end posts, excluding the length occupied by gate openings.

BASIS OF PAYMENT

180-5.1 At the contract unit price per linear foot of fence.

Work and materials involved in clearing and disposal of material along the fence line is subsidiary.

Payment will be made under:

Item F180.010.0006	6-feet Screen Fence – per linear foot
Item F180.010.0008	8-feet Screen Fence – per linear foot

CONTRACTOR FURNISHED SERVICES

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, and supplies 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

100-4.1 Payment for mobilization and demobilization will be made in partial payments as follows:

- **a.** When equipment and supplies are landed in serviceable condition at the project site and other necessary preparation have been completed so that work can commence on other pay items, 60% of the pay item.
- **b.** When 25% or more of the original contract is earned, an additional 20%.
- **c.** With Final Payment, the remaining 20%.

The Department 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

100-5.1 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 G100.010.0000 Mobilization and Demobilization – per lump sum

ITEM G-115 WORKER MEALS AND LODGING, OR PER DIEM

DESCRIPTION

115-1.1 This item consists of complying with the Alaska Department of Labor and Workforce Development (DOLWD) requirements for Worker Meals and Lodging, or Per Diem; as described in the Laborers' and Mechanics' Minimum Rates of Pay (Pamphlet 600), current issue.

Ensure subcontractors comply with the DOLWD requirements. The direct internet address is http:www.labor.state.ak.us/lss/pamp600.htm.

Ensure facilities meet the Alaska Administrative Code 8 AAC 61.1010 and 8 AAC 61.1040 Occupational Safety and Health Standards, 18 AAC 31 Alaska Food Code, and U. S. Code of Federal Regulations 29 CFR Section 1910.142 Temporary Labor Camps.

Do not consider the cost of Meals and Lodging or Per Diem in setting wages for the worker or in meeting wage requirements under AS 23.10.065 or AS 36.05.

METHOD OF MEASUREMENT

115-4.1 Progress payments for Worker Meals and Lodging, or Per Diem will be computed as equivalent to the percentage, rounded to the nearest whole percent, of the original contract amount earned.

BASIS OF PAYMENT

115-5.1 Payment will be made at the contract lump sum price for Worker Meals and Lodging, or Per Diem. This price and payment shall be full compensation for all costs associated with this item.

Payment will be made under:

Item G115.010.0000 Worker Meals and Lodging, or Per Diem – per lump sum

ITEM G-120 DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM

(RESERVED)

ITEM G-130 SERVICES TO BE FURNISHED BY THE CONTRACTOR

DESCRIPTION

130-1.1 Furnish and maintain facilities and services specified in the Contract for the Department's project administrative personnel to use during the project. Services include heat, electrical power (NEC compliant), water and any others required to operate the facilities. All furnished facilities remain the property of the contractor when the work is completed.

The Engineer may delete any G-130 Items, by Directive within five working days after the Preconstruction Conference. If any G-130 Items are deleted within the specified period, Subsection 90-09, Eliminated Items, shall not apply to the deleted G-130 Items.

REQUIREMENTS

130-2.1 FIELD OFFICE. Furnish and maintain a suitable office for the Engineer to use during construction. Make the Field Office available for occupancy two weeks before commencing work on the project through two weeks after Project Completion

a. Submit office proposal to the Engineer prior to procurement or transporting office to the project. The Engineer will approve the office general condition, location, access, features, and physical layout prior to beginning any office setup work. If this office is part of your building, completely partition it from the rest of the structure and provide a separate outside door equipped with a lock.

b. Provide at least the following minimum requirements, or as approved by the Engineer:

(1) Floor space of at least 500 ft^2

(2) Window area of at least 60 ft^2

(3) Lockable outside door(s)

(4) 6 each plastic folding tables, 8 ft long

(5) Shelf space of at least 24 linear feet

(6) Adequate heating and cooling devices, and fuel or power to run the devices, to maintain an office temperature between 65°F and 75°F

(7) Adequate ventilation

(8) Continuous supply of drinking water from an approved source or commercial supplier

(9) Toilet and Sanitary facilities including adequate hand soap, hand sanitizer, toilet paper, and paper towels

(10) Janitorial services at least weekly

(11) In addition to any power required for adequate heating and cooling devices, provide electrical service and facilities as referenced in 130-2.8 a

(12) Internet service and phone as referenced in 130-2.7.

(13) One multifunction Color Printer/Scanner/Copier meeting the following requirements:

New or like-new condition
Printing/copying at least 32 pages per minute (ppm)
Scan speed of 40 ppm at 400 dots per inch (DPI) in color, at a minimum

Print/Scan/Copy 8.5 inches by 11 inches and 11 inches by 17inches in color, at a minimum
Supports network scanning (FTP and SMB Support)
Supports network printing (PCL and Postscript)
Network card included
Automatic Document Feeder
Furnish ink and toner and perform repairs and maintenance as necessary.
The Printer/Scanner/Copier remains property of the Contractor upon completion of the contract.

(14) Make the field office accessible according to the requirements of 2006 U.S. DOT ADA Standards for Transportation Facilities. Provide at least one designated handicap parking space.

(15) One AED (Automated External Defibrillator), with carrying case and properly marked wall cabinet. Provide training on how to use the AED.

(16) One combination Smoke and Carbon Monoxide Detector minimum. Provide combination Smoke and Carbon Monoxide Detectors in any location requested by the Engineer.

(17) One 25 Person Trauma First Aid Kit.

(18) 2 mobile hotspots with month-to-month data plans. Include car charger and 5 gigabytes of data usage per month.

c. Provide electrical power to the Department's portable concrete compressive strength lab, as identified in 130-2.8 i, if there are any bridge items in the bid schedule.

d. Provide electrical power to the Department's portable nuclear storage trailer as identified in 130-2.8, h.

e. Provide the following to the Department's portable asphalt lab if there are any asphaltic materials in the bid schedule and item 130-2.2 Field Laboratory does not appear in the bid schedule.

(1) Electrical service as identified in 130-2.8 d Asphalt Laboratory.

(2) Internet service as specified for the Field Laboratory.

All long distance calls made by State personnel will be paid by the State. Installation and maintenance fees, local calls, connection fees and internet service provider fees, and all other fees shall be paid by the Contractor. Paper used by the copier/scanner/printer will be paid by the State.

130-2.2 FIELD LABORATORY. Furnish and maintain a field laboratory for the Engineer to use exclusively throughout the contract. Provide a completely functional installation two weeks before commencing construction work through two weeks after Project Completion.

a. **Site.** Grade and compact a site for the lab acceptable to the Engineer. Locate and level the structure on this site. If subsequent ground movement causes an unlevel or unstable condition, re-level or re-locate the facility as directed.

b. **Main Lab.** Provide a weatherproof structure suitable to field test construction materials, with the following minimum functional requirements:

(1) Floor space of 300 ft^2

(2) Two 10-ft^2 windows that open and lock

(3) Lockable door(s)

(4) Work bench(es), 2-1/2 feet wide 16 feet long, 3 feet tall

(5) Shelf space, 1 foot by 16 feet

(6) One 18-inch deep sink with attached industrial faucet with hand sprayer attachment and approved drain

(7) A gravity-fed 250-gallon tank or pressurized constant water supply of acceptable quality.

(8) Electrical service as indicated in 130-2.8 b Field Laboratory

(9) Heating equipment suitable to maintain a uniform room temperature of 65 F to 75 F

(10) Storage cabinet, 3 feet wide by 3 feet tall by 3 feet deep, lockable, securely fixed to an inside wall with a hinged door opening outward

(11) Office desk and 2 chairs

(12) One combination Smoke and Carbon Monoxide Detector minimum. Provide Combination Smoke and Carbon Monoxide Detectors at any location requested by the engineer.

(13) One 25 person Trauma First Aid Kit.

(14) Continuous supply of drinking water from an approved source or commercial supplier

(15) Toilet and Sanitary Facilities including adequate hand soap, hand sanitizer, toilet paper, and paper towels

(16) Internet service and phone as referenced in 130-2.7.

If the lab is a mobile unit mounted on axles and wheels, block the structure under the frame so that the wheels do not touch the ground and the blocking rests firmly on the prepared site.

c. Auxiliary Lab. Provide a separate weatherproof shed within 20 feet of the main lab structure with the following minimum functional requirements:

(1) Floor 8 feet by 12 feet, ceiling height 8 feet

(2) Door 4 feet wide and window 5 ft^2 that opens and locks

(3) Electrical service as identified in 130-2.8 c, Field Laboratory Out Building

(4) Work table 1-1/2 feet wide, 3 feet long, 3 feet tall, capable of supporting 250 pounds and affixed to an inside wall as directed

(5) Concrete-slab floor, 8 feet by 8 feet and 4 inches thick, cast-in-place or pre-cast. Install anchor bolts in the floor to accommodate the mounting pattern of the Gilson sieving machine at a location as directed.

(a) Comply with 1. above for slab foundation requirements.

(b) Found the slab directly on the prepared site.

d. Access. For all types of installations, if the entryway is located higher than a single 7-inch rise, provide the following:

(1) Stairway, 3 feet wide with 11-inch tread and 7-inch rise

(2) Landing, 4 feet by 4 feet centered on the entryway

(3) Handrail(s) firmly affixed to the stairway

e. Lab Equipment and Services. Provide the following lab equipment and services:

(1) Propane necessary for the lab operation, including two 100-pound tanks, regulators, hoses, fittings, and incidentals for a functional system

(2) Specialized sampling equipment such as belt templates or belt sampling devices as required

(3) Fuel and power necessary to continuously operate the facilities

f. Provide the following to the Department's portable asphalt lab if there are any asphaltic materials in the bid schedule.

(1) Electrical service as identified in 130-2.8 d Asphalt Laboratory.

(2) Internet service as specified for the Field Laboratory.

130-2.3 CURING SHED. Furnish and maintain a suitable weather tight shed for curing concrete test cylinders, with a suitable tank(s) for curing concrete test cylinders.

Provide a tank(s) large enough to contain at least 6 test cylinders, each 4 inches by 8 inches, from each pour that you propose to make during any 28-day period. Use a tank(s) at least 18 inches high, insulated, and constructed of heavy duty plastic or non-corrosive metal. Construct a lid to provide access to the tank(s).

Provide suitable heating to maintain the temperature in the tank between 70 and 77°F at all times when curing the test cylinders. In addition, provide suitable thermometers in the shed and tank(s) to check the temperature.

Provide a supply of calcium hydroxide (high-calcium hydrated lime) sufficient to maintain a fully saturated water bath in the tank(s). Provide a source of potable water.

Provide one combination smoke alarm and carbon monoxide detector.

Provide electrical service as identified in 130-2.8 e Curing Shed.

130-2.4 CAMP FACILITIES. Furnish and maintain suitable camp facilities for Department employees and other authorized personnel. The Special Provisions will list an estimated number of employees.

Provide the following camp facilities:

a. Lodging (Bunkhouse and Bedding)
b. Meals (Mess Hall and Kitchen)
c. Sanitary and Other Facilities

Provide all camp facilities according to the applicable chapters of the State of Alaska Department of Labor, *Occupational* and *Industrial Structures Code*, and the State of Alaska Department of Environmental Conservation, *Food Service Regulations*.

Camp facilities for your employees, that meet these requirements, may also be used for State employees.

These Specifications do not exclude the use of roadhouses or lodges located near the project that are available for your use. The Engineer may approve a roadhouse, lodge, or camp, providing the accommodations conform with contract requirements.

Provide camp facilities for use by State employees and other authorized personnel while you are engaged in work at the project site, or in material sources used to supply materials to this project.

Department employees and other authorized personnel must sign a meal and/or lodging sheet after each meal and each night's lodging.

When you use camp facilities, completely remove and dispose of all garbage and/or trash piles, cesspools, septic tanks and leach fields as required by applicable laws and regulations and as directed.

130-2.5 NUCLEAR TESTING EQUIPMENT STORAGE SHED. Design, furnish and maintain a weatherproof, heated, and ventilated nuclear densometer/testing equipment storage shed for the Engineer to use exclusively throughout the contract. Install the building at least 15-feet from an occupied area at a location approved by the Engineer. Install the shed at least one week before the commencement of construction activities and maintain it until one week after Project Completion. Provide sufficient floor area for the nuclear testing equipment and a portable electric heater to maintain a minimum room temperature of 50°F. Design the building with enough floor area to provide sufficient clearance between the equipment, heater, and combustibles. Provide a commercial grade metal-clad exterior entrance door of 3 feet width minimum width by 6-feet and 8 inches height with dead-bolt lockset. Hang the door so that hinge pins are not accessible from the exterior. Provide the Engineer with 2 keys to control access. Provide a 5/16-inch by 10 feet long welded steel security chain securely attached inside the structure with tamperproof hardware for the Engineer to secure the testing equipment. Provide electrical service as identified in 130-2.8 g Nuclear Testing Equipment Storage Shed. Secure the structure to the ground with tamperproof anchors to resist wind loads and prevent unauthorized movement of the building. The Nuclear Testing Equipment Storage Shed remains the property of the Contractor. Remove the shed from the site following project completion. The Nuclear Testing Equipment Storage Shed must be windowless.

130-2.6 STORAGE CONTAINER. Furnish, transport and maintain a weathertight, lockable, steel enclosed 20 feet long by 8 feet wide by 8 feet high wooden floored container for the storage of the Department's materials, supplies and testing equipment (but not nuclear equipment). Provide twenty equally spaced fastening points on the interior walls that are capable of securing the Department's contents. Door opening dimensions of the storage container shall be greater than 60 square feet. Supply necessary equipment to lift and move container with minimal disturbance to the Department's contents. The container shall not be moved by skidding or hook lift. The Contractor shall be listed as the shipper on all documents listing and acknowledging receipt of the Department's goods for shipment.

Deliver an empty and clean container to the Regional Materials Laboratory, or location acceptable to the Engineer, three weeks prior to transporting to the project site. Allow 7 days for the Department to load the container. Transport the loaded container to the project site. Set up container at a location approved by the Engineer prior to commencing construction work.

130-2.7 FIELD COMMUNICATIONS. Furnish and maintain a satellite communications system that includes internet and phone for the Engineer to use exclusively throughout the contract. Provide a completely functional installation 2 weeks before commencing construction work through one month after Project Completion.

Two weeks prior to procuring the field office and field laboratory, submit to the Engineer the proposed communications system consisting of phone and internet service. Obtain the Engineer's approval of the communications system prior to procuring the system.

Furnish and install high speed internet service and telephone service, with all necessary ancillary equipment. Provide internet and phone jacks in the field office and field laboratories in locations identified by the Engineer. Furnish one mobile satellite phone in addition to the phone system in the field office.

The internet system shall have a send and receive capability supporting 1.0 Megabytes per second (Mbps) download speed or higher and 0.5 Mbps or higher upload speed at all times. The internet system shall have a minimum monthly data usage of 10 Gigabytes (GB). Include a wireless router and an appropriately sized battery backup for the internet system. The system shall be separate from the internet system of the contractor for exclusive use of the Department.

The telephone system shall consist of commercially available telephones with the necessary equipment for each line. Provide one telephone that includes a built in digital answering machine.

Internet and telephone service shall be supplied and operational no more than two weeks after the field laboratory has been set up on site. Service plans shall be provided and remain in effect for the duration of the use of the field laboratory and field laboratory

130-2.8 ELECTRICAL POWER. Furnish and maintain a constant source of power to the facilities specified in the contract for the Department's use during the project. Provide a completely functional installation 2 weeks before commencing construction work through 2 weeks after Project Completion.

a. Field Office. Provide electrical services as follows:

(1) Heating/Cooling adequate to maintain temperatures between 65°F to 75°F

(2) Electrical current: 120/240 VAC, 60 cycle on 24 hour basis

(3) Wiring system to support a 40 Ampere user load demand with two 20-Amp circuits

(4) Outlets spaced every six feet on the interior wall, consistent with local codes

(5) Eight 100 Watt incandescent or sixteen 40 Watt florescent, or equivalent LED fixtures

b. Field Laboratory. Provide electrical services as follows:

(1) Heating/Cooling adequate to maintain temperatures between 65°F to 75°F

(2) Electrical current: 120/240 VAC, 60 cycle on 24 hour basis

(3) Wiring system to support a 60 Ampere user load demand with two 20-Amp circuits, GFI Protected

(4) Outlets spaced every six feet on the interior wall, consistent with local codes

(5) Four 100 Watt incandescent or eight 40 Watt florescent, or equivalent LED fixtures

(6) Exhaust fan: minimum airflow capacity of 5 cubic feet per second (cfs)

c. Field Laboratory Out Building. Provide electrical services as follows:

(1) Heating/Cooling adequate to maintain temperatures between 65°F to 75°F

(2) Electrical current: 120/240 VAC, 60 cycle on 24 hour basis

(3) Wiring system to support a 20 Ampere user load demand, GFI Protected

(4) Three conveniently spaced outlets on the interior wall, consistent with local codes

(5) Two 100 Watt incandescent or four 40 Watt fluorescent, or equivalent LED fixtures

(6) Exhaust fan: minimum airflow capacity of 5 cubic feet per second (cfs)

(7) 1-30 amp 110 volt circuit (asphalt cut off saw)

d. Asphalt Laboratory Provide electrical services as follows:

(1) Electrical current: 120/240 VAC, 60 cycle on 24 hour basis

(2) 100 Ampere service

(3) At least one 15 Amp lighting circuit,

(4) Outlets, six duplex outlets conveniently spaced around the lab, consistent with local codes.

(5) Lights, switch by door and either four 100 Watt incandescent or eight 40 Watt fluorescent, or equivalent LED fixtures.

(6) Exhaust fan, minimum airflow capacity of 5 cubic feet per second (cfs).

(7) 1-240 volt -50 Ampere circuit (Asphalt Burn off oven)

(8) 2 240 volt 20 Amp circuit for each (of two) aggregate ovens. (If a large oven is used power required depending on oven demands)

e. Curing Shed. Provide electrical services as follows:

(1) Heating/Cooling adequate to maintain temperatures between 70°F to 77°F

(2) Two 100 Watt incandescent or four 40 Watt fluorescent, or equivalent LED fixtures

f. Storage Container. Provide electrical services as follows:

(1) Electrical current: 120/240 VAC, 60 cycle on 24 hour basis

(2) Wiring system to support a 20 Ampere user load demand, GFI Protected

(3) Two conveniently spaced outlets on the interior wall, consistent with local codes

(4) Four 100 Watt incandescent or eight 40 Watt fluorescent, or equivalent LED fixtures

g. Nuclear Testing Equipment Storage Shed. Provide electrical services as follows:

(1) Heating/Cooling adequate to maintain minimum temperatures of 50°F

(2) Electrical current: 120/240 VAC, 60 cycle on 24 hour basis

(3) Two 100 Watt incandescent or four 40 Watt fluorescent, or equivalent LED fixtures

(4) Wiring system to support a 20 Ampere user load demand

h. Nuclear Testing Equipment Storage Shed (State Provided). Provide electrical services as follows:

(1) Electrical current, 120/240 VAC, 60-cycle on 24-hour basis

(2) Wiring system to support a 20 Ampere user load demand

i. Portable Concrete Compressive Laboratory. Provide electrical services as follows:

(1) Electrical current: 120/240 VAC, 60 cycle on 24 hour basis

(2) Wiring system to support a 20 Ampere user load demand

If Nuclear Testing Equipment Storage Shed is deleted the electrical power requirement are still required per 130-2.8 h.

If the contract contains bridge items that require concrete or grout provide electrical power to the Department's Portable Concrete Compressive Laboratory per 130-2.8 i.

METHOD OF MEASUREMENT

130-4.1 MEAL. By each meal served to authorized personnel, based on signed meal sheets.

130-4.2 LODGING. By each night's lodging received by authorized personnel based on signed lodging sheets.

130-4.3 NUCLEAR TESTING EQUIPMENT STORAGE SHED. By the number of storage sheds specified, to include all components, installed and accepted as completed units and ready for equipment storage.

130-4.4 STORAGE CONTAINER. By the number of storage containers specified, to include all components, installed and accepted as completed units and ready for materials and equipment storage.

BASIS OF PAYMENT

130-5.1 LUMP SUM ITEMS. Payment for Items G-130a, G-130b and G-130c will be made as follows:

a. A percentage of the lump sum amount, to be determined by the Engineer, will be paid as full compensation for furnishing the facility at the site.

b. The balance of the lump sum amount will be prorated over the anticipated active construction period with a portion included as part of each interim payment, for maintenance, repairs, providing all utilities, and for removing it from the site. If anticipated construction period changes, the final increment will be held until final payment.

Item G-130a Field Office, includes initial telephone and Internet service costs to provide operational connections.

When Item G-130i, Field Communications appears in the bid schedule, internet and telephone service will be measured and paid under G-130i, and are not subsidiary to G-130a and G-130b.

130-5.2 MEAL. Includes all labor, materials, tools, equipment and supplies required to provide meals to all authorized personnel assigned to, or associated with, the project.

130-5.3 LODGING. Includes all labor, materials, tools, equipment and supplies required to provide lodging for all authorized personnel assigned to, or associated with, the project.

130-5.4 NUCLEAR TESTING EQUIPMENT STORAGE SHED. At the contract unit price to include all labor, materials, tools, equipment and supplies required to furnish and install the shed before commencement of construction, to maintain it for the duration of the project and to remove the shed and electrical service after project completion. Electrical service and utility costs are subsidiary to this item.

130-5.5 STORAGE CONTAINER. At the contract unit price to include all labor, materials, tools, equipment and supplies required to deliver the storage shed to the regional office for loading, to deliver it to the project office, to install it before commencement of construction, to maintain it for the duration of the project, to remove the shed and electrical service after project completion, to deliver it to the regional office for unloading, and to remove the storage shed. Electrical service and utility costs are subsidiary to this item.

130-5.6 (RESERVED)

130-5.7 ENGINEERING COMMUNICATIONS. Installation and maintenance of equipment and monthly invoice costs will be paid for by Contingent sum under Item G-130i, Field Communications. Provide invoices from vendor for installation, maintenance, and monthly subscription costs.

Payment will be made under:

Item G130.010.0000	Field Office – per lump sum
Item G130.020.0000	Field Laboratory – per lump sum

Item G130.030.0000	Curing Shed – per lump sum
Item G130.040.0000	Meal – per each

ITEM G-131 ENGINEERING TRANSPORTATION

DESCRIPTION

131-1.1 Furnish and maintain vehicles for the exclusive use of the Engineer and their staff throughout the duration of the project.

REQUIREMENT

131-2.1 Provide the specified number of the following vehicle types:

a. **Truck.** Full-size four wheel drive pickup or sport utility vehicle. Less than 3 model years old, in good condition and with less than 36,000 miles on the odometer. Equip vehicles with mud/snow tires, strobe beacons (Whelen 360 or equivalent) and two-way radios set on the airport CTAF (Common Traffic Advisory Frequency).

b. **ATV.** All-terrain vehicle, fully enclosed cab, 4x4, 300 cc minimum, with a 500-lb capacity trailer. Less than 3 model years old, in good condition. Equip with securely attached two-way radio set on the airport CTAF (Common Traffic Advisory Frequency). Equip with a rotating beacon or strobe light.

c. **Snowmachine.** A snowmachine with 440 cc minimum engine size, and with a 500-lb capacity sled. Less than 3 model years old, in good condition.

d. **Boat.** An aluminum boat 20 foot long, and rated to carry a minimum of 1000 pounds. A motor capable of moving the loaded boat at 20 mph. Less than 3 model years old, in good condition.

The Contractor shall furnish all fuels and maintenance. The Contractor is responsible for normal wear and tear, and any other incidental damage, including broken windshields, that might arise during the Departments operation and use.

The Department is responsible for physical damage to any vehicle provided under this section if proximately caused by its negligent operation. The Department will provide non-owned auto liability insurance providing third party liability coverage for any accident during the Department's operation and use.

Obtain the Engineer's approval of vehicles prior to their shipment to the site. Vehicles remain the property of the Contractor and shall be removed from the site following the completion of the work.

METHOD OF MEASUREMENT

131-4.1 Lump sum items will not be measured for payment.

The quantity of per each items will be the number of vehicles provided and maintained for use for the duration of the project at the contract unit price.

BASIS OF PAYMENT

131-5.1 Payment will be made as follows:

a. A percentage of the contract unit price, to be determined by the Engineer, will be paid as full compensation for furnishing the vehicles at the site.

b. The balance of the contract unit price will be prorated over the anticipated active construction period, with a portion included as part of each interim payment, for maintenance, fuel and repairs, and for removing vehicles from the site. If the anticipated construction period changes, the final increment will be held until final payment.

Payment will be made under:

Item G131.010.0000	Engineering Transportation (Truck) – per each
Item G131.020.0000	Engineering Transportation (ATV) – per each
Item G131.030.0000	Engineering Transportation (Snowmobile) – per each
Item G131.040.0000	Engineering Transportation (Boat) – per each

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.

The Contractor shall provide all survey work including, but not limited to: project layout, cross sections, slope stakes, grade stakes, as-built measurements, and quantity measurements. Immediately upon completion of initial cross sections, the Contractor shall furnish reduced and checked survey notes to the Engineer. From time to time throughout the work, as requested by the Engineer, the Contractor shall take appropriate sections and shall provide the Engineer with reduced and checked notes from which quantity calculations for progress payment purposes can be accomplished. Notes shall be kept in a neat, orderly, and legible form according to professional surveying practices.

Upon completion of each phase of the work, the Contractor shall furnish the Engineer with all necessary measurements for completion of the as-built drawings. The Contractor shall include identification and location of project features where actual locations differ from locations shown on the Plans. All original survey notes and field books shall become the property of the Department and shall be delivered to the Engineer as a condition to final payment on this contract.

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 "STATE OF ALASKA DOT&PF". 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 by 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 Department.

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 Department's Construction Surveying Requirements.

The Department 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 Departmental 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. Staking and hubbing of bottom of excavation and the top of each layer in the pavement structure.

l. 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.

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

Notify the Engineer immediately if a Department-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 Department'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 Department 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 Department 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:

n. 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.

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

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

q. 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.

At the end of each day's work, the surveyor shall email a copy of the downloaded raw data from the data collector, in its original format, to the Engineer. If editing is deemed necessary, send a separate email with the amended electronic data and a change log annotating the changes.

Provide in 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 Department's Construction Surveying Requirements.

The following will be supplied by the Department:

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 Department 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 Department. 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 G135.020.0000, 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 a PAC or SAC is disturbed by the

Contractor's actions, the Contractor shall reimburse the State of Alaska 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 CONTRACTOR FURNISHED ENGINEERING TOOLS. Furnish and maintain Engineering Tools as directed by the Engineer for the exclusive use of the Engineer throughout the duration of the project. The Contractor shall furnish all equipment specifications to the Engineer for approval prior to furnishing equipment. The equipment shall be in good working condition not more than 1 model year old. The Contractor shall insure and indemnify the Department against normal wear and tear, damage, theft, and all other events that may cause a loss of function of the furnished tools. The equipment shall be returned to the Contractor upon completion of the project, or when services are terminated by the Engineer. Furnish training for the Engineer's staff, as directed by the Engineer.

a. Global Positioning System (GPS) Rover Unit. All components shall be fully compatible to provide a stand-alone GPS Rover Unit. The Rover Unit shall be an "all on the pole" system equipped with the following:

(1) Receiver

(a) Bluetooth compatible.

(b) Meet waterproof specification IPX7.

(c) Shockproof for a drop onto a hard surface from a height of 4 feet.

(d) Dual frequency receiver capable of tracking at least twelve 12 satellites simultaneously on parallel channels.

(e) Capable of Real-Time Kinematic (RTK), Static, and Fast Static occupations.

(f) Capable of receiving L1, L2, and Global Navigation Satellite System (GNSS) frequencies.

(g) Antenna model shall have undergone antenna calibration by the National Geodetic Survey (NGS).

(h) Ensure the receiver contains the manufacturer's latest firmware upgrades.

(i) Provide the manufacturer's user guide.

(2) Controller

(a) Bluetooth compatible.

(b) Equipped with onboard software allowing for the configuration of RTK, Post Processed Kinematic (PPK), or Static rover modes.

(c) Meet waterproof specification IPX7.

(d) Shockproof for a drop onto a hard surface from a height of 4 feet.

(e) Full QWERTY keyboard with numeric keypad, and/or equivalent touch screen interface.

(f) Capable of collecting data in WGS84 and displaying local project coordinates.

(g) Equipped with onboard software that allows automatic point logging.

(h) Capable of creating and storing line-work in DFX or DWG format.

(i) Equipped with onboard software to allow the user to stake-out points, 3D lines, and DTM surfaces. Software shall allow the user to read cut/fill elevations relative to a Digital Terrain Model (DTM) surface.

(j) Capable of importing, exporting, and storing point, line, and DTM data.

(k) Capable of showing satellite, radio, and battery status.

(l) Equipped with onboard software that allow the user to create and manage survey jobs, point data, coordinate systems, and alignments.

(m) Equipped with a removable memory storage device with a minimum capacity of 512 megabytes (MB).

(n) Capable of storing custom configuration settings for the GPS Rover Unit.

(o) Ensure the controller contains the manufacturer's latest firmware upgrades.

(p) Provide the manufacturer's user guide.

(3) Radio System

(a) Meet waterproof specification IPX7.

(b) Support a frequency compatible with the Reference Station.

(c) Capable of storing multiple radio frequencies.

(d) Compatible with the Reference Station's broadcasting format and protocol.

(e) Power and programming cables.

(f) Provide the manufacturer's user guide.

(4) Batteries

(a) Provide all batteries required to fully power and operate the GPS Rover Unit.

(b) Batteries shall be capable of powering their respective equipment continuously, for not less than 6 hours under normal operating conditions.

(c) Each battery shall be rechargeable and commercially available.

(d) Provide an identical replacement backup battery for each primary battery required.

(e) Provide all power connectors necessary to connect the batteries to the equipment.

(f) Provide battery chargers to allow all onboard batteries to be charged simultaneously, and that safeguard against overcharging.

(5) Rod

(a) Fixed height (non-adjustable).

(b) Mounting hardware for GPS controller and radio.

(c) Pole grip with bubble level.

(d) Detachable bipod.

(e) Interchangeable flat and pointed footings.

(f) Quick release adapter for the GPS receiver.

(6) Carrying Case

(a) Hard Shell.

(b) Shockproof.

(c) Waterproof.

(d) Capacity to hold all components of the GPS rover, minus the rod.

b. GPS Base/Repeater Station. All components shall be fully compatible to provide a stand-alone GPS Base/Repeater Station setup. The setup shall include the following:

(1) Receiver

(a) Meet waterproof specification IPX7.

(b) Shockproof for a drop onto a hard surface from a height of 4 feet.

(c) Dual frequency receiver capable of tracking at least 12 satellites simultaneously on parallel channels.

(d) Antenna model shall have undergone antenna calibration by the NGS.

(e) Ensure the receiver contains the manufacturer's latest firmware upgrades.

(f) Carrying case.

(g) Tribrach with optical plummet and height rod.

(h) Provide the manufacturer's user guide.

(2) Controller

(a) Equipped with onboard software allowing for configuration as a GPS reference station in RTK, PPK, Static, and Fast Static modes.

(b) Capable of logging raw observations for post processing.

(c) Capable of showing satellite, radio, and battery status.

(d) Meet waterproof specification IPX7.

(e) Shockproof for a drop onto a hard surface from a height of 4 feet.

(f) Full QWERTY keyboard with numeric keypad, and/or equivalent touch screen interface.

(g) Equipped with a removable memory storage device with a minimum capacity of 512 MB.

(h) Equipped with 1 primary and 1 secondary power input port.

(i) Ensure the controller contains the manufacturer's latest firmware upgrades.

(j) Provide the manufacturer's user guide.

(3) Radio

(a) Transmission power, 25 Watts minimum.

(b) Meet waterproof specification IPX7.

(c) Shockproof for a drop onto a hard surface from a height of 4 feet.

(d) Support a frequency compatible with the Reference Station.

(e) Capable of storing multiple radio frequencies.

(f) Compatible with the CORS broadcasting format and protocol.

(g) Ensure the radio has a current license to broadcast in accordance with FCC requirements.

(h) Ensure the radio broadcast frequency doesn't conflict with other nearby broadcasting sources.

(i) Equipped with onboard software/firmware allowing for configuration as either a Reference Station or a Repeater Station.

(j) Carrying case.

(k) Antenna.

(l) Antenna/pole mounting adapter.

(m) Provide the manufacturer's user guide.

(4) Tripods – Provide one of each:

(a) Conventional tripod with extendible range pole. Include carrying case.

(b) Conventional wood tripod.

(5) Batteries

(a) Provide all batteries required to fully power and operate the GPS Base/Repeater Station.

(b) Batteries shall be capable powering their respective equipment continuously, for not less than 6 hours under normal operating conditions.

(c) Each battery shall be rechargeable and commercially available.

(d) Provide an identical replacement backup battery for each primary battery required.

(e) Provide all power connectors necessary to connect the batteries to the equipment.

(f) Provide battery chargers to allow all batteries to be properly charged, and that safeguard against overcharging.

135-3.5 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.

135-3.6 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 Department-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 Department. Deliver the certification letter and field notes for this work to the Engineer.

135-3.7 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 G135.020.0000 may include field work, office engineering, or any work described under the construction requirements of item G-135.

METHOD OF MEASUREMENT

135-4.1 The work will be measured according to GCP Section 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.

c. Contingent Sum. As specified by the Engineer in the Directive authorizing the work.

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 G135.010.0000 Construction Surveying by the Contractor, includes all Contractor surveying work described in the Contract.

Pay Item G135.020.0000 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 Subsection 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 G135.020.0000.

Pay Item G135.030.0000 Monuments by the Contractor, includes all monument work described in the Contract.

Pay Item G135.040.0000 Extra Surveying by the Contractor, includes payment according to a Directive from the Engineer authorizing the work. This pay item is for extra, additional, or unanticipated work made necessary by changes in the project.

Payment will be made under:

Item G135.010.0000	Construction Surveying by the Contractor – per lump sum
Item G135.020.0000	Extra Three Person Survey Party – per hour
Item G135.030.0000	Monuments by the Contractor – per lump sum
Item G135.040.0000	Extra Surveying by the Contractor – per contingent sum

ITEM 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 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

150-4.1 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

150-5.1 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, camp, camp personnel wages, 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 Department. No payment will be made separately or directly for embankments.

Payment will be made under:

Item G150.010.0070	Equipment Rental, Dozer 70-hp Minimum – per hour
Item G150.010.0075	Equipment Rental, Dozer 75-hp Minimum – per hour
Item G150.020.0070	Equipment Rental, Dozer 70-hp Minimum – per contingent sum
Item G150.020.0075	Equipment Rental, Dozer 75-hp Minimum – per contingent sum

ITEM G-200 CONTRACTOR QUALITY CONTROL PROGRAM

DESCRIPTION

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

REQUIREMENTS

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

METHODS OF MEASUREMENT

200-4.1 This item will not be measured for payment. The Engineers acceptance of the work constitutes measurement of this item.

BASIS OF PAYMENT

200-5.1 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 G200.010.0000	Contractor Quality Control Program - per lump sum
Item G200.020.0000	QC Program Administrator – per lump sum
Item G200.030.0000	QC Technician – per each

ITEM G-300 CRITICAL PATH METHOD 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 Department. Update the CPM schedule, as required.

Provide work plans.

300-2.1 SUBMITTAL OF SCHEDULE. 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.

300-3.1 REQUIREMENTS AND USE OF SCHEDULE

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.

The Engineer reserves the right to limit the number of activities on the schedule. No activity duration may be longer than 15 work days without the Engineer's approval.

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

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

b. Schedule Updates. Hold job site progress meetings with the Engineer for the purpose of updating the CPM Schedule. Meet with the Engineer monthly, or 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 during construction, 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 CPM Scheduling will not be measured for payment. Refer to GCP Section 90 for requirements regarding lump and contingent sum items.

BASIS OF PAYMENT

300-5.1 At the lump sum price for CPM Scheduling.

Payment will be made under:

Item G300.010.0000	CPM Scheduling – per lump sum
Item G300.020.0000	Schedule Price Adjustment – per contingent sum

ITEM G-310 PUBLIC UPDATES

DESCRIPTION

310-1.1 This item consists of providing updated construction information via email and advertisements throughout the project and administering weekly meetings with stakeholders and the public during active work. It also consists of a separate weekly meeting with the Engineer and his invitees (who may attend via teleconference) to discuss progress and scheduling. Provide meeting locations and teleconference services for all meetings, prepare and transmit weekly email updates with informational graphics, and place radio and newspaper advertisements as specified.

SUBMITTAL SCHEDULE

310-2.1 Submit draft advertisements and weekly email layout at the preconstruction conference for Engineer review and acceptance. Allow two weeks for initial review. Make any required revisions promptly. Ensure that the advance notice deadlines specified in section 310-3.1 are met by allowing sufficient time for both initial review and any resubmittal reviews.

REQUIREMENTS

310-3.1 LOCAL ADVERTISEMENT. Place advertisements in the local newspaper and on local radio. Place advertisements to publish or broadcast 60, 30, and 15 days prior to beginning construction activity for each season and 30 and 15 days prior to closing an entire runway.

The advertisement in the local newspaper shall be minimum 5 inches by 6 inches in size. It shall include the date that construction is expected to begin, and list and describe milestones for the season and anticipated impacts to the traveling public. Include the Department's and Contractor's point-of-contact names and telephone numbers for additional information and requests to be added to the weekly email update address list. Transmit the newspaper advertisement graphic in .pdf format to all persons listed in section 310-3.2 and on the current stakeholders list.

The advertisement to be broadcast on [designer to insert number] local radio stations, shall state the date that construction will begin and list and describe milestones for the season and anticipated impacts to the traveling public. Have the advertisement broadcast at least once for each station between noon and 1:00pm on the required days.

If the stated dates, milestones or impacts change or are expected to change as the season progresses, the Contractor shall place additional advertisements with updated information to keep the public informed. Submit to the Engineer for acceptance prior to placing any additional advertisement and allow a minimum of 3 business days for review.

310-3.2 WEEKLY EMAILS. Transmit weekly email updates and invitations to attend the weekly public meeting to representatives of the following, with a carbon copy (cc) to the Engineer:

- DOT&PF Airport Manager
- DOT&PF Airport Management
- DOT&PF Airport Rescue and Firefighting (ARFF)
- DOT&PF Regional Maintenance and Operations, Director
- DOT&PF Regional Airports Maintenance
- Designer(s) of Record
- DOT&PF Regional Public Information Officer
- FAA local maintenance and operations
- FAA Flight Service Station (FSS)
- All parties listed in the CSPP document
- Any party from the airport stakeholder list provided by the Engineer that expresses interest or that requests to be added to the list during the project

Each email update shall include a graphic (attached in .pdf format) that shows the active work area(s) including active haul routes, the parts of the airport that are currently closed, area(s) where work is intended during the next week, including the intended haul route and the resultant impacts that the intended work is expected to have upon airport operations, tenants, users and Air Carriers including movement routes for aircraft and ground traffic. Include the location, time and toll-free teleconference call-in number (and any required instructions) for the weekly public meeting. Include the Department's and Contractor's point-of-contact information. The Contractor shall ensure that each email size does not exceed 500 KB.

The email update shall be transmitted one weekday before the weekly meetings. Weekly email updates shall only be transmitted during the active construction season.

310-3.3 WEEKLY MEETINGS. The Contractor shall provide locations with toll-free teleconference services (so that people may attend telephonically) for the purpose of holding two separate weekly meetings as follows:

Weekly Progress Meetings with the Engineer. Meet with the Engineer and his invitees (who may attend via teleconference) at the time(s) and location(s) acceptable to the Engineer. Keep airport safety, security and short term construction schedules as a standing agenda item for each weekly progress meeting. The Contractor shall be prepared to discuss questions, any items the Contractor needs clarification on and the upcoming coordination through the Engineer efforts, especially if coordination is required through the Engineer with a stakeholder(s). Any concerns or possible construction changes shall also be discussed. Weekly progress meetings with the Engineer are only required during the construction season.

Weekly Public Meetings with Stakeholders and the Public. Administer and hold meetings with stakeholders and the public at the time and place agreed to at the preconstruction conference. Keep all stakeholders informed of the next week's status of airport operational areas in relation to aircraft and ground traffic. Provide hardcopies of the detail graphics provided with that week's email update. Provide updated detail graphics as required. Reserve meeting topics with the Engineer in advance. The Contractor shall only share or discuss information that is pertinent to stakeholders and the travelling public attending or teleconferencing the weekly public meetings.

METHOD OF MEASUREMENT

310-4.1 This item will not be measured for payment.

BASIS OF PAYMENT

310-5.1 Payment will be made at the contract lump sum price as follows:

a. A percentage of the lump sum amount, to be determined by the Engineer, will be paid as full compensation for providing accepted meeting locations and facilities with functional toll-free teleconferencing.

b. The balance of the lump sum amount will be prorated over the anticipated active construction period for performance of the work as required. If anticipated construction period changes, the final increment will be held until final payment.

The lump sum amount shall be full compensation for all advertising and all necessary personnel, equipment, transportation, facilities and supplies required to perform the work as required. There shall be no additional compensation for additional advertisements or weekly meetings made necessary by Contractor's schedule changes.

Payment will be made under:

Item G310.010.0000 Public Updates – 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. The airport flagger shall have no other assigned duties.

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. 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

700-4.1 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

700-5.1 Payment will be made at the contract unit price for each Airport Flagger per hour. The hourly rate for Airport Flagger is set at [$__.__] per hour for this contract. The Engineer does not require a change order/directive for this pay item.

Payment will be made under:

Item G700.010.0000	Airport Flagger – per contingent sum
Item G700.020.0000	Airport Pilot Car – per hour
Item G700.030.0000	Airport Traffic Maintenance – per lump sum
Item G700.040.0000	Traffic Control for Airports – 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 operator's 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

705-4.1 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

705-5.1 The contract price includes all resources required to provide watering, as directed.

Payment will be made under:

Item G705.010.0000 Watering for Dust Control – per Mgal

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, sequential arrow panels, portable changeable message board signs, special signs, warning lights, portable concrete barriers, crash cushions, highway flaggers, pilot cars, interim pavement markings, 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. Include longitudinal buffer space for the posted speed limit, according to Table 6C-2 of the ATM unless project conditions or geometric features prohibit including all or a portion of the buffer length.

When a TCP is included in the Plans, use it, modify it, or design an alternative TCP. All TCPs must include the following information:

a. Project name and number.

b. A designated TCP number and name on each page.

c. For TCPs more than one page, each page must be numbered.

d. The posted speed limit for each roadway.

e. Existing striping width, lane width, and road surfacing.

f. Construction lane widths, striping layout, and temporary pavement marker layout.

g. Provisions for Pedestrian, Bicycle, and ADA travel through the work zone.

h. Dates and times the TCP will be in effect and why it is being used.

i. The Worksite Traffic Supervisor's signature certifying that all TCPs conform with the ATM and the Contract.

j. The Project Superintendent's signature confirming the TCP is compatible with the work plan.

k. The name(s) of the Worksite Traffic Supervisor, his/her alternate and their 24 hour telephone number(s).

l. Signs to be used and the ASDS designation number and size.

m. Location and spacing of all devices and signs.

n. A plan to address any possible slopes, drop offs, paving joints, or similar temporary features that may occur during use of the TCP.

o. For TCPs proposed to be used at night, note how the requirements will be met for the required lighting and retroreflective material.

TCPs submitted for approval without all the required information will be rejected. Allow 7 days for review of each TCP submittal. All required modifications to a TCP require a new submission and an additional 7 days for review.

A minor revision to a previously approved TCP during construction requires 48 hours for review and approval by the Engineer.

The TCPs, Plans, and Alaska Standard Plans 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 oversize and overweight equipment in a highway traffic control zone must conform to an approved TCP, including all highway traffic control devices these operations require.

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

a. Qualifications. The Worksite Traffic Supervisor shall be knowledgeable and experienced regarding the requirements of the ATM and the implementation of those requirements. The Worksite Traffic Supervisor shall be familiar with the Plans, the Specifications, proposed operations, and is certified as one of the following:

(1) Traffic Control Supervisor, American Traffic Safety Services Association (ATSSA).

(2) Work Zone Temporary Traffic Control Technician, or Work Zone Safety Specialist, International Municipal Signal Association (IMSA).

Certify according to Form 25D-124 that the Worksite Traffic Supervisor has a minimum 4,000 hours of temporary traffic control work experience, is competent and capable, and has the authority to perform the duties and responsibilities in accordance with this section.

- Temporary traffic control work experience shall demonstrate an understanding of concepts, techniques, and practices in the installation and maintenance of traffic control devices, and skill in reading, interpreting, implementing, and modifying TCPs.

- Temporary traffic control work experience includes: flagging; installing traffic control devices in accordance with TCPs; monitoring traffic control devices and TCPs for correction.

- Temporary traffic control work experience is gained while serving as a Worksite Traffic Supervisor-in-training, temporary traffic control support personnel, and Flagger.

- Four thousand (4,000) hours of experience serving solely as a flagger does not satisfy these requirements.

Worksite Traffic Supervisors shall maintain current certification 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 twice each day and at approximately 12 hour intervals. 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 within 24 hours. Use Traffic Control Daily Review Form 25D-104.

(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, highway flaggers, and pilot car drivers.

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

c. Authority. The Worksite Traffic Supervisor shall have the Contractor's authority to stop work and implement immediate corrective action to unsafe traffic control, in locations where unsafe traffic control is present.

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 ASTM D4956. 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 retroreflective sheeting that meets ASTM D4956 Type II or III.

d. Portable Concrete Barriers. Use portable concrete barriers that conform to the Contract. For each direction of highway traffic, equip each 12.5-foot section of barrier with at least two side-mounted retroreflective tabs placed approximately 6 to 8 feet apart, or a continuous 4-inch wide horizontal retroreflective stripe mounted 6 inches below the top of the barrier. Use yellow tabs or stripe when barriers are placed at centerline. Use white tabs or stripe when barriers are placed on the roadway shoulder. Use retroreflective sheeting that meets ASTM D4956 Type III, IV or V.

e. 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.

f. Drums. Use plastic drums that conform to the requirements of the ATM. Use reflective sheeting that meets ASTM D4956 Type II or III.

g. 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 ASTM D4956 Type II or III.

h. 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.

i. 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 ASTM D4956 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) or Manual for Assessing Safety Hardware MASH 2016 (Test Level 3).

Temporary work zone devices manufactured after December 31, 2019 must have been successfully tested to the 2016 edition of MASH. Such devices manufactured on or before this date, and successfully tested to NCHRP 350 or the 2009 edition of MASH, may continue to be used throughout their normal service lives.

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 inside and outside the project limits, day and night, to guide traffic safely.

Unless otherwise provided in this Section, keep all roadways, business accesses, and pedestrian facilities within the project limits 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 the traveling public must be redirected or stopped. Organize construction operations so the total of all construction related stoppages experienced by a vehicle traveling through the project does not exceed 20 minutes except when indicated otherwise in the Contract.

Stop 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 project limits as soon as an employee, or a subcontractor becomes aware of the accident.

710-3.2 ROADWAY CHARACTERISTICS DURING CONSTRUCTION. Obtain an approved TCP 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 maintaining traffic on an unpaved surface, 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.

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 two-way traffic can't be maintained on the existing roadway or detour, 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 to avoid 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. Give notice of major changes, delays, lane restrictions, or road closures to local officials and transportation organizations, including but not necessarily limited to:

a. Alaska Trucking Association

b. Alaska State Troopers

c. Division of Measurement Standards

d. Local Police Department

e. Local Fire Department

f. Local Government Traffic Engineer

g. School and Transit Authorities

h. Local Emergency Medical Services

i. Local Media (newspapers, radio, television)

j. Railroads (where applicable)

k. U.S. Postal Service

l. 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. The Engineer will determine advisory speeds when necessary.

For lane closures on multilane roadways, use sequential arrow panels. 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. Completely cover signal heads with durable material that fully blocks the view of signal head and will not be damaged or removed by weather.

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 Guidelines for Temporary Traffic Control Devices” and meet crashworthiness requirements per Section 710-2.2.

Immediately replace any devices provided under this Section that are lost, stolen, destroyed, inoperable or deemed unacceptable while used on the project. Stock repair parts for each Temporary Crash Cushion used on the project. Repair damaged crash cushions within 24 hours.

Maintain pre-existing roadside safety hardware at an equivalent or better level than existed prior to project implementation until the progress of construction necessitates removing the hardware. All existing hazards that are currently protected with roadside safety hardware or new hazards which result from project improvements shall be protected or delineated as required in the plans, specifications, and approved TCPs until permanent roadside safety hardware is installed.

All items paid under this Section remain the property of the contractor, unless noted otherwise in the contract. Remove them after completing the project.

a. Embankments. Install portable concrete or steel barrier, 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. Adjacent Travel Lane Paving. When paving lifts are 2 inches or greater and adjacent travel lanes or paved shoulders are not paved to the same elevation before the end of the shift, install W8-11 (Uneven Lanes), W8-9 (Low Shoulder), W8-17 (Shoulder Drop-Off), W14-3 (No Passing Zone), R4-1 (Do Not Pass), R4-2 (Pass with Care), and W8-1 (Bump) signs as appropriate. Place additional signs every 1500 feet if the section is longer than ½ mile.

c. Fixed Objects and Construction Vehicles and Equipment Working On Or Next to the Traveled Way. Do not park equipment in medians. Locate fixed objects at least 30 feet from the edge of traveled way. Fixed objects that exist prior to construction activity are not subject to this requirement unless the proposed temporary traffic routing moves the edge of traveled way closer to the pre-existing fixed object. Vehicles and other objects within parking lots in urban environments are considered preexisting fixed objects regardless of whether they are or are not present continuously throughout the day.

When worksite restrictions, land features, right of way limitations, environmental restrictions, construction phasing, or other construction conditions allow no practicable location meeting the preceding requirements, the Engineer may approve alternate locations for fixed objects. Alternate locations shall be as far as practicable from the edge of traveled way, the Engineer may verbally approve the alternate location. When the alternate location provides less than 15 feet separation, written approval is required.

When the Engineer determines a fixed object or fixed objects present unacceptable hazard, use drums or Type II barricades with flashing warning lights, or use portable concrete or steel barriers, or temporary crash cushion to delineate or shield the hazard, as approved by the Engineer.

d. Flagging. 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 flagging operation before it begins and direct adjustments as conditions change.

Flaggers must be certified by one of the following:

(1) Flagging Level I Certification by IMSA

(2) Flagger Certification by ATSSA

(3) Traffic Control Supervisor, ATSSA

(4) Work Zone Safety Specialist, IMSA

(5) ATSSA Flagging Instructor

Flaggers shall maintain current flagger certification. Flaggers must be able to show their flagger certification anytime they are on the project.

Highway flaggers must maintain their assigned flagging location at all times, unless another qualified highway flagger relieves them, or the approved TCP terminates the flagging requirements. Remove, fully cover, or lay down flagger signs when no highway flagger is present. Keep the highway flaggers' area free of encumbrances. Keep the flagger's vehicle well off the roadway and away from the flagging location so the flagger can be easily seen.

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

Obtain the Engineer's written approval before flagging signalized intersections. When flagging a signalized intersection, either turn off and cover the traffic signal or place it in the All-Red Flash mode. Coordinate changing traffic signal modes and turning off or turning on traffic signals with the agency responsible for signal maintenance and operation and the Engineer. Get their written approval in advance. Only uniformed police officers are permitted to direct traffic in an intersection with an operating traffic signal.

e. Watering. Furnish, haul, and place water for dust control and pavement flushing, as directed. Use water trucks that can provide a high pressure water stream to flush the pavement and a light-

water spray to control dust. If the flushing operations contaminate or fill adjacent catch basins, clean and restore them to their original condition. This requirement includes sections of roadway off the project where flushing is required. The Engineer will control water application.

When taking 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. The Engineer will provide written notice when conditions may adversely affect the traveling public's safety and/or convenience The notice will state the defect(s), the corrective action(s) required, and the time required to complete such action(s). If corrective action(s) are not taken within the specified time, the Engineer will immediately close down the offending operations until the defect(s) are corrected. 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 reductions. Unauthorized lane reductions will be assessed as one full lane closure for each lane reduced without authorization.

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 roadway, pedestrian walkway or route, and bicycle route or pathway surfaces, such as severe bumps, ruts, washboarding, potholes, excessive dust or mud, and non-conforming, or out of place highway traffic control devices. Failure to install temporary crash cushions or barriers, when required according to the contract or TCP, is also considered an unauthorized lane reduction. The Engineer will make the sole determination as to whether unauthorized lane reductions or closures are present.

Adjustment Rates are listed in Table 710-1. These rates are liquidated damages which represent highway user costs, based on Average Daily Traffic (ADT). The Engineer will use the rate shown for the current ADT for this project, as published in the Regional Traffic Volume Report prepared by the Department's Planning Section. Adjustment rates for unauthorized reduction or closure of each lane of pedestrian walkways or route, and bicycle route or pathway, are the same as for one full lane closure.

TABLE 710-1
ADJUSTMENT RATES

Published ADT	Dollars/Minute of Unauthorized Lane Reduction or Closure
Less than 1.000	$2.00
1,000 – 4,999	$10.00
5,000 – 9,999	$30.00
10,000+	$40.00

710-3.7 MAINTENANCE OF TRAFFIC DURING SUSPENSION OF WORK. Approximately one month before work is suspended for the season, schedule a preliminary meeting with the Engineer and Maintenance and Operations to outline the work expected to be completed before shutdown. Schedule a field review with the Department 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. Make sure illumination and signals, including vehicle detectors, are in good working order.

After the project is accepted for winter maintenance and until ordered to resume construction operations, the Department is responsible for maintaining the facility. The Department will accept maintenance responsibility only for portions of the work that are open to the public, as determined by the Engineer. The Department will not accept maintenance responsibility for incomplete work adjacent to accepted roads. The contractor is 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 Department will maintain during a seasonal work suspension. The Contractor retains all contractually required maintenance responsibilities until receipt of this letter.

If the contractor suspends work due to unfavorable weather (other than seasonal) or due to failure to correct unsafe conditions, carry out Contract provisions, or carry out the Engineer's orders. All costs for highway traffic maintenance during the suspended period will be borne by the contractor.

When work is resumed, replace or renew any work or materials lost or damaged during temporary use. If the Department caused damage during winter suspension, payment will be made for repairs by unit pay item or in accord with GCP Subsection 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 project limits wear outer garments that are highly visible and comply with the following requirements:

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

b. Labeling. Use garments labeled in conformance with Section 11.2 of ANSI/ISEA 107-2004 or ANSI/ISEA 107-2010.

c. Tops. Wear high visibility vests, jackets, or coverall tops at all times.

d. Bottoms. Wear high visibility pants or coverall bottoms during nighttime work (sunset to sunrise). Worksite Traffic Supervisors, employees assigned to highway traffic control duties, and flaggers wear high visibility pants or coverall bottom at all times.

e. Outer Raingear. Wear raingear tops and bottoms conforming to the requirements of this Subsection 710-3.11.

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

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 highway traffic contract 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 Department waives the requirements.

The Engineer may waive the permit requirements of regulation 17 AAC 25 regarding oversize and overweight vehicles within the project limits when the contractor submits and follows an approved Highway TCP.

Permits shall be obtained from the Department's Division of Measurement Standards & Commercial Vehicle Enforcement, for movements of oversize and overweight equipment outside of the project limits, except when the Department waives the permit requirements outside of the project limits. Retain this permit for your records and submit a copy to the Engineer.

Submit a highway TCP 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 TCP. 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 TCP:

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 TCP, 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 Circular 150/5370-2, and the CSPP;

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 TCP.

METHOD OF MEASUREMENT

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

a. Highway Traffic Control Device Items. By the number of units in the Highway Traffic Control Rate Schedule, under item G-710d Highway Traffic Control that are installed, accepted, and operational. Incomplete or unsatisfactory devices will not be measured. Special Construction Signs are measured by the total area of legend-bearing sign panel, as determined under subsection P-661-4.1. Items measured by the day are for each item per 24-hour period.

b. Highway Flagger. By the number of approved hours, supported by certified payroll.

c. Watering. By the 1,000 gallons (M-Gallon) of water applied. The Engineer may specify measurement by weight or volume. 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.

d. Highway Traffic Price Adjustment. By each minute of unauthorized lane closure or lane reduction, per lane, measured to the nearest minute. The Engineer will determine whether the roadway is opened to full unimpeded use by the traveling public.

e. Highway Traffic Control. By the units specified.

f. Plastic Safety Fence. By the linear foot, as placed, to protect or channelize pedestrian traffic as shown on an approved TCP. Any adjustments in configuration of the fence at the same location that does not result in an increased amount of fence is not measured. Opening and closing the fence to gain access to and from the worksite is not measured.

g. Temporary Guardrail. By the linear foot, including end treatments, as shown on an approved TCP.

BASIS OF PAYMENT

710-5.1 Use the following table for unit rates of pay for Contingent Sum:

HIGHWAY TRAFFIC CONTROL RATE SCHEDULE

Traffic Control Rate Schedule (03/2019)	Pay Unit	Unit Rate
Construction Signs	Each/Day	$6.50
Special Construction Signs	Sq Ft.	$28.00

Traffic Control Rate Schedule (03/2019)	Pay Unit	Unit Rate
Type II Barricade	Each/Day	$3.30
Type III Barricade	Each/Day	$11.00
Traffic Cone or Tubular Marker	Each/Day	$1.10
Drums	Each/Day	$3.30
Temporary Guardrail	Lineal Foot	$25.00
Portable Concrete or Steel F Shape Barrier (12.5 foot standard length or $8/foot)	Each	$100.00
Temporary Crash Cushion / non-redirective gated water barrier (all required per end)	Each	$2,500.00
Temporary Crash Cushion / Water filled Barrels (all required per end)	Each	$3,285.00
Temporary Crash Cushion / Sand filled Barrels or Barrier (all required per end)	Each	$4,325.00
Temporary Crash Cushion / Redirective	Each	$9,230.00
Plastic Safety Fence	Foot	$1.00
Temporary Sidewalk Surfacing	Sq Ft	$2.00
Flexible Markers (Flat Whip, Reflective)	Each	$60.00
Electronic Boards, Panels, and Signals		
Sequential Arrow Panel	Each/Day	$36.00
Portable Changeable Message Board Sign	Calendar Day	$130.00
Portable Traffic Signals (two)	Each /Day	361.00
Cars and Trucks w/driver		
Pilot Car (4x2 ½ ton truck, or any car)	Hour	$72.00
Watering – up to 4900 gallon	M-Gallon	$28.00
Watering Truck - more than 4900 gallon	M-Gallon	$21.00
Street Sweeping (Regenerative Sweeper, Vacuum Sweeper, Mechanical or Power Broom with vacuum)	Hour	$214.00
40,000 GVW Truck with Crash Attenuator	Hour	$162.00
Interim Pavement Markings		
Painted Markings	Lineal Foot	$0.30
Preformed Pavement Marking Tape (removable or non-removable)	Lineal Foot	$1.75
Temporary Raised Pavement Markings	Each	$1.00
Word or Symbol Markings	Each	$40.00
Temporary Cover Markings	Lineal Foot	$4.00
Removal of Pavement Markings	Lineal Foot	1.25

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 CSPP, 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, except Highway Traffic Price Adjustment.

b. **Highway Traffic Control Device Items.** The contract price in the Highway Traffic Control Rate Schedule includes all resources required to provide, install, maintain, move, and remove the specified devices. Warning lights, vertical panels, and sign supports required for highway traffic control devices are subsidiary.

c. **Highway Flagger.** The contract price includes all required labor, radios, flagger paddles, and transportation to and from the worksite. The Engineer will pay for item G-710b Highway Flagger at the contract unit price for each Highway Flagger per hour. The hourly rate for Highway Flagger is set at $__.__ per hour for this contract. The Engineer does not require a change order/directive for this pay item.

d. **Watering.** The contract price in the Highway Traffic Control Rate Schedule includes all resources required to provide watering, as directed.

e. **Highway Traffic Price Adjustment.** If Item G-710c, Highway Traffic Price Adjustment, is shown on the bid schedule, the total value of this contract will be adjusted, for unauthorized lane closures or lane reductions at the rate stated as a pay deduction.

f. **Highway Traffic Control.** Payment for Item G-710d Highway Traffic Control will be made at the unit rate value contained in the Highway Traffic Control Rate Schedule for the accepted units of highway traffic control devices. The Engineer does not require a change order/directive for this pay item.

g. **Plastic Safety Fence.** The contract price in the Highway Traffic Control Rate Schedule includes all resources required to install, maintain, and remove the fence.

h. **Temporary Sidewalk Surfacing.** The contract price in the Highway Traffic Control Rate Schedule includes all resources required to construct, maintain, and remove the surfacing.

i. **Temporary Guardrail.** The contract price in the Highway Traffic Control Rate Schedule includes all resources required to construct, maintain, and remove the guardrail.

Payment will be made under:

Item G710.010.0000	Highway Traffic Maintenance – per lump sum
Item G710.020.0000	Highway Flagger – per contingent sum
Item G710.030.0000	Highway Traffic Price Adjustment – per contingent sum
Item G710.040.0000	Highway Traffic Control – per contingent sum

ITEM G-715 WILDLIFE MONITORING

DESCRIPTION

715-1.1 Comply with the Bald Eagle Protection Act in accordance with U.S. Fish and Wildlife Service (USF&WS) requirements. Engage a professional services contractor to provide a basic survey of active eagle nests within the project vicinity. If active eagle nests are discovered in the project vicinity, monitor eagle activity at nests during construction in accordance with this section and GCP Section 80. At the preconstruction conference, provide the names and qualifications of the professional services contract manager and the on-site eagle surveyor and monitor.

REQUIREMENTS

715-2.1 An eagle surveyor will conduct an eagle survey to scan for eagle nests in the project area and determine if the nests are active. If active nests are found, provide a monitor to conduct eagle monitoring with a video camera equipped with a minimum 10 power optical zoom lens to record nest activity.

Provide an on-site eagle surveyor and monitor that are employed by and report directly to the professional services contract manager. The surveyor and the monitor are trained by the professional services contract manager (or another representative with the same qualifications) in the techniques of surveying, monitoring and observing eagles. The professional services contract manager will prepare an eagle monitoring plan in conjunction with the contractors work plan when the eagle monitoring plan restricts work areas or work periods.

Provide a professional services contract manager with the following qualifications:

a. Bachelor of Science degree in biology, environmental science or ecology and presently working in that profession.

b. Two years experience surveying eagle nests, monitoring and observing eagles or other birds of prey or studying their habitat.

METHOD OF MEASUREMENT

715-4.1 Subsection 90-05 and in the manner specified in the directive authorizing the work.

BASIS OF PAYMENT

715-5.1 Subsection 90-05 and paid for as specified in the directive authorizing the work.

Payment will be made under:

Item G715.010.0000	Eagle Survey – per contingent sum
Item G715.020.0000	Eagle Monitoring – per contingent sum
Item G715.030.0000	Wildlife Monitoring – per contingent sum

LIGHTING INSTALLATION ITEMS

[Reserved]

MARINE AVIATION FACILITY ITEMS

[Reserved]

SITEWORK ITEMS

ITEM P-151 CLEARING AND GRUBBING

DESCRIPTION

151-1.1 This item shall consist of clearing or clearing and grubbing, including the disposal of materials, for all areas within the limits designated on the Plans or as required by the Engineer.

Clearing shall consist of the cutting and removal of all trees, stumps, brush, logs, hedges, the removal of fences and other loose or projecting material from the designated areas. The grubbing of stumps and roots will not be required.

Clearing and grubbing shall consist of clearing the surface of the ground of the designated areas of all trees, stumps, down timber, logs, snags, brush, undergrowth, hedges, heavy growth of grass or weeds, fences, structures, debris, and rubbish of any nature, natural obstructions or such material which in the opinion of the Engineer is unsuitable for the foundation of strips, pavements, or other required structures, including the grubbing of stumps, roots, matted roots, foundations, and the disposal from the project of all spoil materials resulting from clearing and grubbing by burning or otherwise.

Selective tree removal requires the hand cutting (topping) of all types of trees either by chain saw or by other approved conventional hand clearing methods. Dispose of the tree in the same manner as clearing and grubbing spoil materials.

CONSTRUCTION METHODS

151-2.1 GENERAL. The areas to be cleared or cleared and grubbed shall be staked or otherwise marked on the ground at the direction of the Engineer. The Engineer will flag or mark each tree designated for selective tree removal. The clearing and grubbing shall be done far enough ahead of the earthwork operation to permit cross-sectioning prior to excavation or embankment. Mechanical brush cutting equipment may be used for clearing. Dozers or other mechanical equipment not specifically designed for brush cutting may not be used.

Vegetation clearing will follow the USFWS Recommended Time Periods for Avoiding Vegetation Clearing in Alaska in order to protect Migratory Birds unless the USFWS has been consulted to determine the most appropriate method to avoid impacts to nesting birds.

Debris from mechanical brush cutting equipment less than 4 feet long by 4 inches in diameter may remain in place outside of Runway and Taxiway Safety Area surfaces except as specified in areas to be embanked. All other spoil materials generated by clearing or by clearing and grubbing shall be disposed of by burning, when permitted by local laws, or by removal to approved disposal areas. When burning of material is permitted, it shall be burned under the constant care of competent watchmen so that the surrounding vegetation and other adjacent property will not be jeopardized. Burning shall be done according to all applicable laws, ordinances, and regulations. Before starting any burning operations, the Contractor shall notify the agency having jurisdiction.

As far as practicable, waste concrete and masonry shall be placed on slopes of embankments or channels. When embankments are constructed of such material, this material shall be placed according to requirements for formation of embankments. Any broken concrete or masonry which cannot be used in construction, and all other materials not considered suitable for use elsewhere, shall be disposed of by the Contractor. In no case shall any discarded materials be left in windrows or piles adjacent to or within the airport limits. The manner and location of disposal of materials shall be subject to the approval of the Engineer and shall not create an unsightly or objectionable view. When the Contractor is required to locate a disposal area outside the airport property limits, the Contractor shall obtain and file with the Engineer, permission in writing from the property owner for the use of private property for this purpose.

If the Plans or the Specifications require the saving of merchantable timber, the Contractor shall trim the limbs and tops from designated trees, saw them into suitable lengths, and make the material available for removal by others.

Perform blasting in accordance with all Federal, state, and local safety regulations. Submit notice 15 days prior to starting work. Submit a Blasting Plan, prepared and sealed by a registered professional Engineer that includes calculations for overpressure and debris hazard. Obtain written approval prior to performing any blasting and notify the Engineer 24 hours prior to blasting. Include provisions for storing, handling and transporting explosives as well as for the blasting operations in the plan. The Contractor is responsible for damage caused by blasting operations.

The Contractor shall remove existing structure and utilities that are identified to be removed or demolished, except when another entity is identified in the Contract to accomplish the work.

151-2.2 CLEARING. The Contractor shall clear the staked or indicated area of all objectionable materials. Trees unavoidably falling outside the specified limits must be cut up, removed, and disposed of in a satisfactory manner. In order to minimize damage to trees that are to be left standing, trees shall be felled toward the center of area being cleared. The Contractor shall preserve and protect from injury all trees not to be removed. The trees, stumps, and brush shall be cut flush with the original ground surface. The grubbing of stumps and roots will not be required.

Fences shall be removed and disposed of when directed by the Engineer. Fence wire shall be neatly rolled and the wire and posts stored on the airport if they are to be used again, or stored at a designated location if the fence is to remain the property of a local owner.

151-2.3 CLEARING AND GRUBBING. In areas designated to be cleared and grubbed, all stumps, roots, buried logs, brush, grass, and other unsatisfactory materials shall be removed, except where embankments exceeding 4 feet in depth are to be made in areas that are not subject to aircraft or vehicle traffic loadings and are unpaved. For embankments that are greater than 4 feet in depth, which are not subject to aircraft or vehicle traffic loadings and are unpaved, all unsatisfactory materials shall be removed, but sound trees, stumps, and brush can be cut off flush with the original ground and allowed to remain. Tap roots and other projections over 1.5 inches in diameter shall be grubbed out to a depth of at least 18 inches below the finished subgrade or slope elevation.

Any buildings and miscellaneous structures that are shown on the Plans to be removed shall be demolished or removed, and all materials therefrom shall be disposed of either by burning or otherwise removed from the site. The cost is incidental to this item. The remaining or existing foundations, wells, cesspools, and all like structures shall be destroyed by breaking down the materials of which the foundations, wells, cesspools, etc., are built to a depth at least 2 feet below the existing surrounding ground. Any broken concrete, blocks, or other objectionable material which cannot be used in backfill shall be removed and disposed of at the Contractor's expense. The holes or openings shall be backfilled with acceptable material and properly compacted.

All holes remaining after the grubbing operation in embankment areas shall have the sides broken down to flatten out the slopes, and shall be filled with suitable material, moistened and properly compacted in layers to the density required in Item P-152. The same construction procedure shall be applied to all holes remaining after grubbing in excavation areas where the depth of holes exceeds the depth of the proposed excavation.

METHOD OF MEASUREMENT

151-4.1 Measure according to GCP Section 90 and the following:

a. Acre. The area acceptably cleared, or cleared and grubbed, measured on the ground surface. Only areas shown on the Plans, or areas cleared at the Engineer's direction will be measured. Islands of existing cleared areas, such as lakes, ponds, existing stream beds, and roads and trails within the clearing limits of more than 60 square yards will not be included as pay areas.

b. Each. The number of designated trees acceptably removed, regardless of size.

BASIS OF PAYMENT

151-5.1 At the contract lump sum or unit price, for each of the pay items listed below that are shown in the bid schedule.

Payment will be made under:

Item P151.010.0000	Clearing – per acre
Item P151.020.0000	Clearing – per lump sum
Item P151.030.0000	Clearing & Grubbing – per acre
Item P151.040.0000	Clearing & Grubbing – per lump sum

ITEM P-152 EXCAVATION, SUBGRADE, 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.

h. **Ditch Lining.** Use crushed or naturally occurring stones that are sound and durable, are not larger than 8 inches in greatest dimension, and containing not more than 50% by weight passing a 3-inch sieve and not more than 5% by weight passing the 1-in sieve as determined by ATM 304, or as accepted by the Engineer.

152-2.2 UNSUITABLE MATERIAL. Material that does not meet the testing requirement 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 GCP Subsection 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 GCP Subsection 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 GCP Subsection 70-11.f. 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 shown on the plans.

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 Department 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 GCP Subsection 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 Department, 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 Subsection 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 below the subgrade, or to the depth directed by the Engineer. 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 backfilled with suitable material, obtained from the grading operations or borrow areas and thoroughly compacted as specified. Where rock cuts are made and backfilled 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. All overbreak shall be graded or removed by the Contractor and disposed of as directed by the Engineer. Payment will not be made for the removal and disposal of overbreak which the Engineer determines as avoidable. Unavoidable overbreak 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 ATM 207, ATM 212, or ATM 309. The in-place field density and moisture content shall be determined according to ATM 213.

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.

f. Blasting. Blasting will be permitted only when proper precautions are taken for the safety of all persons, the work, and the property. The Contractor is responsible for blasting operations including the requirements of GCP Subsection 70-10. All damage done to the work or property shall be repaired at the Contractor's expense. All operations of the Contractor in connection with the transportation, storage, and use of explosives shall conform to all federal, state, local regulations, explosive manufacturers' instructions, and approved permits.

The Contractor shall submit a Safety Plan that includes descriptions of road and runway closures, warning signals; and plans for notification of affected local, state, and federal agencies, the airport manager, and other interested parties. Discuss in the Safety Plan methods for protection of life and health, public and private property, new work or existing work on the project, nearby structures, wetlands, waters and wildlife. When working within airport property include an emergency response contingency to clear runways of debris, to repair damaged navigational or visual aids; and get a NOTAMs before blasting. Hold a safety meeting prior to commencement of blasting operations to address safety issues.

In each distinct blasting area the Contractor shall submit a blasting plan, prepared by a qualified blaster, to the Engineer. This plan must consist of hole size, depth, spacing, burden, type of explosives, type of delay sequence, maximum amount of explosive on any one delay period, depth of rock, and depth of overburden if any. The maximum explosive charge weights per delay included in the plan shall not be increased without submitting a revised blasting plan to the Engineer.

When blasting, the Safety Plan and the Blasting Plan shall conform to FAA Order 7400.2 *Procedures for Handling Airspace Matters*, Chapter 27, and AC 150/5370-2 *Operational Safety on Airports During Construction*.

The Contractor shall keep a record of each blast fired, its date, time, and location; the amount of explosives used, maximum explosive charge weight per delay period, and, where necessary, seismograph records identified by instrument number and location. These records shall be made available daily to the Engineer.

The Engineer will keep the submitted plans and records, and has authority to review and reject plans.

152-3.3 BORROW SOURCES. Borrow sources within the airport property if available will be 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 Subsection 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 embankment fills; unsuitable material shall be placed in waste areas or as directed by the Engineer. 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.

Place and spread ditch lining materials so that the finished face is uniform and conforms with the lines and slope shown on the Plans or as directed.

152-3.5 PREPARATION OF EMBANKMENT AREA. In areas of Clearing and Grubbing, completely break up the subgrade by plowing or scarifying to a minimum depth of 6 inches. Where an embankment is to be constructed to a height of 4 feet or less, or where the embankment supports asphalt or concrete paving, compact the subgrade as indicated in Subsection 152-3.2.e. Where the height of fill is greater than 4 feet and the embankment does not support asphalt or concrete paving, compact the subgrade to the density of the surrounding ground before construction of embankment.

When new embankment is placed 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. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. 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 ATM 207 or ATM 212. Under all areas serving

aircraft or vehicle traffic loadings, the embankment shall be compacted to a density of not less than 98% of the maximum density as determined by ATM 207 or ATM 212. The in-place field density and moisture content shall be determined according ATM 202.

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 4 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 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.

152-3.9 TOPSOIL. When topsoil is specified or required as shown on the plans or under Item T-905, it may be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. The material may be stockpiled at approved locations in conformance with the CSPP.

Upon completion of grading operations, topsoil shall be handled and placed as directed, or as required in Item T-905. No direct payment will be made for topsoil under Item P-152.

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.

Ditch Lining will be paid by the ton in accordance with subsection GCP Subsection 90-02. Excavation required below normal ditch grade is subsidiary.

BASIS OF PAYMENT

152-5.1 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.

a. For “Unclassified Excavation” payment will be made at the contract unit price per cubic yard.

b. For “Common Excavation” payment will be made at the contract unit price per cubic yard.

c. For “Rock Excavation” payment will be made at the contract unit price per cubic yard.

d. For “Muck Excavation” payment will be made at the contract unit price per cubic yard.

e. For “Drainage Excavation” payment will be made at the contract unit price per cubic yard.

f. 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:

Item P152.010.0000	Unclassified Excavation – per cubic yard
Item P152.040.0000	Rock Excavation – per cubic yard
Item P152.050.0000	Muck Excavation – per cubic yard
Item P152.070.0000	Drainage Excavation – per cubic yard

TESTING REQUIREMENTS

ATM 212	Determining the Standard Density of Coarse Granular Materials using the Vibratory Compactor
ATM 207	WAQTC FOP for AASHTO T 99/ T 180 Moisture-Density Relations of Soils*
ATM 202	WAQTC FOP for AASHTO T 255/T 265 Moisture Content of Aggregate and Soils
ATM 213	WAQTC FOP for AASHTO T 310 In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)*.
ATM 304	WAQTC FOP for AASHTO T 27/T 11 Sieve Analysis of Fine and Coarse Aggregates *

ITEM P-153 CONTROLLED LOW-STRENGTH MATERIAL (CLSM)

DESCRIPTION

153-1.1 This item shall consist of furnishing, transporting, and placing a controlled low-strength material (CLSM) as flowable backfill in trenches or at other locations shown on the plans or as directed by the Engineer.

MATERIALS

153-2.1 MATERIALS.

a. **Portland cement.** Portland cement shall conform to the requirements of ASTM C150, Type I or II, or ASTM C595, Type IP, IS, S, or I(PM) as indicated on the plans. If for any reason, cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

b. **Fly ash.** Fly ash shall conform to ASTM C618, Class C or F.

c. **Fine aggregate (sand).** Fine aggregate shall conform to the requirements of ASTM C33 except for aggregate gradation. Any aggregate gradation which produces performance characteristics of the CLSM specified here will be accepted, except as follows.

Sieve Size	Percent Passing by weight
3/4 inch	100
No. 200	0 - 12

d. **Water.** Water used in mixing shall be potable and free of oil, salt, acid, alkali, sugar, vegetable matter, or other substances injurious to the finished product.

MIX DESIGN

153-3.1 PROPORTIONS. The Contractor shall submit, to the Engineer, a mix design including the proportions and source of aggregate, fly ash, cement, water, and approved admixtures. No CLSM mixture shall be produced for payment until the Engineer has given written approval of the proportions. The proportions shall be prepared by a laboratory and shall remain in effect for the duration of the project. Laboratory costs are incidental to this item. The proportions shall establish a single percentage or weight for aggregate, fly ash, cement, water, and any admixtures proposed.

a. **Compressive strength.** CLSM shall be designed to achieve a 28-day compressive strength of 100 to 200 psi when tested in accordance with ASTM D4832. There should be no significant strength gain after 28 days.

b. **Consistency.** CLSM should be designed to achieve a consistency that will produce an approximate 8-inch diameter circular-type spread without segregation when tested by: (1) filling a 3-inch inside diameter by 6-inch length flow cylinder (non-absorbent pipe) (2) strike off of the flow cylinder and start of lift within five seconds of filling and (3) by steady upward pull, lift the cylinder in a time period of between two and four seconds. Adjustments of the material proportions should be made to achieve proper solid suspension and flowable characteristics, however the theoretical yield shall be maintained at one cubic yard for the given batch weights.

CONSTRUCTION METHODS

153-4.1 PLACEMENT.

a. **Placement.** CLSM may be placed by any reasonable means from a mixing unit into the space to be filled. Agitation is required during transportation and waiting time. Placement shall be performed so structures or pipes are not displaced from their final position and intrusion of CLSM into unwanted

areas is avoided. The material shall be brought up uniformly to the fill line shown on the plans or as directed by the Engineer. Each placement of CLSM shall be as continuous an operation as possible. If CLSM is placed in more than one layer, the base layer shall be free of surface water and loose foreign material prior to placement of the next layer.

b. Limitations of placement. CLSM shall not be placed on frozen ground. Mixing and placing may begin when the air or ground temperature is at least 35°Fand rising. At the time of placement, CLSM shall have a temperature of at least 40°F. Mixing and placement shall stop when the air temperature is 40°F and falling or when the anticipated air or ground temperature will be 35°F or less in the 24 hour period following proposed placement.

153-4.2 CURING AND PROTECTION

a. Curing. The air in contact with the CLSM shall be maintained at temperatures above freezing for a minimum of 72 hours. If the CLSM is subjected to temperatures below 32°F, the material may be rejected by the Engineer if damage to the material is observed.

b. Protection. The CLSM shall not be subject to loads and shall remain undisturbed by construction activities for a period of 48 hours or until a compressive strength of 15 psi is obtained. The Contractor shall be responsible for providing evidence to the Engineer that the material has reached the desired strength. Acceptable evidence shall be based upon compressive tests made in accordance with paragraph 153-3.1a.

153-4.3 ACCEPTANCE. Acceptance of CLSM delivered and placed as shown on the plans or as directed by the Engineer shall be based upon mix design approval and batch tickets provided by the Contractor to confirm that the delivered material conforms to the mix design. The Contractor shall verify by additional testing, each 1,000 cubic yards of material used. Verification shall include confirmation of material proportions and tests of compressive strength to confirm that the material meets the original mix design and the requirements of CLSM as defined in this specification. Adjustments shall be made as necessary to the proportions and materials prior to further production.

METHOD OF MEASUREMENT

153-5.1 MEASUREMENT. Controlled low-strength material shall be measured by the number of cubic yards as computed from the neatline plan and section, adjusted for the quantities for any embedments, and as specified, completed, and accepted.

BASIS OF PAYMENT

153-6.1 PAYMENT. Accepted quantities of controlled low-strength material shall be paid for at the contract unit price per cubic yard. Payment shall be full compensation for all materials, equipment, labor, and incidentals required to complete the work as specified.

Payment will be made under:

Item P153.010.0000	Dewatering – per lump sum
Item P153.020.0000	Infiltration Site – per lump sum
Item P153.030.0000	Upland Waste Disposal Site – per lump sum

TESTING REQUIREMENTS

ASTM D4832	Standard Test Method for Preparation and Testing of Controlled Low-Strength Material (CLSM) Test Cylinders

MATERIAL REQUIREMENTS

ASTM C33	Standard Specification for Concrete Aggregates

ASTM C150	Standard Specification for Portland Cement
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

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 ATM 304.

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 ATM 204 and ATM 205.

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 98% of the maximum density, as determined according to ATM 207 or ATM 212. The in-place field density and moisture content shall be determined according to ATM 213.

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 or measured by the cubic yard in final position according to GCP Subsection 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 P154.010.0000	Subbase Course – per cubic yard
Item P154.020.0000	Subbase Course – per ton
Item P154.030.0000	Subbase Course Stockpile – per ton
Item P154.040.0000	Salvaged Subbase – per lump sum

TESTING REQUIREMENTS

ATM 212	Determining the Standard Density of Coarse Granular Materials using the Vibratory Compactor
ATM 304	WAQTC FOP for AASHTO T 27/T 11 Sieve Analysis of Fine and Coarse Aggregates * .
ATM 204	WAQTC FOP for AASHTO T 89 Determining the Liquid Limit of Soils ..
ATM 205	WAQTC FOP for AASHTO T 90 Determining the Plastic Limit and Plasticity Index of Soils
ATM 207	WAQTC FOP for AASHTO T 99/ T 180 Moisture-Density Relations of Soils*
ATM 213	WAQTC FOP for AASHTO T 310 In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)*

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 Contractor. Remove excavated material to an approved disposal site off of 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

160-4.1 Section 90. Where portland cement concrete pavement is overlain by asphalt concrete pavement, the asphalt concrete pavement will not be measured separately and will be considered portland cement concrete pavement for payment purposes.

BASIS OF PAYMENT

160-5.1 At the contract unit price for excavation and disposal of pavement materials for either AC or PCC pavement.

Payment will be made under:

Item P160.010.0000	Excavation of Pavement, AC – per square yard
Item P160.020.0000	Excavation of Pavement, AC – per cubic yard
Item P160.030.0000	Excavation of Pavement, AC – per lump sum
Item P160.040.0000	Excavation and Disposal of Existing Pavement, AC – per square yard

ITEM 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 State. 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 your 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 Department.

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

161-4.1 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

161-5.1 At the contract unit price for recycled asphalt pavement accepted in place.

Payment will be made under:

Item P161.010.0000	Recycled Asphalt Pavement – per square yard
Item P161.020.0000	Recycled Asphalt Pavement – per cubic yard
Item P161.030.0000	Excavation of Pavement, AC – per cubic yard
Item P161.040.0000	Recycled Asphalt Pavement Placement – per square yard

TESTING REQUIREMENTS

ATM 412 Relative Standard Density of Treated Mixes by the Control Strip Method

ITEM P-162 PAVEMENT COLD PLANING

DESCRIPTION

162-1.1 Cold plane existing asphalt cement concrete (AC) pavement. Clean pavement surfaces after planing. Place and shape the material produced by cold planing (millings) on a prepared foundation, to the lines, grades, and depths shown on the plans.

Excess millings are the property of the State. Place excess millings in stockpiles located and shaped as shown on the plans or as directed by the Engineer.

EQUIPMENT

162-2.1 COLD PLANING MACHINE. Use a self-propelled specialized cold planing machine with the following capabilities:

a. Removes the millings or cuttings from the pavement surface and loads them into a truck for disposal.

b. Mills the pavement to the required depth and smoothness.

c. Prevents damage to any part of the remaining pavement structure.

d. Establishes grade control, by string line or laser.

e. Controls transverse slope.

f. Mills a minimum 3-foot width of pavement per pass.

g. Effectively controls dust produced during planing operations.

162-2.2 POWER BROOM. Use a self-propelled or towed power broom capable of removing all loose material resulting from the cold planing operation.

CONSTRUCTION REQUIREMENTS

162-3.1 PLANING. Furnish all materials and survey control to accomplish this work. Mill the designated areas of pavement to the depths shown on the plans. Establish any controls required to maintain the specified depth of cut or grade. Establish a finished cold-planed surface that when checked with a four-foot straight edge, does not deviate more than 3/8-inch in either the transverse or longitudinal direction.

Ensure that the cold planing operation does not adversely affect the paving schedule due to breakdowns.

162-3.2 PROTECTION OF EXISTING PAVEMENT AND STRUCTURES. Repair or replace at your expense, any pavement that is torn, cracked, gouged, broken, or undercut as directed by the Engineer. Take all precautions necessary to ensure that existing structures within pavement planing areas are not damaged. If damage to any structure occurs, repair the damage at no cost to the Department.

162-3.3 FINAL CLEANING OF COLD-PLANED SURFACES. After cold planning is complete, use a power broom to remove all loose material from the planed surface.

METHOD OF MEASUREMENT

162-4.1 Section 90. By the area of pavement in original position regardless of depth of cut, milled to the required tolerances. Placement and shaping of millings and the clean up and disposal of surplus material is subsidiary to the item.

BASIS OF PAYMENT

162-5.1 Payment will be made at the contract unit price for acceptably completed quantities.

Payment will be made under:

Item P162.010.0000	Pavement Cold Planing – per square yard
Item P162.020.0000	Pavement Cold Planing – per cubic yard

ITEM P-163 SURFACE CLEANING

DESCRIPTION

163-1.1 Clean designated concrete areas to leave a sound and durable surface suitable for overlay. Collect all loose and friable material from unsound surfaces and crevices. Haul waste to the waste disposal site designated on the plans.

EQUIPMENT & MATERIALS

163-2.1 Provide the following equipment:

a. Water sprayer rated and producing at least 3000 PSI.

b. Truck-mounted sweeper with integrated vacuum unit.

Obtain approval for substitute equipment proposed for this work from the Engineer. Use equipment capable of leaving a sound surface without particulate residue.

Provide all water and other expendables necessary to complete the described work.

CONSTRUCTION REQUIREMENTS

163-3.1 Remove all loose and friable material from existing concrete. Collect all loosened particles and place them at the waste disposal site indicated in the plans. Sound and durable surfaces are those capable of withstanding a sustained application of the specified water spray with the nozzle placed against the concrete.

METHOD OF MEASUREMENT

163-4.1 Section 90. Surface cleaning areas will be determined by plan dimensions or as staked in the field.

BASIS OF PAYMENT

163-5.1 At the contract unit price for performing the work as described.

Payment will be made under:

Item P163.010.0000 Surface Cleaning – per square yard

ITEM P-165 REMOVAL OF STRUCTURES

DESCRIPTION

165-1.1 Remove and dispose of or salvage existing structures as specified. Backfill the resulting holes and pits.

CONSTRUCTION REQUIREMENTS

165-3.1 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 excavated materials and compact in accordance with item P-152.

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. *[List specific structures designated for disposal.]*

b. Removed Structures Designated for Salvage. Removed structures designated for salvage remain the property of the State. *[List specific structures designated for salvage and describe where each salvaged structure is to be delivered.]*

METHOD OF MEASUREMENT

165-4.1 This item will not be measured for payment. The Engineer's acceptance constitutes measurement.

BASIS OF PAYMENT

165-5.1 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 P165.010.0000	Removal of Structures – per lump sum
Item P165.060.0000	Equipment Storage Building Relocation – per lump sum
Item P165.090.0000	Site Cleanup – per contingent sum
Item P165.100.0000	Labor – per hour

ITEM P-170 SOIL TESTING

DESCRIPTION

170-1.1 Characterize and test soils for hydrocarbon fuel and deicer compound contamination at the project site. The purpose of the testing is to assure the proper disposal of contaminated materials and to determine what soil will or will not need special handling. Employ an independent environmental consulting firm with Alaska Department of Environmental Conservation (ADEC) approved personnel meeting 18 AAC 78 qualifications to perform work under this item.

REQUIREMENTS

170-2.1 GENERAL. The Engineer will direct implementation of the soil testing work along the fuel hydrant system piping and appurtenances and for other areas of the excavation if contaminated soils are encountered. Prior to commencing with soils excavation, submit a field sampling work plan for the soil sampling and testing procedures. Ensure that a qualified environmental consulting firm representative is available to perform work in accordance with ADEC procedures during pavement/concrete removal, soil removal, and stockpiling.

The testing program as outlined requires cooperation between the Contractor and Consultant to achieve the results required by the Airport. If the Consultant deems that there is a safety problem, it will be the right of the Consultant to notify the Contractor of the issue. If corrective actions are not instituted by the Contractor, the Consultant must notify the State for corrective actions and negotiations to take place with the Contractor.

170-2.2 WORK PLAN. Based on the site's historical information prepare a site specific field sampling plan for work to be performed under this item. Submit the plan to the Engineer, ADEC, and the ASIG Environmental Manager allowing a minimum of 10 work days for review and approval of the field sampling plan. For planning purposes, classify fuel contaminated materials as:

a. Clean. Diesel range organics (DRO) 0 to 250 parts per million (ppm) or gasoline range organics (GRO) 0 to 300 ppm.

b. Contaminated. DRO greater than 250 ppm or GRO greater than 300 ppm. Further classify DRO contaminated materials as:

(1) Warm. Contaminated soil greater than 250 ppm DRO and less than or equal to 12,500 ppm DRO.

(2) Hot. Contaminated soil greater than 12,500 ppm DRO.

Soils will not be classified for deicer compound contamination.

170-2.3 SOIL TESTING AND DOCUMENTATION PROCEDURES. For areas that are excavated, determine if excavated soil is contaminated with hydrocarbon fuel and/or deicer compounds and classify the fuel contaminated materials for segregation and disposal as necessary. Conduct soil tests for deicer compound contamination only when required by ADEC or when necessary to determine if deicer compound contamination is impacting field screening readings for fuel contamination.

Use ADEC approved methods in accordance with the ADEC Underground Storage Tank (UST) Procedures Manual, ADEC Underground Storage Tank Regulations (18 AAC 78), and ADEC Contaminated Site Regulations (18 AAC 75) to perform the following:

a. Sampling Based on Field Screening Results. For excavated areas, use visual observation and conduct field screening using a photo-ionization detector (PID) or flame-ionization detector (FID) to determine the location of areas that could be contaminated and will require additional screening and sampling.

(1) Field Screening. From these areas with suspected contamination, determine sampling locations by field screening at a predetermined frequency for excavated soils and field screening the bottom of the excavation on a minimum 25-foot by 25-foot grid and the sidewalls at 25-foot

intervals half way between the top and bottom of the excavation except that trench excavations for storm drains, fueling systems, utilities, etc. may be field screened at the centerline and both side walls at 25 foot intervals.

(2) Analytical Sampling and Testing. If soil is to be left in place, collect samples for laboratory analysis from 25% of the field screening locations with the highest reading. Analyze the samples for DRO and GRO/BTEX. Samples can also be analyzed for glycols per the field sampling plan. Collect one duplicate sample for every 10 samples collected. Locate and document all excavation samples by field surveying. Trench soils excavated for storm drains, fueling systems, utilities, etc. may be characterized prior to excavation using borings. Perform borings at 25-foot intervals along the proposed trench centerlines. Return test results to the Engineer within a minimum of 5 days after sampling.

(3) Storage Pile Sampling and Testing. Store potentially warm or hot soil in 30 to 50 cubic yard segments prior to determination of final disposal. Collect a soil sample from each segment of storage pile soil to be analyzed for DRO. Collect one duplicate sample per every 10 soil samples collected. Additional soil samples can be collected to be analyzed for glycols per the field sampling plan. Return test results to the Engineer within a minimum of 5 days after sampling.

Submit field and laboratory results to ADEC (original hard copy, two copies, and electronic format) and the Engineer (one copy). Brief the Engineer on a daily basis as required. Prepare and submit a draft report to the ASIG Environmental Manager 15 business days after receipt of the analytical results. Submit a final project report to include all field and lab results to the ADEC, the Engineer, and ASIG (original in hard copy and electronic format and six copies to ADEC, one copy to the Engineer).

170-2.4 TRENCH PLUGS. Where required to inhibit fuel contamination migration, provide minimum 4-foot vertical trench plugs, extending 2 feet below and 2 feet above the utility installation, and bentonite/sand ratio of 20% bentonite to 80% sand by weight. Comply with the following material requirements:

a. Bentonite. Pulverized, 55 lbs/ft^3, 75% - 90% passing 75 micro-meter sieve, supplied in bags clearly marked to show weight, grade, and supplier.

b. Sand. Meet ASTM C144 Mason Sand.

170-2.5 DISPOSITION OF SOILS.

a. Clean Soils. Clean soils meeting material requirements may be re-used in the project. Move any excess clean soils without organics to the disposal area shown in the Plans. Move excess clean soils with organics to an off-airport disposal site in accordance with P-152.

b. Hot Soils. Haul soil classified as hot to Alaska Soil Recycling facility located at 2301 Spar Avenue, Anchorage for thermal remediation. As an alternative, the Engineer may direct hot soil to be stockpiled in accordance with item P-171. When hot soil is identified, immediately contact the ANC Environmental manager through the Engineer. Prior to and after delivery of contaminated soils to the thermal remediation facility, weigh haul vehicles at Carlile Enterprises, 1813 E 1st Avenue, Anchorage. Present a certified invoice to the Engineer and a copy to the ANC Environmental manager. Coordinate delivery of contaminated soils with the remediation facility prior to the haul. The remediation facility will not accept soil without ANC Environmental and ADEC's approval. Coordinate with remediation and weigh facilities to determine limitations on the type of haul vehicle and comply with any limitations.

c. Warm Soils. Segregate and store warm contaminated soil removed from the excavations separate from other project storage piles. Transport soil classified as contaminated warm directly to the landspreading area at the direction of the Engineer, unless re-used in accordance with ADEC screening and analytical sampling requirements.

170-2.6 LANDSPREADING AND TEMPORARY CONTAMINATED SOIL STOCKPILE AREAS. Determine dimensions for temporary stockpiles. Clearly mark, map, and document soil lots within landspreading and temporary stockpile areas. Identify and delineate the stockpile and landspreading areas by field markings that are unaffected by the elements and designed for long term storage. Identify, document, and correlate all

field markings to test results in the report document. Estimate and document quantities of material placed in the landspreading and temporary stockpile areas using truck counts.

METHOD OF MEASUREMENT

170-4.1 Subsection 90-05 and measured as specified in the directive authorizing the work.

BASIS OF PAYMENT

170-5.1 As specified in the directive authorizing the work and as follows.

For Soil Testing Program, payment for all labor (including the environmental consultant), equipment, and materials necessary to conduct sampling and testing, the screening of the area to be excavated, field testing and screening of excavated material including laboratory correlation, locating and documenting all excavation samples by field surveying, stockpile marking, mapping, and documentation to correlate soil lots to test results will be made in accordance with subsection 90-05 Compensation For Extra Work On Time And Materials Basis.

For Supplemental Laboratory Test, payment will be made in accordance with subsection 90-05 Compensation for Extra Work On Time and Materials Basis to furnish all labor, equipment, and materials necessary for additional composite or discrete sample tests ordered by the Engineer.

For “Hot” Material Offsite Transportation and Disposal, payment will be made in accordance with subsection 90-05 Compensation for Extra Work On Time and Materials Basis to furnish all labor, equipment, and materials necessary to transport and dispose of contaminated “hot” soil.

Field surveying to locate and document excavation samples will be paid for under the Soil Testing Program pay item. Field surveying to locate and document additional sample tests ordered by the Engineer will be paid for under the Supplemental Laboratory Test pay item.

Payment will be made under:

Item P170.010.0000	Soil Testing Program – per lump sum
Item P170.020.0000	Soil Testing Program – per contingent sum
Item P170.030.0000	Supplemental Laboratory Test – per each
Item P170.040.0000	Supplemental Laboratory Test – per contingent sum

ITEM P-171 TEMPORARY CONTAMINATED SOIL STOCKPILE AREA

DESCRIPTION

171-1.1 At the location shown on the plans or as directed by the Engineer, establish a temporary petroleum contaminated soil storage area and construct contaminated soil stockpiles according to the requirements for *[specify short-term or long-term]* stockpiling as defined in Alaska Department of Environmental Conservation (DEC) Contaminated Site Regulations (18 AAC 75) for *[specify short-term or long-term]* storage of petroleum contaminated soil. This area serves as temporary storage for material that has been designated fuel contaminated soil.

Nothing in this contract is intended to impose on the Contractor the status under state or federal law of a facility owner or operator or the status of an owner or generator of the hazardous substances or contaminated materials that existed on the designated sites before the contract. The Contractor must carefully abide by all applicable laws, regulations, plans and practices to avoid becoming a facility owner or operator, or an owner or generator of contaminated materials by a release of hazardous substances.

MATERIALS

171-2.1 BERM. Use uncontaminated suitable material from project excavations.

171-2.2 SUBMITTALS. At least 5 days before ordering liner and cover material, submit manufacturer's product bulletins for approval. Include in the submittal proposed seam layout and joining methods, if applicable.

171-2.3 LINER. Use a membrane impervious to petroleum that meets the minimum specifications for *[specify short-term or long-term storage]* as per 18 AAC 75.370, Table D

171-2.4 COVER. Use 0.006 inch (6 mil) reinforced polyethylene for cover sheeting with manufacturer or field sealed seams.

171-2.5 TEMPORARY FENCE. Provide a 6-foot high chain-link fence on a tubular frame supported with concrete foundation blocks.

CONSTRUCTION REQUIREMENTS

171-3.1 CONTAMINATED CRITERIA. The applicable criteria for determining what soil is fuel contaminated and placed in this area is described in Item P-170 and P-152.

171-3.2 STOCKPILE AREA PREPARATION. Construct separate bermed areas for each stockpile by placing suitable material from unclassified excavation on a prepared site. Prepare site by removing objects that may damage the liner and grade to smooth contours.

171-3.3 LINER. Cover both the berm and the stockpile floor with the liner.

171-3.4 COVER. Lap the edge of the cover over the bottom liner to prevent water from running through the soil. Maintain the top cover over the stockpiled material. Secure sheeting against displacement throughout the project. Use rope, sandbags, and/or netting to secure the cover. Do not use tires.

171-3.5 TEMPORARY FENCE. Surrounding the completed temporary stockpiles, erect a 6-foot high fence.

171-3.6 REMOVAL. Remove berm, liner, cover and temporary fence following disposition of the temporarily stockpiled material.

METHOD OF MEASUREMENT

171-4.1 Subsection 90-05 Compensation For Extra Work On Time And Materials Basis and measured as specified in the directive authorizing the work.

BASIS OF PAYMENT

171-5.1 Subsection 90-05 Compensation for Extra Work on Time and Materials Basis and paid for as specified in the directive authorizing the work.

Payment will be made under:

Item P171.010.0000	Temporary Contaminated Soil Stockpile – per contingent sum
Item P171.020.0000	Temporary Contaminated Soil Stockpile – per lump sum
Item P171.030.0000	Contaminated Soil Cell – per each
Item P171.040.0000	Contaminated Soil Excavation – per contingent sum

ITEM P-180 RIPRAP

DESCRIPTION

180-1.1 Construct riprap bank and slope protection.

MATERIALS

180-2.1 Use evenly graded stones that are hard, angular, and have no more than 50% wear at 500 revolutions as determined by AASHTO T 96. Use stones with breadth and thickness at least 1/4 of its length. Do not use rounded boulders or cobbles on slopes steeper than 2:1.

Meet the following gradation for the class specified. Percents are by total weight, weights are for each stone:

Class I	0-50% weighing up to 25 pounds 0-10% weighing more than 50 pounds
Class II	50-100% weighing 200 pounds or more 0-15% weighing up to 25 pounds 0-10% weighing more than 400 pounds
Class III	50-100% weighing 700 pounds or more 0-15% weighing up to 25 pounds 0-10% weighing more than 1400 pounds
Class IV	50-100% weighing 2000 pounds or more 0-15% weighing up to 400 pounds 0-10% weighing more than 5400 pounds

CONSTRUCTION REQUIREMENTS

180-3.1 Provide a level, compact area large enough to dump and sort typical loads of riprap at approved location(s). Dump the loads specified in this area and assist the Engineer as needed to sort and measure the stones in the load to determine if the riprap is within specifications. Provide the equipment needed to assist in this sorting.

Excavate a footing trench along the toe of the slope as shown on the Plans.

Place stones to the thickness, height, and length shown on the Plans, or as staked, in a well-graded mass with a minimum of voids. Fill in unacceptable voids with smaller stones. Place riprap to its full course thickness in one operation. Avoid displacing the underlying material. Do not place riprap in layers or use methods likely to cause segregation.

Manipulate the rock sufficiently using a backhoe, rock tongs, or other suitable equipment to secure a reasonably regular surface and stability.

METHOD OF MEASUREMENT

180-4.1 Section 90. By neat line volume or by weight. Excavation and backfill will not be measured for payment and is considered subsidiary.

BASIS OF PAYMENT

180-5.1 Payment will be made at the contract unit price for each item below that appears on the bid schedule.

Payment will be made under:

Item P180.010.0000	Riprap, Class I – per cubic yard
Item P180.030.0000	Riprap, Class II – per cubic yard
Item P180.050.0000	Riprap, Class III – per cubic yard

Item P180.070.0000 Riprap, Class IV – per cubic yard

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 on both ends of the runway 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 armor and filter or underlayer stone; stone shall not be elongated or tabular. The minimum dimension of each individual stone shall be at least one-third of the stone's maximum dimension. 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 and Filter Stone.** Provide uniformly graded stone that falls within the limits shown in the following gradations, based on class:

Primary Armor Stone - Class ____

Stone Weight	Approximate Diameter	Allowable % Smaller **by Stone Count**
___ lb	__ inch	100%
___ lb	__ inch	0-50%
___ lb	__ inch	0%

Filter Stone - Class F-___ lb

Stone Weight	Approximate Diameter	Allowable % Smaller **by Stone Count**
___ lb	___ inch	100%
___ lb	___ inch	0-50%
___ lb	___ inch	0%

b. **Underlayer Stone.** Provide uniformly graded underlayer stone that falls within the limits shown in the following gradations, based on class:

Underlayer Stone - Class UL-___ lb

Stone Weight	Approximate Diameter	Allowable % Smaller **by Stone Count**
___ lb	__ inch	100%
___ lb	__ inch	0-50%
___ lb	__ inch	0%

CONSTRUCTION METHODS

185-3.1 GENERAL. Provide a level, compact area large enough to dump and sort at approved locations(s). Dump the loads specified in this area and assist the Engineer as needed to sort and measure the stones in the load to determine it the riprap is within specifications. Provide the equipment needed to assist in this sorting.

Place primary armor and filter or underlayer stones on prepared slopes within the limits shown on the plans. 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 the Contractor's expense.

Place materials in a manner that produces a well-keyed mass of stone, with each individual stone having three points of contact. Ensure that finished surfaces of all layers are free from pockets of single sized stone. Placement of small stone in primary armor and filter or 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 filter or underlayer stone to the full course thickness in 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 is 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
Filter or 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 appropriate specific gravity. 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 (e.g., 20 stones placed in a truck weigh 20,000 pounds; this is equivalent to 20 stones with an average weight of 20,000/20 = 1,000 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 C97	2% max.
Soundness (Sodium Sulfate)	ASTM C88	5% max. loss
Solubility & Durability (Ethylene Glycol)	COE CRD-C-148	2% max. loss after 15 days
LA Abrasion	ASTM C535	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 filter or 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 filter or 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 P185.010.0000	Primary Armor Stone, Class I – per ton
Item P185.090.0000	Underlayer Stone, Class I – per ton
Item P185.170.0000	Filter Stone – per ton
Item P185.220.0000	Recovered Primary Armor Stone – per ton

ITEM P-186 SACKED SLOPE PROTECTION

DESCRIPTION

186-1.1 Furnish and place sacks (sandbags) filled with granular soils on a prepared slope as shown on the plans.

MATERIALS

186-2.1 SACKS. Provide new sacks with an approximate capacity of 1.25 cubic feet, made of at least ten ounce burlap, and measuring approximately 19-1/2 inches by 36 inches inside the seams when the sack is laid flat.

186-2.2 GRANULAR SOILS. Use granular soils for filling the sacks that meets the requirements of base course material as specified in item P-209.

186-2.3 GEOTEXTILE. Provide separation geotextile in accordance with the material requirements of specification P-681 Geotextile for Separation & Stabilization.

CONSTRUCTION REQUIREMENTS

186-3.1 Prepare slopes that are designated for sacked slope protection as shown on the plans. Repair damaged slopes where geotextile is to be placed and smoothly finish within 0.2 foot of the designated slopes. Place, join, and repair geotextile in accordance with the requirements of item P-681.

Place approximately one cubic foot of base course material in each sack. Immediately after filling, place each closed sack in position and firmly tamp to a stable condition. Conform each sack to the slope and to the adjacent sacks already in place. Prepare the excavation for toe sacks to the approximate depths and elevations shown on the plans. Place toe sacks to form a multiple row of stretchers in this prepared excavation. Prepare the next course consisting of a single row of headers. Prepare the third and remaining courses consisting of a single row of stretchers placed in such a manner that joints in succeeding courses are staggered. Remove all dirt and debris from the tops of sacks before the placing the following course. Place stretchers so that the folded ends will not be adjacent. Place headers with the folds turned in towards the bank. When, in the opinion of the Engineer, there is a lack of solid contact or there are gaps between adjacent sacks, adjust the sacks before continuing with the work.

Place two independent layers of sacked slope protection so that all joints are firm and staggered.

METHOD OF MEASUREMENT

186-4.1 Section 90. By the unit, completed and accepted in place.

BASIS OF PAYMENT

186-5.1 The accepted quantity of sacked slope protection will be paid for at the contract unit bid price per each sack, complete and in place. This price is full compensation for all materials, for preparation of slopes, for geotextiles, sacks, and base course material and for all labor, tools, equipment and incidentals for the slope protection.

Payment will be made under:

Item P186.010.0000	Sacked Slope Protection- per square yard
Item P186.020.0000	Sacked Slope Protection – per each

ITEM P-189 GABIONS

DESCRIPTION

189-1.1 Construct wire gabion bank protection at locations shown on the plans.

MATERIALS

189-2.1 WIRE MESH. Use 11 gage minimum wire, except that the selvedge may be heavier. Meet or exceed ASTM A641 medium hardness and tensile strength; Class 3 coating. Furnish at least one sample of each component of the mesh for testing.

Use mesh with 4-inch openings in the longest dimension.

Use wire mesh that is designed to be nonraveling. It must resist pulling apart at any of the connections forming the mesh when a single wire strand in a section of mesh is cut.

Tie and Connecting Wire: Conform to the same specifications as wire used in the mesh except that it may be not more than 2 gauges smaller. Supply sufficient quantity for securing and fastening all edges of the gabion baskets and diaphragms, for fastening adjacent gabion baskets together, and to provide cross connecting wires in each gabion cell as specified below.

189-2.2 GABION BASKETS. Supply baskets, as specified, in various lengths and heights. Make the lengths multiples (2, 3, or more) of the horizontal width. Furnish all gabion baskets in uniform width of not less than 24 inches or more than 48 inches.

Fabricate the sides, ends, lid, and diaphragms for field assembly into a rectangular basket of the required size. Construct gabions as a unit. The base, ends and sides are either to be woven into a single unit or one edge of these members connected to the base so that strength and flexibility at the point of connection is at least equal to that of the mesh.

189-2.3 DIAPHRAGMS. Where the length of the gabion exceeds its horizontal width, divide the gabion equally with diaphragms of the same mesh and gage as the gabion basket and make compartments of a length approximately equal to horizontal width. Furnish the gabion with the necessary diaphragms secured in proper position on the base section so that no additional tying at this juncture is necessary.

Securely selvedge or bind all perimeter edges so that the joints formed by tying the selvedges have approximately the same strength as the body of the mesh.

189-2.4 GABION BACKFILL. Stone and gravel, uniformly graded from 4 to 12 inches in least dimension and having no more than 60% wear (AASHTO T 96).

CONSTRUCTION REQUIREMENTS

189-3.1 Construct gabions to the lines and grades as staked. Meet the details shown on the plans.

Assemble gabion baskets per the manufacturer's recommended procedures. Align each row or tier of gabion baskets before filling the baskets. Install tie wires in both directions horizontally so that layers between ties are not more than 14 inches thick. Space tie wires not more than 14 inches apart horizontally within any gabion basket cell. Loop tie wires around at least 3 meshes of the gabion basket and tie or twist securely. Fill each gabion basket so the lid, when secure, will bear on the gabion filler. Securely fasten gabion baskets to all adjacent baskets, using sufficient wire to provide the same strength as the body of the mesh.

Meet the requirements of section P-152 for all excavation and backfill for gabions.

METHOD OF MEASUREMENT

189-4.1 By the calculated neat line volume of gabion baskets in place using the manufacturer's specified dimensions.

BASIS OF PAYMENT

189-5.1 Excavation for gabions will be paid for under section P-152.

Payment will be made under:

Item P189.010.0000	Gabion – per cubic yard

TESTING REQUIREMENTS

AASHTO T 96	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM A641	Zinc-Coated (Galvanized) Carbon Steel Wire

ITEM P-190 INSULATION BOARD

DESCRIPTION

190-1.1 Furnish and install polystyrene insulation board where shown on the plans.

MATERIALS

190-2.1 Use materials that conform to the following:

a. Insulation Board. AASHTO M 230, Type VI, except that extrusion is not required, and the maximum water absorption is 0.3% by volume, as determined by ASTM C272. Insulation board must meet or exceed the minimum thickness called out in the plans, and have a 20-year warranted thermal resistance (R-Value) @ 75°F of 4.5 per inch of thickness as determined by ASTM C177 or ASTM C518.

b. Sand Blanket. Sand containing no muck, frozen material, roots, sod or other deleterious matter and with a plasticity index not greater than 6 as determined by ATM 204 and ATM 205. Meet the grading requirements of Table 1 as determined by ATM 304:

TABLE 1
SAND BLANKET MATERIAL GRADATION

SIEVE	PERCENT PASSING BY WEIGHT
3/8 in.	100
No. 4	15-65
No. 200	0-6

CONSTRUCTION REQUIREMENTS

190-3.1 Prior to placing the insulation board, blade, shape, and compact the area per item P-152. Place a sand blanket leveling course at least four inches thick. Finish the leveling course surface so it does not vary more than 0.10 foot when tested using a 12-foot straightedge.

Set each board accurately to the line and grade established and anchor firmly in place by driving a minimum of two wood dowels per panel. Place insulation to the required thickness, using a minimum of two layers. The required thickness is shown on the plans and is actual thickness, not nominal thickness. Stagger all joints between layers.

Cover the insulation board with twelve inches of sand blanket material prior to placing subsequent lifts. Use approved spreading and compacting equipment.

METHOD OF MEASUREMENT

190-4.1 By the square foot of insulation board with the required “R” value in final position, including transitions, regardless of thickness, complete and accepted.

Sand blanket material is will be paid under P-152.200.0000, Borrow, per ton.

BASIS OF PAYMENT

190-5.1 At the contract unit price.

Payment will be made under:

Item P190.010.0000	Insulation Board – per square foot
Item P190.020.0000	Insulation Board – per 1,000 board feet (MBM)

TESTING REQUIREMENTS

ATM 204	WAQTC FOP for AASHTO T 89 Determining the Liquid Limit of Soils
ATM 304	WAQTC FOP for AASHTO T 27/T 11 Sieve Analysis of Fine and Coarse Aggregates *

MATERIAL REQUIREMENTS

ASTM C272	Water Absorption of Core Materials for Sandwich Constructions
ASTM 177	Steady-State Heat Flux Measurement and Thermal Transmission Properties by Means of the Guarded-Hot Plate Apparatus

AGGREGATE BASE AND SURFACE COURSE ITEMS

ITEM P-207 IN-PLACE FULL DEPTH RECLAMATION (FDR) RECYCLED ASPHALT AGGREGATE BASE COURSE

DESCRIPTION

207-1.1 This item consists of a recycled asphalt aggregate base course resulting from the in-place full depth reclamation (FDR) of the existing pavement section (asphalt wearing surface and aggregate base), plus mechanical stabilization with additional aggregate or chemical stabilization with Portland cement, or asphalt emulsion, when shown on the plans.

MATERIALS

207-2.1 AGGREGATE. The FDR shall consist of materials produced by recycling (pulverizing and mixing) the existing asphalt pavement, aggregate base, subgrade, and any additional aggregate as necessary. .

The FDR shall meet the gradation in Table 207-1, below.

TABLE 207-1. FDR GRADATION

Sieve	Minimum Percentage by weight passing sieves
2-inch	
1-1/2-inch	100
1-inch	90-100
No. 4	
No. 200	

a. Deleterious substances. Materials for aggregate base shall be kept free from weeds, sticks, grass, roots and other foreign matter.

b. Uniformity. The materials shall be thoroughly recycled (pulverized and mixed) to ensure a uniform gradation.

207-2.2 STABILIZATION.

a. Mechanical stabilization. Addition of corrective aggregate material to adjust gradation shall be equivalent to P-209 Crushed Aggregate Base Course.

b. Chemical Stabilization. Provide the specific chemical stabilization material designated in the Plans. Portland cement shall meet the requirements of AASHTO M 85. Emulsified asphalt cement shall meet the requirements of AASHTO M 140. Cationic emulsified asphalt shall meet the requirements of AASHTO M 208. Materials shall be handled, stored, and applied in accordance with all federal, state, and local requirements.

207-2.3 WATER. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

207-2.4 QUALITY CONTROL (QC) SAMPLING AND TESTING. The Contractor shall take at least two FDR samples per day of production in the presence of the Engineer to check the gradation. Sampling shall be per ATM 301. Material shall meet the requirements in paragraph 207-2.1. Samples shall be taken from the in-place, un-compacted material at random sampling locations according to ATM SP 4.

CONSTRUCTION METHODS

207-3.1 MILLING. The existing asphalt pavement shall be milled to the depth below surface grade shown on the plans.

207-3.2 CONTROL STRIP. The control strip shall be 12 feet in width and 300 feet in length. The Engineer will designate the location of control strips. The Contractor shall demonstrate, in the presence of the Engineer, that the materials, equipment, and construction processes meet the requirements of the specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not begin until the control strip has been accepted by the Engineer. Upon acceptance of the control strip by the Engineer, the Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the Engineer.

207-3.3 RECYCLING (PULVERIZATION AND MIXING). The asphalt pavement and aggregate base shall be recycled (pulverized and mixed) into a uniformly blended mixture to the depth shown on the plans. Add mechanical and chemical stabilization materials of the type(s) and in proportions shown on the plans to the mixture of asphalt pavement and aggregate base. All material over approximately 1-1/2 inches will be removed by the Contractor. The mixture shall be brought to the desired moisture content.

The maximum lift thickness of the recycled aggregate base course material to be compacted is shown on the plans.

207-3.4 GRADING AND COMPACTION. Immediately upon completion of recycling (pulverization and mixing), the material shall be shaped and graded in accordance with the project plans. The Engineer will use ATM 412 to determine the density standard from the control strip. The recycled asphalt aggregate base course shall be compacted within the same day to an in-place density of 98 percent as determined by ATM 213. Compact the remainder of the project to not less than 98 percent of the density standard, in accordance with ATM 213. The number, type and weight of rollers shall be sufficient to compact the material to the required density.

207-3.5 FINISHING. The surface of the aggregate base course shall be finished by blading or with automated equipment designed for this purpose. If the top layer is 1/2 inch or more below grade, the top layer shall be scarified to a depth of at least 3 inches, new material added, and the layer blended and re-compacted to bring it to grade. The addition of layers less than 3 inches shall not be allowed.

207-3.6 PROOF ROLLING. Compacted asphalt aggregate base course shall be proof rolled with a tandem axle dual wheel dump truck loaded to the legal limit with tires inflated to 80 psi in the presence of the Engineer. Soft areas that deflect greater than 0.5 inch or show permanent deformation greater than 0.5 inch shall be removed and reworked at the Contractor's expense.

207-3.7 WEATHER LIMITATIONS. When weather conditions detrimentally affect the construction process and/or quality of the materials, the Contractor shall stop construction. Portland cement shall not be applied when wind conditions affect the distribution of the materials. Do not use any frozen material or compact on a frozen base. Construction shall not be performed unless the atmospheric temperature is above 35°F and rising or approved by the Engineer. When the temperature falls below 35°F, protect all completed areas against detrimental effects of freezing by approved methods. Correct completed areas damaged by freezing, rainfall, or other weather conditions to meet specified requirements.

207-3.8 MAINTENANCE. The asphalt aggregate base course shall be maintained in a satisfactory condition until the work is accepted by the Engineer. Equipment used in the construction of an adjoining section may be routed over completed sections of asphalt aggregate base course, provided that no damage results and equipment is routed over the full width of the completed asphalt aggregate base course. Any damage to the recycled asphalt aggregate base course shall be repaired by the Contractor at the Contractor's expense.

207-3.9 SURFACE TOLERANCES. The finished surface shall be tested for smoothness and accuracy of grade. Any area failing smoothness or grade shall be scarified to a depth of at least 3 inches, reshaped and re-compacted by the Contractor at the Contractor's expense.

a. Smoothness. The finished surface shall not vary more than 3/8-inch when tested with a 12-foot straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot straightedge for the full length of each line on a 50-foot grid.

b. Grade. The grade shall be measured on a 50-foot grid and shall be within +0 and -1/2 inch of the specified grade.

207-3.10 ACCEPTANCE SAMPLING AND TESTING FOR DENSITY. FDR base course will be accepted for density and thickness on an area basis. One (1) test for density and thickness will be made for each 1200 square yds. Sampling locations will be determined on a random basis in accordance with ATM SP 4.

a. Density. The Engineer will perform all density tests.

Each area will be accepted for density when the field density is at least 98 percent of the density standard of the FDR base course in accordance with ATM 412. The in-place field density will be determined in accordance with ATM 213, and ATM 213 will be used to determine the moisture content of the material. The machine will be calibrated in accordance with ATM 213. If the specified density is not attained, the area represented by the failed test must be reworked and/or recompacted and two additional random tests made. This procedure will be followed until the specified density is reached.

b. Thickness. The thickness of the base course shall be within +0 and -1/2 inch of the specified thickness as determined by depth tests taken by the Contractor in the presence of the Engineer for each area. Where the thickness is deficient by more than 1/2-inch, the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches, adding new material, and recompacted to grade. The Contractor shall replace, at his expense, base material where depth tests have been taken.

METHOD OF MEASUREMENT

207-4.1 See GCP Section 90, and the following:

a. FDR asphalt aggregate base course, by the area of the finished top surface.

b. Emulsified asphalt, by the ton.

c. Portland cement, by the ton**.**

d. FDR asphalt aggregate base course, by Lump Sum. Chemical stabilization is subsidiary.

BASIS OF PAYMENT

207-5.1 Payment will be made at the contract unit price, per unit of measurement, accepted in place. Corrective aggregate material, if required, will be paid under Item P-209.

Payment will be made under:

P207.110.0000	FDR Asphalt Aggregate Base Course	per square yard
P207.120.0000	FDR Asphalt Aggregate Base Course	per lump sum
P207.130.0000	Emulsified Asphalt	per ton
P207.140.0000	Portland Cement	per ton

References

ASTM C1602 Mixing Water Used in the Production of Hydraulic Cement Concrete

AASHTO M 85	Portland Cement
AASHTO M 140	Emulsified Asphalt
AASHTO M 208	Cationic Emulsified Asphalt
ATM 213	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth), FOP for AASHTO T 310
ATM 301	Sampling of Aggregates FOP for AASHTO T 2
ATM 412	Relative Standard Density of Treated Mixtures by the Control Strip Method
ATM SP 4	Random Sampling

ITEM P-209 CRUSHED AGGREGATE BASE COURSE

DESCRIPTION

209-1.1 This item consists of a base course composed of crushed aggregate constructed on a prepared course in accordance with these Specifications and to the dimensions and typical cross-sections shown on the Plans.

MATERIALS

209-2.1 CRUSHED AGGREGATE BASE. Crushed aggregate shall consist of clean, sound, durable particles of crushed stone or crushed gravel and shall be free from excess coatings of clay, silt, organic material, clay lumps or balls or other deleterious materials. The method used to produce the crushed gravel shall result in the fractured particles in the finished product as consistent and uniform as practicable. Fine aggregate passing the No. 4 sieve shall consist of fines from the coarse aggregate crushing operation. 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 coarse aggregate requirements for wear and soundness. Aggregate base material requirements are listed in Table 209-1.

TABLE 209-1, CRUSHED AGGREGATE BASE MATERIAL REQUIREMENTS

Material Test	Requirement	Standard
Coarse Aggregate		
Resistance to Degradation	Loss: 45% maximum	AASHTO T 96
Soundness of Aggregates by Use of Sodium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate	AASHTO T 104
Percentage of Fractured Particles	Minimum 90% by weight of particles with at least two fractured faces and 100% with at least one fractured face[1]	ATM 305
Flat Particles, Elongated Particles, or Flat and Elongated Particles	10% maximum, by weight, of flat, elongated, or flat and elongated particles [2]	ATM 306
Degradation Value	45%, minimum	ATM 313
Fine Aggregate		
Liquid limit	Less than or equal to 25	ATM 204
Plasticity Index	Not more than six (6)	ATM 205

[1] The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

[2] A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

209-2.2 GRADATION REQUIREMENTS. The gradation of the final aggregate base material shall meet the requirements of the gradation given in Table 209-2 when tested per ATM 304. The gradation shall be well graded from coarse to fine and shall not vary from the lower limit on one sieve to the high limit on an adjacent sieve or vice versa. Use Gradation D-1 unless specified otherwise.

TABLE 209-2. REQUIREMENTS FOR GRADATION OF AGGREGATE

Sieve Size	Design Range Percentage by Weight passing		Contractor's Final Gradation	Job Control Grading Band Tolerances[1] (Percent)
	C-1	D-1		
1-1/2 inch	100			0
1 inch	70-100	100		±5
3/4 inch	60-90	70-100		±8
3/8 inch	45-75	50-80		±8
No. 4	30-60	35-65		±8
No. 8	22-52	20-50		±8
No. 50[2]	6-30	6-30		±5
No. 200[2]	0-5	0-5		±3

[1] The "Job Control Grading Band Tolerances for Contractor's Final Gradation" in the table shall be applied to "Contractor's Final Gradation" to establish a job control grading band. The full tolerance still applies if application of the tolerances results in a job control grading band outside the design range.
[2] The fraction of material passing the No. 200 sieve shall not exceed two-thirds the fraction passing the No. 50 sieve.

209-2.3 SAMPLING AND TESTING.

a. **Aggregate base materials.** The Contractor shall take samples of the aggregate base in accordance with ATM 301 to verify initial aggregate base requirements and gradation. Material shall meet the requirements in Subsection 209-2.1. This sampling and testing will be the basis for approval of the aggregate base quality requirements.

b. **Gradation requirements.** The Contractor shall take at least two aggregate base samples per day in the presence of the Engineer to check the final gradation. Sampling shall be per ATM 301. Material shall meet the requirements in Subsection 209-2.2. The samples shall be taken from the in-place, un-compacted material at sampling points and intervals designated by the Engineer.

209-2.4 SEPARATION GEOTEXTILE. Not Used.

CONSTRUCTION METHODS

209-3.1 CONTROL STRIP. The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the Engineer, that the materials, equipment, and construction processes meet the requirements of the Specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined.

Control strips that do not meet Specification requirements shall be reworked, re-compacted or removed and replaced at the Contractor's expense. Full operations shall not continue until the control strip has been accepted by the Engineer. The Contractor shall use the same equipment, materials, construction methods, and sequence and manner of rolling for the remainder of base course construction, unless adjustments made by the Contractor are approved by the Engineer.

209-3.2 PREPARING UNDERLYING COURSE. The underlying subgrade and/or subbase shall be checked and accepted, in writing, by the Engineer before base course placing and spreading operations begin. Any ruts or soft, yielding areas shall be corrected and compacted to the required density before the base course is placed. To ensure proper drainage, the spreading of the base shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope, or as directed by the Engineer.

209-3.3 PRODUCTION. The aggregate shall be uniformly blended and, when at a satisfactory moisture content according to Subsection 209-3.5, the approved material may be transported directly to the spreading equipment. The plant shall blend and mix the materials to meet the Specifications.

209-3.4 PLACEMENT.

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 aggregate shall meet gradation and moisture requirements prior to compaction. . Crushed aggregate base course shall not be placed on frozen material.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the Specifications at the Contractor's expense.

209-3.5 COMPACTION. Immediately after completion of the spreading operations, and within the same day that the aggregate is placed, compact each layer of the base course to the required density.

The field density of each compacted lift of material shall be at least 98% of the maximum density of laboratory specimens prepared from samples of the crushed aggregate base material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with ATM 207 or ATM 212. The moisture content of the material during placing operations shall be within ±2 percentage points of the optimum moisture content as determined by ATM 207 or ATM 212. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

209-3.6 WEATHER LIMITATIONS. Material shall not be placed unless the ambient air temperature is at least 40°F and rising. Work on base course shall not be conducted when the subgrade or subbase is wet or frozen or the base material contains frozen material.

209-3.7 MAINTENANCE. The base course shall be maintained in a condition that will meet all Specification requirements until the work is accepted. Equipment may be routed over completed sections of base course, provided that no damage results and the equipment is routed over the full width of the completed base course to avoid rutting or uneven compaction. Any damage resulting to the base course from routing equipment over the base course shall be repaired by the Contractor at the Contractor's expense.

209-3.8 SURFACE TOLERANCES. After the course has been compacted, the surface will be tested by the Engineer for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches, reshaped and recompacted to grade until the required smoothness and accuracy are obtained and approved by the Engineer. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

a. **Smoothness.** The finished surface shall not vary more than 3/8-inch when tested with a 12-foot straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot straightedge for the full length of each line on a 50-foot grid.

b. **Grade.** The grade and crown shall be measured on a 50-foot grid and shall be within +0 and -1/2 inch of the specified grade.

209-3.9 ACCEPTANCE SAMPLING AND TESTING. Crushed aggregate base course shall be accepted for density and thickness on an area basis. Two tests shall be made for density and thickness for each 1200 square yards. Sampling locations will be determined on a random basis according to ATM SP 4.

a. **Density.** The Engineer will perform all density tests. Base course will be accepted for density when the field density is not less than 98% of the maximum density, as determined according to

ATM 207 or ATM 212. The in-place field density and moisture content will be determined according to ATM 213. If the specified density is not attained, the material shall be reworked and/or recompacted until the specified density is reached.

b. Thickness. 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, the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches, adding new material of proper gradation, and the material shall be blended and recompacted to grade. The Contractor shall replace, at his expense, base material where depth tests have been taken.

METHOD OF MEASUREMENT

209-4.1 The quantity of crushed aggregate base course will be determined by the ton or measured by the cubic yard of material in final position according to Subsection 90-02.

BASIS OF PAYMENT

209-5.1 Payment shall be made at the contract unit price per unit of measurement, accepted in place.

Payment will be made under:

Item P209.010.0000	Crushed Aggregate Base Course - per cubic yard
Item P209.020.0000	Crushed Aggregate Base Course - per ton
Item P209.030.0000	Crushed Aggregate Base Course Stockpile – per ton
Item P209.070.0000	Base Course Reconditioning – per square yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

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 204	WAQTC FOP for AASHTO T 89 Determining the Liquid Limit of Soils
ATM 205	WAQTC FOP for AASHTO T 90 Determining the Plastic Limit and Plasticity Index of Soils
ATM 207	WAQTC FOP for AASHTO T 99/ T 180 Moisture-Density Relations of Soils
ATM 212	Determining the Standard Density of Coarse Granular Materials Using the Vibratory Compactor
ATM 213	WAQTC FOP for AASHTO T 310 In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)*
ATM 301	WAQTC FOP for AASHTO T 2 Sampling of Aggregates
ATM 304	WAQTC FOP for AASHTO T 27/T 11 Sieve Analysis of Fine and Coarse Aggregates *
ATM 305	WAQTC FOP for AASHTO T 335 Determining the Percentage of Fracture in Coarse Aggregate*

ATM 306	Determining the Percentage of Flat and Elongated Particles in Coarse Aggregate
ATM 313	Degradation Value of Aggregates
ATM SP 4	Random Sampling

ITEM P-220 CEMENT TREATED SOIL BASE COURSE

DESCRIPTION

220-1.1 This item shall consist of constructing a base course by uniformly mixing soil, Portland cement, and water. The mixed material shall be spread, shaped, and compacted in accordance with these Specifications and in conformity to the dimensions and typical cross-section shown on the Plans. Tests shall be required for each approved soil included within the treated layer.

Runway, taxiway, or apron pavements shall be built in a series of parallel lanes using a plan that reduces the number of longitudinal and transverse joints to a minimum.

Provide an experienced Soil-Cement technician on site to supervise the Soil-Cement process and the related process control testing.

MATERIALS

220-2.1 CEMENT. Portland cement shall conform to the requirements of AASHTO M 85, Type I or II.

220-2.2 WATER. Water used in mixing or curing shall be from potable water sources or shall meet the requirements of ASTM C1602.

220-2.3 SOIL. The soil for this work shall consist of an approved select soil. The soil shall be free of roots, sod, weeds, have an organic content less than 1.5% as determined by ATM 203, shall meet the gradation in Table 220-1, as determined by ATM 304, and have a sulfate content of less than 0.3%.

TABLE 220-1. GRADATION REQUIREMENTS

SIEVE DESIGNATION PER ATM 304	PERCENTAGE BY WEIGHT PASSING SIEVES
1 inch	100
No. 4	55-100
No. 200	0-20

220-2.4 ASPHALT MATERIAL. Not used.

MIX DESIGN

220-3.1 PROPORTIONS. Before the start of base course construction, tests shall be made on the soil or soil-aggregate material to be stabilized to determine the quantity of cement required for the job mix design.

Test specimens containing various amounts of Portland cement shall be compacted per AASHTO T 134, and the optimum moisture determined for each test specimen. Samples at the optimum moisture shall be subjected to the wet-dry and the freeze-thaw test in accordance with ASTM D559 and ASTM D560, respectively.

Cement shall be added at an application rate determined by the job mix design to achieve the strength parameters required by the embankment design. When not specified in the job mix design, molded soil-cement cylinders tested according to ASTM D1633 Method A shall have a 7-day compressive strength of 300 to 800 psi.

Submit the following to the Engineer at least 30 days before the production of soil-cement base course:

a. A letter stating the source of soil, Portland cement, and water proposed for use.

b. Furnish a minimum 300 pound representative soil sample for laboratory tests.

c. Furnish one sack (94 pounds) of Portland cement proposed for use in the mixture.

The Engineer will evaluate the material using procedures and test methods contained in the Portland Cement Association's "Soil-Cement Laboratory Handbook" and establish the approved job mix design which will become a part of the contract.

The approved job mix design will specify the target values for Portland cement content, the maximum density, and optimum moisture content of the soil-cement. The amount of Portland cement shall not vary more than 1% from the designated rate.

The following table provides the pre soil-cement job mix design estimating factors, and specifies the tolerance allowed the Contractor during production.

TABLE 220-2. ESTIMATING FACTORS FOR BIDDING CEMENT TREATED SOIL BASE ITEM

MATERIAL	PRE SOIL-CEMENT JOB MIX DESIGN ESTIMATING FACTOR	PRODUCTION TOLERANCE
Soil	Dry Unit Weight = 107 lb/ft^3 (AASHTO T 99) Optimum Moisture Content = 14%	
Soil-Cement Mixture	Dry Unit Weight = 111 lb/ft^3 (AASHTO T 134) Optimum Moisture Content = 13%	
Portland Cement	7% Portland Cement by weight of soil	±1% Portland Cement

220-3.2 CONTRACTOR'S SOIL-CEMENT TECHNICIAN. At the start of production, the Contractor shall provide an onsite technician to supervise the soil-cement process and the related process control of the product for at least 10 days of production. This technician shall have successfully supervised at least five (5) successful projects using soil-cement with similar base material and equipment. The technician must also be qualified to supervise the process control.

At the preconstruction conference, provide a submittal that includes the following information:

a. Resume of technician including; successful project(s) listing, owners- contact, address, and telephone number; location of projects and description of soil-cement equipment used on the projects.

b. Construction plan including equipment to be used and procedures to be used for mixing and paving.

220-3.3 PRE SOIL-CEMENT PRODUCTION MEETING. Submit a soil-cement base course production plan at the pre soil-cement production meeting to be held a minimum of 10 working days before initiating soil-cement operations. Address the sequence of operations and joint construction. Outline steps to assure product consistency, protection, and curing of the soil-cement base course. Provide calibration records of cement distributor.

CONSTRUCTION METHODS

220-4.1 CONTROL STRIP. The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the Engineer, that the materials, equipment, and construction processes meet the requirements of the Specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The Engineer must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet Specification requirements shall be reworked, re-compacted or removed and replaced at the Contractor's expense. Full operations shall not continue until the control strip has been accepted by the Engineer. The Contractor shall use the same equipment, materials, and

construction methods for the remainder of construction, unless adjustments made by the Contractor are approved by the Engineer.

220-4.2 WEATHER LIMITATIONS. The material shall not be mixed or placed while the atmospheric temperature is below 40°F or when conditions indicate that the temperature may fall below 40°F within 24 hours, or when the weather is foggy or rainy, or to soils that are frozen or contain frost, or when the underlying material is frozen.

220-4.3 MAINTENANCE. The material shall be maintained in a condition that will meet all Specification requirements. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, prior to placement of additional material, the Contractor shall verify that materials still meet all Specification requirements. Equipment may be routed over completed sections of base course, provided that no damage results and the equipment is routed over the full width of the completed base course. Any damage resulting to the base course from routing equipment over the base course shall be repaired by the Contractor at their expense.

220-4.4 EQUIPMENT. The course may be constructed with any equipment that will meet the requirements for soil pulverization, cement application, mixing, water application, incorporation of materials, compaction, finishing, and curing specified here. The cement distributor shall be designed to spread a uniform coverage of Portland cement at a specified rate. The spread rate shall be integrated with the speed of travel to maintain a uniform coverage. Equipment must be calibrated prior to use.

220-4.5 PREPARATION. The area to be stabilized shall be graded and shaped to conform to the lines, grades and cross-section shown on the Plans. Any soft or yielding areas in the subgrade shall be removed and replaced with acceptable soil and compacted to the specified density.

220-4.6 PULVERIZATION. After completion of moist-mixing, the soil for the base course shall be pulverized so that 100% by dry weight passes a 1-inch sieve and a minimum of 80% passes a No. 4 sieve.

220-4.7 CEMENT APPLICATION, MIXING, AND FINISHING. Mixing of the soil, Portland cement, and water shall be accomplished by the mixed-in-place method or the central plant mixed method.

a. Method A – Mixed-in-place. Shape pulverized material to the cross-section indicated. Portland cement shall be applied so that when uniformly mixed with the soil, the specified cement content is obtained, and a sufficient quantity of cement-treated soil is produced to construct a compacted cement-treated course conforming to the lines, grades, and cross-section indicated.

Immediately after the cement has been distributed, it shall be mixed with the soil. The cement shall not be mixed below the required depth. Continue mixing until the cement has been sufficiently blended with the soil to prevent the formation of cement balls when water is applied.

Determine moisture content of the mixture immediately after completion of mixing of the soil and cement. Provide water supply and pressure distributing equipment that will permit the application within three (3) hours of all mixing water on the section being processed. Incorporate water in the mix so that concentration of water near the surface does not occur. After all mixing water has been applied, continue mixing until the water is uniformly distributed throughout the full depth of the mixture.

Do not apply cement if the soil moisture content exceeds the optimum moisture content specified for the cement-treated mixture. After mixing is complete, the proportions of the mixture shall be in accordance with the approved job mix design.

b. Method B – Central plant mixed. The soil, Portland cement, and water shall be mixed in either a batch or continuous-flow type pugmill. The plant shall be equipped with feeding and metering devices that will add the soil, cement, and water into the mixer in the specified quantities. Soil and

cement shall be mixed sufficiently to prevent cement balls from forming when water is added. Mixing shall continue until a uniform mixture of soil, cement, and water is obtained.

The mixture shall be hauled to the project in trucks equipped with protective covers. The mixture shall be placed on the moistened subgrade in a uniform layer by an approved spreader. Not more than 30 minutes shall elapse between the placement of soil-cement in adjacent lanes.

The layer of soil-cement shall be uniform in thickness and surface contour and of sufficient quantity that the completed base conforms to the required line, grade and cross-section. Dumping of the mixture in piles or windrows on the subgrade shall not be permitted.

Not more than 60 minutes shall elapse between the start of moist mixing and the start of compaction of soil-cement.

220-4.8 COMPACTION. Compaction of the course shall begin within 30 minutes after mixing the cement into the subgrade. All compaction operations shall be completed within 2 hours from the start of mixing.

The field density of the compacted mixture shall be at least 98% of the maximum density of laboratory specimens prepared from the job mix design and compacted and tested in accordance with AASHTO T 134. The in-place field density shall be determined in accordance with ATM 213. The in-place moisture content shall be determined in accordance with ASTM D2216. Test the in-place field density and moisture content at a frequency of 1 test per 1,000 yd^2, but not less than four (4) tests per day of production. The moisture content of the mixture at the start of compaction shall be within ±2 percentage points of the optimum moisture content.

220-4.9 FINISHING AND CURING. After the final lift or course of treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the cross sections.

Finished portions of treated subgrade shall be protected to prevent equipment from marring, permanently deforming, or damaging completed work.

Not later than 24 hours after completion of final finishing, the surface shall be cured by being kept continuously moist for a period of 7 days with a fog-type water spray. The curing material shall be maintained and applied as needed by the Contractor during the 7-day protection period.

Sufficient protection from freezing shall be provided for at least 7 days after its construction or as approved by the Engineer.

220-4.10 CONSTRUCTION LIMITATIONS. At the end of each day's construction and/or when operations after application of the cement are interrupted for more than 30 minutes, a straight transverse construction joint shall be formed by a header or by cutting back into the compacted material to form a true vertical face.

Completed portions may be opened to light traffic, if approved by the Engineer, and provided the curing is not impaired.

220-4.11 SURFACE TOLERANCE. In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches, reshaped and re-compacted to grade until the required smoothness and accuracy are obtained and approved by the Engineer. The Contractor shall perform all final smoothness and grade checks in the presence of the Engineer. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

a. **Smoothness**. The finished surface shall not vary more than +/- 3/8 inch when tested with a 12-foot straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot straightedge for the full length of each line on a 50-foot grid.

b. **Grade.** The grade and crown shall be measured on a 50-foot grid and shall be within +/-0.05 feet of the specified grade.

220-4.12 ACCEPTANCE SAMPLING AND TESTING. Cement Treated Solid Base course shall be accepted for density and thickness on an area basis. Two tests will be made for density and thickness for each 1,000 square yards, but not less than four (4) tests per day of production. Sampling locations will be determined on a random basis per ATM SP 4.

a. **Density.** The Engineer will perform all density tests.

   Each area shall be accepted for density when the field density is at least 98% of the maximum density of laboratory specimens compacted and tested according to AASHTO T 134. The in-place field density shall be determined according to ATM 213. The in-place moisture content shall be determined in accordance with ASTM D2216. Perform in-place density test immediately after completion of compaction to determine degree of compaction. If the specified density is not attained, the area represented by the failed test must be reworked and/or recompacted at the Contractor's expense and two additional random tests made. This procedure shall be followed until the specified density is reached.

b. **Thickness.** Depth tests shall be made for each sublot by test holes or cores at least 3 inches in diameter that extend through the base. Depth tests shall be taken by the Contractor in the presence of the Engineer. For sublots where the thickness is deficient by more than 1/2-inch, the material shall be removed to full depth and replaced, at Contractor's expense.

METHOD OF MEASUREMENT

220-5.1 The quantity of cement treated soil base course shall be the number of square yards of completed and accepted base course.

220-5.2 Portland cement shall be measured by the ton.

BASIS OF PAYMENT

220-6.1 Payment shall be made at the contract unit price per square yard for cement treated soil base course. This price shall be full compensation for furnishing all materials, except Portland cement, and for all preparation, delivering, placing, and mixing of these materials; and for all labor, equipment, tools and incidentals necessary to complete the item.

220-6.2 Payment shall be made at the contract unit price per ton for cement. This price shall be full compensation for furnishing this material and for all delivery, placing, and incorporation of this material, and for all labor including the experienced soil-cement technician, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P220.010.0000	Cement Treated Soil Base Course - per square yard
Item P220.020.0000	Portland Cement - per ton

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AASHTO M 85	Portland Cement

AASHTO T 99	Moisture–Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
AASHTO T 134	Moisture-Density Relations of Soil-Cement Mixtures
ASTM D559	Wetting and Drying Compacted Soil-Cement Mixtures
ASTM D560	Freezing and Thawing Compacted Soil-Cement Mixtures
ASTM C1602	Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D1633	Compressive Strength of Molded Soil-Cement Cylinders
ASTM D2216	Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ATM 203	Organic Content of Soils
ATM 213	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ATM 304	Sieve Analysis of Fine and Coarse Aggregates and Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregate by Washing
ATM SP 4	Random Sampling

ITEM P-299 AGGREGATE SURFACE COURSE

DESCRIPTION

299-1.1 This item consists of an aggregate surface course composed of crushed or uncrushed 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

299-2.1 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.

a. 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 ATM 305.

If necessary to meet this requirement, or to eliminate an excess of fine, uncrushed particles, the gravel shall be screened before crushing.

The fine, aggregate portion, defined as the portion passing the No. 4 sieve, produced in crushing operations, shall be incorporated in the base material to the extent permitted by the gradation requirements.

b. Uncrushed Aggregate Surface Course. This material may consist of natural pit-run aggregate. However, screening, blending, ripping, washing, and/or necessary mixing of the material or other processing may be necessary to meet the gradation and performance requirements of this specification.

299-2.2 GRADATION. The gradation of the uncrushed or crushed material shall meet the requirements of the gradations indicated in Table 1, when tested according to ATM 304.

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 35 and a plasticity index not more than 10, when tested according to ATM 204 and ATM 205.

299-2.3 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

299-3.1 (RESERVED).

299-3.2 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.

299-3.3 METHODS OF PRODUCTION. The aggregate shall be uniformly blended and when at the satisfactory moisture content per paragraph 299-3.5, the approved material may be transported directly to the spreading equipment.

299-3.4 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.

299-3.5 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 ± 2 percentage points of the optimum moisture content.

299-3.6 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 ATM 207, ATM 212, or ATM 309. The control strip for ATM 309 shall be compacted by a vibratory compactor with a minimum operating weight of 22,000 pounds. The in-place field density and moisture content will be determined according to ATM 213. If the specified density is not attained, the material shall be reworked and/or recompacted until the specified density is reached.

299-3.7 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.

299-3.8 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 and approved by the Engineer.

299-3.9 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.

299-3.10 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

299-4.1 Aggregate Surface Course will be weighed by the ton or measured by the cubic yard in final position according to GCP Subsection 90-02.

BASIS OF PAYMENT

299-5.1 Aggregate Surface Course will be paid for at the contract price, per unit of measurement, accepted in place.

Payment will be made under:

Item P299.010.0000	Crushed Aggregate Surface Course – per cubic yard
Item P299.020.0000	Crushed Aggregate Surface Course – per ton
Item P299.030.0000	Crushed Aggregate Surface Course – per contingent sum
Item P299.040.0000	Uncrushed Aggregate Surface Course – per cubic yard

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	WAQTC FOP for AASHTO T 27/T 11 Sieve Analysis of Fine and Coarse Aggregates *
ATM 313	Degradation Value of Aggregates
ATM 304	WAQTC FOP for AASHTO T 27/T 11 Sieve Analysis of Fine and Coarse Aggregates *
ATM 204	WAQTC FOP for AASHTO T 89 Determining the Liquid Limit of Soils
ATM 205	WAQTC FOP for AASHTO T 90 Determining the Plastic Limit and Plasticity Index of Soils
ATM 207	WAQTC FOP for AASHTO T 99/ T 180 Moisture-Density Relations of Soils*

ATM 213	WAQTC FOP for AASHTO T 310 In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)*
ATM 305	WAQTC FOP for AASHTO T 335 Determining the Percentage of Fracture in Coarse Aggregate*

STABLIZIED BASE COURSE ITEMS

ITEM P-315 EMULSIFIED ASPHALT TREATED BASE COURSE

DESCRIPTION

315-1.1 Construct an emulsified asphalt treated base (EATB) course on a prepared foundation to the lines, grades, and depths shown on the plans.

MATERIALS

315-2.1 Use materials that conform to the following:

a. Aggregate. Section P-209, D-1

b. Emulsified Asphalt Cement. Meet AASHTO M 140.

c. Anti-Strip. As required by the approved job mix design.

d. Portland Cement. Meet AASHTO M 85, Type I, including the low-alkali cement requirement shown in Table 2 of AASHTO M 85.

315-2.2 COMPOSITION OF MIXES. At least 15 days in advance of the production of EATB material, provide a representative 300-pound sample of the base aggregate proposed for the project, and a representative 3-gallon sample of the emulsified asphalt cement.

The Engineer will determine the job mix design. Changes in aggregate gradation or aggregate sources will require a new job mix design. Submit samples in the same manner as the original submittal.

Use anti-strip agents in the proportions determined by ATM 414 and included in the approved job mix design. At least 70% of the aggregate must remain coated when tested by ATM 414.

CONSTRUCTION REQUIREMENTS

315-3.1 PULVERIZING AND MIXING. Add a base course aggregate as required prior to pulverizing. Pulverize and mix the existing material on the initial pass with the reclaimer. In separate passes, introduce the portland cement, followed by the emulsified asphalt cement.

Add portland cement at the rate of 11.7 lbs/yd^2 for a compacted depth of 12 inches. Add emulsified asphalt cement at the rate of 4.2 gals/yd^2 for a compacted depth of 12 inches.

In any segment of the project, mix the cement and introduce the emulsion all in the same day. Ensure that the total fluids (emulsion plus water) of the mixture is 7 percent maximum and 4 percent minimum as determined by nuclear methods. To achieve optimum compaction, the Engineer may direct the Contractor to adjust the moisture content of the mixture.

Cover the completed emulsified asphalt treated base with an asphalt surface treatment or asphalt pavement, within 48 hours.

315-3.2 WEATHER LIMITATIONS. Do not mix or place EATB until the aggregate temperature is above 40°F and the air temperature as measured in the shade and away from any heat source is 45°F and rising. Do not place the EATB on a wet or frozen surface, or when weather conditions will prevent proper handling, compacting, finishing, or curing of the mixture.

315-3.3 OPERATIONAL LIMITATIONS. Coordinate the various portions of the work to conform to traffic control requirements.

Place EATB only on an accepted subgrade. Ensure that the subgrade surface is substantially true to line and grade, firm and reasonably smooth, and free of loose or objectionable material, before placement of EATB.

315-3.4 EQUIPMENT.

a. Cement Distributor. Use a cement distributor designed to spread a uniform coverage of Portland cement at a specified rate integrated with the speed of travel to maintain a uniform coverage.

b. Reclaimer. Provide a reclaimer with the following features and capabilities:

(1) 600 horsepower minimum.

(2) Capability to pulverize to the size specified, mix and recycle material to the depth shown on the plans.

(3) Ability to increase the effective volume of the mixing chamber in relation to depth of cut.

(4) Two microprocessor controlled systems, complete with two independent pumping systems and spray bars, to regulate the application of emulsified asphalt cement, separate from water that is used to increase the moisture content of the mixed material. Both systems must perform in relation to the forward speed of the reclaimer and the mass of the material being processed.

(5) Two spray bars, one for emulsified asphalt cement and one for compaction moisture, each fitted with self-cleaning nozzles at a maximum spacing of one nozzle for each 6-inch width of the mixing chamber. Provide a way to monitor the flow rate at each nozzle to verify that all nozzles are producing foamed asphalt at the same rate.

(6) System with operator cabin to verify the emulsified asphalt cement is being evenly distributed across the full width of the spray bar at the rate specified. Demonstrate to the engineer capability to spray evenly.

(7) Single asphalt cement feed pipe installed between the recycler and the supply tanker. Do not use circulating systems that incorporate a return pipe to the supply tanker.

(8) Ability to print out emulsified cement quantities used during production.

c. Roller. Provide the following rollers:

(1) Self-propelled vibratory pad foot roller having a minimum dynamic force of 60,000 pounds.

(2) Pneumatic tired roller.

(3) Vibratory steel drum roller.

d. Motor Grader. Provide a grader equipped with an automatic grade and cross slope control system. AGTEK Blade Control system or approved equal.

315-3.5 SHAPING AND GRADING. Develop finish grade by shaping the material to produce the planned cross slopes (crowns or superelevations) by means of the automatic cross slope control system. Base longitudinal grade control on either string line or the existing roadway surface, depending on the performance of the grading operation, as determined by the Engineer. If required, install and maintain the string line.

315-3.6 COMPACTION. The Engineer will use ATM 412 to determine the density standard. Make each control strip at least 12 feet by 300 feet. Compact the remainder of the project to not less than 98% of the density standard, in accordance with ATM 411. The Engineer will designate the location of test strips.

Immediately upon completion of the mixing operations, use the vibratory pad foot roller to achieve initial compaction by compacting the EATB to within 3 inches of the final surface. Achieve finish compaction with the pneumatic tired roller and the vibratory steel drum roller.

315-3.7 SURFACE TEST. After rolling has been completed, the surface will be tested for smoothness and accuracy of grade, crown, superelevation, and width.

Limit surface deviations to 3/8 inch, as measured from the testing edge of a 12-foot straightedge between two contacts with the surface parallel with, and at right angles to, the centerline.

315-3.8 THICKNESS REQUIREMENTS. Limit deviations in thickness to 1/2 inch.

METHOD OF MEASUREMENT

315-4.1 This work will be measured according to GCP Section 90 and the following:

a. **Emulsified Asphalt Treated Base.** No deduction will be made for the weight of emulsified asphalt cement or for water added to provide optimum moisture content in the mix.

b. **Emulsified Asphalt Cement.** By supplier's invoice quantity minus waste, diversion and remnant.

BASIS OF PAYMENT

315-5.1 When Pay Item P315.020.0000 does not appear in the bid schedule, emulsified asphalt cement is subsidiary.

Payment will be made under:

Item P315.010.0000	Emulsified Asphalt Treated Base – per ton
Item P315.020.0000	Emulsified Asphalt Cement, Type HFMS-2S – per ton
Item P315.030.0002	Emulsified Asphalt Treated Base, 2-inch depth - per square yard
Item P315.040.0000	Portland Cement - per ton

TESTING REQUIREMENTS

ATM 412	Relative Standard Density of Treated Mixes by the Control Strip Method
ATM 411	FOP for AASHTO T 355 In-Place Density of Asphalt Mixtures By Nuclear Method
ATM 414	Anti-Strip Requirements of Hot Mix Asphalt

MATERIAL REQUIREMENTS

AASHTO M 85	Portland Cement
AASHTO M 140	Emulsified Asphalt

ITEM P-318 FOAMED ASPHALT STABILIZED BASE COURSE

DESCRIPTION

318-1.1 Construct a foamed asphalt stabilized base course by uniformly mixing together asphalt binder, water, Portland cement, recycled aggregate and imported aggregate. Spread, shape, and compact the mixed material in conformity to the dimensions and typical cross section shown on the Plans. Build runway, taxiway, or aprons in a series of parallel lanes using a plan of processing that reduces longitudinal and transverse joints to a minimum.

MATERIALS

318-2.1 ASPHALT BINDER. Conform to Table 318-1 Asphalt Binder when testing in accordance with AASHTO M 320. Binders shall be free of polymer modifiers and antistrip additives.

TABLE 318-1: ASPHALT BINDER

Property	Test Methods	Performance Grade Requirements
Performance Grading (Temp. range, Deg. C.)	AASHTO M 320	PG 52-28

The Contractor shall furnish vendor's certificate of compliance and certified test reports for each lot of asphalt binder shipped to the project. The vendor's certified test report for the asphalt binder can be used for acceptance or tested independently by the Engineer.

The following documents shall be furnished at delivery:

a. Manufacturer’s certificate of compliance

b. Certified test reports for the lot.

c. Lot number, storage tanks, and shipping containers (if applicable) used.

d. Date and time of load out for delivery.

e. Type, grade, temperature, and quality of asphalt binder loaded.

All excess asphalt binder shall remain the property of the Contractor. Removal of excess asphalt binder from the project area shall be incidental to the contract and no separate payment will be made.

318-2.2 PORTLAND CEMENT. Conform to the requirements of ASTM C150, Type I or II and include the low-alkali cement requirement shown in Table 2 of ASTM C150.

318-2.3 WATER. Use water that is clean and free from sewage, oil, acid, strong alkalies, or vegetable matter. Test water of questionable quality in accordance with the requirements of AASHTO T 26.

318-2.4 AGGREGATE. Aggregates recycled from existing materials shall consist of crushed stone or crushed gravel with or without sand or other inert finely divided mineral aggregate, as approved by the Engineer.

For Recycled Asphalt Pavement (RAP) aggregate, conform to Item P-161, Table 161-1 for RAP gradation.

For imported aggregate, conform to:

a. Item P-209. See Table P-209-1 for D-1 gradation.

b. Item P-299. See Table P-299-1 for E-1 gradation.

COMPOSITION

318-3.1 COMPOSITION OF MIXTURE. The foamed asphalt stabilized base course shall be composed of a mixture of asphalt binder, Portland cement, water, and aggregates. The resulting mixture shall meet the requirements of the Job Mix Design (JMD).

a. Sampling. The Department will conduct laboratory tests of the material samples in accordance with ATM 301 for coarse and fine aggregate, and AASHTO T 127 for mineral filler. If testing fails, the Contractor must provide a full set of samples to retest. At least 15 days prior to the production of foamed asphalt stabilized base course, the Contractor shall furnish the proposed materials and documentation to SOA DOT&PF CR Materials, 5750 East Tudor Road, Anchorage, AK 99507, (907) 269-6200:

(1) 500-pound representative sample of existing subgrade material

(2) 500-pound representative sample of imported aggregates (D-1 or E-1)

(3) 200-pound representative sample of RAP

(4) 10 gallons of asphalt binder

(5) One 94-pound sack of Portland cement with appropriate certifications

(6) A statement describing anticipated field proportioning of submitted materials

b. Job Mix Design (JMD). The Department will determine the JMD and provide the following:

(1) The percent of foamed asphalt binder to be added to the aggregate

(2) The optimum percent water to be added to the asphalt binder during the foaming process

(3) The minimum Foamed Asphalt Expansion Characteristics required

(4) The temperature of asphalt binder at the time of injection

(5) The percent by weight of Portland cement added to the aggregate

(6) The gradation of the in-place aggregate

(7) The optimum moisture content for proper compaction and dispersion of foamed asphalt binder

(8) Design dry indirect splitting tensile strength

(9) The JMD unit weight

When a change in source materials occurs, the Contractor must furnish samples according to subsection 318-3.1a. A new JMD will be determined before the new source materials can be used.

CONSTRUCTION REQUIREMENTS

318-4.1 FOAMED ASPHALT TECHNICIAN. The Contractor will provide a qualified Foamed Asphalt Technician on site during any foaming operations and as directed by the Engineer. Minimum qualifications include:

a. **Qualified Person.** A person knowledgeable in the principles and practice of foamed asphalt stabilized base course paving, with required experience stated in subsection 318-4.1b, c, & d.

b. **Work Experience.** 5 years experience with foamed asphalt stabilized base course

c. **Supervisory Experience.** 5 successfully supervised foamed asphalt stabilized base course projects

d. **JMD Experience.** Developed a foamed asphalt stabilized base course mix design, a processing plan, and a Quality Control (QC) plan

The Contractor may use a consultant or a manufacturer's representative to satisfy these requirements. At the Preconstruction Conference per GCP 80, provide a Foamed Asphalt Technician submittal that includes:

e. **Technical Resume.** Include experience as specified in subsections 318-4.1 a-c.

f. **List of Successful Projects:**

(1) Clients name and contact information (address and telephone number)

(2) Projects location

(3) Description of foamed asphalt binder equipment used on the projects

(4) Appropriate Certifications

318-4.2 PRE-FOAMING MEETING. Conduct a meeting at the job site with the Engineer and the Foamed Asphalt Technician a minimum of 5 days before initiating foaming operations, where following documents will be provided by the Contractor:

a. **List and Configuration of Equipment**
b. **Sequence of Operations**
c. **Approved QC Plan**
d. **Safety Plan**
e. **Traffic Control Plan**
f. **Public Notification Plan**

Safety Plan must include procedures to be implemented prior to and during foaming operations.

318-4.3 QUALITY CONTROL (QC) PLAN. The Contractor shall provide their QC plan to the Department for approval no less than 15 calendar days prior to the start of foaming operations. The QC plan must ensure operational activities shall provide finished material of acceptable quality.

The Contractor is required to furnish a project specific QC plan that includes, at a minimum, the following:

a. **Description of the Contractor's QC Organization**. The number of full-time equivalent employees, an organizational line of authority, and reporting responsibilities.

b. **QC Sampling, Testing, and Analysis Plan.** Methods that include a description of how random locations for sampling and testing are determined. Provide the sampling and testing frequency.

c. **Protection from Excessive Moisture.** Procedures to protect foamed asphalt stabilized base course material from receiving excessive moisture from weather events and corrective actions when criteria are not met.

d. **Contingency Plan.** Addressing but not limited to:

(1) Inclement weather

(2) Equipment breakdowns

(3) Material that does not break or cure

(4) Production modifications due to changes in ambient and/or material temperature

(5) Material moisture changes

(6) In-situ material changes

(7) Material shortages

The Contractor shall provide the following:

e. Production Records. Daily production records for each sublot, including the quantity of asphalt binder, Portland cement, and in-place compaction moisture content. Any other daily and average quantities displayed or transmitted by the recycler on which the above quantities are based.

f. Foaming Characteristics. Measure and report expansion ratio and half-life of foamed asphalt binder for every 4 hours of production.

g. In-Place Field Density. Monitor and report in-place field density of the foamed asphalt stabilized base course for each sublot.

318-4.4 CONTROL STRIP. A control strip shall be constructed prior to full production of each new mix design. At the Pre-Foaming Meeting, provide information on the location of the control strip demonstration site. Before full production, the Contractor shall use the equipment specified for the foamed asphalt stabilized base course operation and construct a control strip section at a location approved by the Engineer. Process material in the control strip, two passes wide and a minimum of 300 feet long, and to the depth shown on the Plans. The Foamed Asphalt Technician shall supervise this process. The control strip shall produce results specified in subsection 318-4.8. Additional control strips shall be required if there are changes in the material.

318-4.5 WEATHER LIMITATIONS. Do not mix foamed asphalt stabilized base course while the ambient air or surface temperature is below 40°F, when conditions indicate that the temperature may fall below 40°F within 24 hours, when the aggregate is above the optimum compaction moisture content, or when the aggregate or subgrade is frozen. Follow the recommendations made by the technician as approved by the Engineer regarding the acceptability of the weather conditions for the foaming operation.

318-4.6 EQUIPMENT. At the Preconstruction Conference, the Contractor must provide a submittal that verifies the equipment specifications meet the requirements of this section. The Engineer must approve the proposed equipment for use before construction of the foamed asphalt stabilized base course control strip.

a. Cold In-Place Recycler. Use a recycler that has the following features and capabilities:

(1) A minimum power capability of 600 horsepower.

(2) The capability to pulverize to the size specified, excavate, mix and recycle material to the depth shown on the Plans.

(3) Ability to increase the effective volume of the mixing chamber in relation to depth of cut.

(4) Two microprocessor controlled systems, complete with independent pumping systems and spray bars, to regulate the application of foamed asphalt binder, separate from water that is

used to increase the moisture content of the mixed material. Both systems perform in relation to the forward speed of the recycler and the mass of the material being processed.

(5) Two spray bars, one for foamed asphalt binder and one for compaction moisture, each fitted with self-cleaning nozzles at a maximum spacing of one nozzle for each 6-inch width of the mixing chamber. Monitor the flow rate at each nozzle to verify that all nozzles are producing foamed asphalt binder at the same rate.

(6) The foamed asphalt binder is produced at the spray bar in individual expansion chambers into which both hot asphalt binder and water are injected under pressure through individual and small orifices that promote atomization. The rate of addition of water into the hot asphalt binder is kept at a constant percentage by mass of asphalt binder by the same microprocessor.

(7) An inspection or test nozzle fitted at one end of the spray bar that produces a representative sample of foamed asphalt binder.

(8) An electrical heating system capable of maintaining the temperature of asphalt binder flow components above 300°F.

(9) A single asphalt binder feed pipe installed between the recycler and the supply tanker. Do not use circulating systems that incorporate a return pipe to the supply tanker.

(10) A system within the operator cabin to verify the foamed asphalt binder is being evenly distributed across the full width of the spray bar. Demonstrate the system to the Engineer to verify even spraying.

(11) The ability to display and/or transmit asphalt binder quantities used during production, at any point during the work shift and for the entire day's production.

(12) The teeth on the mandrel mixing head form a Chevron pattern.

(13) Emulsion injection system spray bar equipped with individual valves that can be turned off to minimize emulsion overlap on subsequent passes.

(14) Minimum of 4 different drum speeds for control of machine.

b. Cold Recycling Mixing Plant. Use a cold recycling mixing plant that has the following features and capabilities:

(1) Plant specifically designed to produce cold mixes that operates independently of external power sources and can be transported to the job site.

(2) Minimum mixing capacity of 200 tons per hour.

(3) Capable of combining all stabilizing agents and aggregates up to 2-inch diameter.

(4) Two microprocessor controlled systems, complete with independent pumping systems and spray bars, to regulate the application of foamed asphalt binder, separate from water that is used to increase the moisture content of the mixed material. Both systems perform in relation to the mass of the material being processed.

(5) Two spray bars, one for foamed asphalt binder and one for compaction moisture, each fitted with self-cleaning nozzles at a maximum spacing of one nozzle for each 6-inch width of the mixing chamber. Monitor the flow rate at each nozzle to verify that all nozzles are producing foamed asphalt binder at the same rate.

(6) The foamed asphalt binder is produced at the spray bar in individual expansion chambers into which both hot asphalt binder and water are injected under pressure through individual and small orifices that promote atomization. The rate of addition to water into the hot asphalt binder is kept at a constant percentage by mass of asphalt binder by the same microprocessor.

(7) An inspection or test nozzle fitted at one end of the spray bar produces a representative sample of foamed asphalt binder.

(8) An electrical heating system capable of maintaining the temperature of asphalt binder flow components above 300°F.

(9) A single asphalt binder feed pipe installed between the recycler and the supply tanker. A circulating system that has a return pipe to the supply tank may be used.

(10) A system accessible by the operator to verify the foamed asphalt binder is being evenly distributed across the full width of the spray bar. Demonstrate the system to the Engineer to verify even spraying.

(11) The ability to display and/or transmit asphalt binder quantities used during production, at any point during the work shift and for the entire day's production.

c. Portland Cement Distributor. Use a distributor that is designed to spread a uniform coverage of Portland cement at a specified rate.

d. Roller. Provide the following rollers:

(1) Self-propelled vibratory pad foot roller having a minimum dynamic force of 60,000 pounds;

(2) Pneumatic tired roller having a minimum operating weight of 50,000 pounds;

(3) Vibratory steel drum roller.

e. Grader. Provide a grader with calibrated automatic cross slope blade controls.

318-4.7 PREPARATION. The area to be stabilized with foamed asphalt binder may require pulverization, removal or addition of material, grading, scarifying, shaping, and compacting, as directed by the Engineer, to conform to the grades and typical section shown on the Plans.

The subgrade shall be firm and able to support, without yielding or subsequent settlement, the construction equipment and the compaction of the foamed asphalt material. Soft or yielding subgrade shall be corrected and made stable before construction proceeds.

318-4.8 PULVERIZATION AND MIXING. Pulverize the existing asphalt pavement and underlying materials to the depth as shown on the Plans so that 100% passes a 2-inch sieve, as determined by ATM 304. Multiple passes may be required to size the insitu material and to adjust moisture content before applying Portland cement and injecting foamed asphalt.

318-4.9 FOAMED ASPHALT BINDER AND PORTLAND CEMENT APPLICATION, MIXING, AND SPREADING. Accomplish the mixing of the foamed asphalt binder, Portland cement, water, and aggregates by the cold recycling methods. Ensure that the percentage of moisture in the aggregate, at the time of Portland cement application, does not exceed the quantity that will permit a uniform mixture during mixing operations, and that it does not exceed the specified optimum moisture content for the foamed asphalt stabilized base course mixture.

a. Cold In-Place Recycling. Before cement is applied, scarification or pulverization may be required for grade control, as directed by the Engineer. Pulverize to the depth required while simultaneously injecting foamed asphalt binder and compaction water. Mixing shall continue until

the foamed asphalt binder, Portland cement and compaction water have been sufficiently blended with the aggregates.

b. **Cold Recycling Mixing.** The foamed asphalt stabilized base course shall be placed in one lift. Material may be placed using either a paver or grader. Assure that there is sufficient material placed to meet the desired finish grade after compaction.

318-4.10 COMPACTION. Thoroughly compact the mixture. Accomplish the initial compaction with the vibratory pad foot roller. Accomplish intermediate compaction with the vibratory steel drum roller. Accomplish finish compaction with the pneumatic tire roller.

Field density of the compacted mixture shall be evaluated in accordance with subsection 318-5.5. The in-place field density will be determined by direct transmission in accordance with ATM 213, Method A. The moisture content of the mixture at the start of compaction shall not exceed the optimum moisture content as determined by the foamed asphalt stabilized base course mix design.

318-4.11 FINISHING. The completed foamed asphalt stabilized base course shall conform to the required lines, grades, and cross section as shown on the Plans. If necessary, scarify the surface to eliminate any deep imprints and re-compact the surface to the required density. Seal the surface with water and a pneumatic roller. Apply tack coat within 24 hours after completing finishing operations as specified in subsection P-603-3.3, using application rates in Table P-603-1.

318-4.12 CONSTRUCTION LIMITATIONS. The operation of cement, bituminous application, mixing, spreading, compacting and finishing shall be continuous and completed within four hours from start of mixing. When any of the operations after the application of Portland cement are interrupted for more than 30 minutes or when the uncompacted mixture is wetted by rain so that the optimum moisture content is exceeded by 2%, the decision to reconstruct the portion affected shall be determined by the Engineer. In the event the uncompacted, rain-wetted mixture exceeds the specified moisture content tolerance, the Contractor shall reconstruct at the Contractor’s expense the portion affected. Material along the longitudinal or transverse construction joints not properly compacted shall be reconstructed, at the Contractor’s expense, with properly moistened and mixed foamed asphalt stabilized base course compacted to specified density.

318-4.13 SURFACE TESTS. The finished surface shall not vary more than 3/8-inch when tested with a 10-foot straightedge applied parallel with, or at right angles to, the longitudinal axis of the foamed surface. Correct any variations in excess of this tolerance at the Contactor’s expense, and in a manner satisfactory to the Engineer.

318-4.14 THICKNESS. The Engineer will continually monitor thickness. Provide an average thickness of the base constructed during one day that is within 1/2-inch of the thickness shown on the plans, except that the thickness of any one point may be within 3/4-inch of that shown on the plans. Where the average thickness shown by the measurements made in one day's construction is not within the tolerance given, the Engineer may direct reconstruction at the Contractor’s expense.

318-4.15 MAINTENANCE AND REPAIR. At the Contractor’s expense, maintain the entire foamed asphalt stabilized base course surface within the limits of the Contract in a condition satisfactory to the Engineer from the time work starts until the work is completed. Maintenance includes immediate repairs of any defects that may occur either before or after the foamed asphalt stabilized base course has been constructed. Repeat maintenance as often as necessary to keep the area within specified limits at all times. Make repairs in a manner that will insure restoration of a uniform surface without compromising the durability of the part repaired. Reconstruct faulty work to the full depth as shown on the Plans. Reconstruct low areas by removing and replacing the material for the full depth of treatment rather than by adding a thin layer of foamed asphalt stabilized base course to the completed work. Traffic, with the exception of aircraft over 100,000 pounds, will be allowed to travel over the foamed asphalt stabilized base course layer for a maximum of 7 days prior to pavement operations, or as directed by the Engineer.

METHOD OF MEASUREMENT

318-5.1 FOAMED ASPHALT STABILIZED BASE COURSE. Foamed asphalt stabilized base course will be measured by the number of square yards of completed and accepted foamed asphalt stabilized base course, and in accordance with GCP subsection 90.

318-5.2 ASPHALT BINDER. Asphalt binder will be measured by the number of tons of asphalt binder used in the accepted foamed asphalt stabilized base course determined by one of the following methods:

a. **Weighing.** The quantity of asphalt binder used will be determined by weighing containers on certified scales prior to and after use. All excess asphalt binder remains the Contractor's property and will not be measured for payment. The Contractor will provide supplier's invoices to the Engineer. As an alternative, Volume Method may be used as approved by the Engineer.

b. **Supplier's Invoices.** The quantity of asphalt binder used will be determined by supplier's invoices minus waste, diversion and excess of left over. This method may be used on projects where deliveries are made in sealed tankers and the plan 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 to be determined by the Engineer.

c. **Volume Measure.** 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.

Whichever above method is selected, it must be used for the duration of the project. Another method may be used and computed as a check, but only one method will be used for payment computation.

318-5.3 PORTLAND CEMENT. Portland cement will be measured by the ton from supplier's invoices minus waste, diversion, and left over.

318-5.4 FOAMED ASPHALT TECHNICIAN. The Foamed Asphalt Technician is subsidiary to Foamed Asphalt Stabilized Base Course and will not be measured for payment.

318-5.5 EVALUATION OF MATERIAL FOR ACCEPTANCE. The quantity of foamed asphalt stabilized base course produced will be divided into lots and the lots will be evaluated individually.

A lot will be 20,000 square yards. The lot will be divided into sublots of 5,000 square yards each. The Department shall randomly sample and test for density each sublot. Sublots shall be tested for density by taking a nuclear density readings, in accordance with ATM 213, Method A, from three random test sites selected by the Engineer within each sublot. Test sites shall not be located within 12 inches of the outside edge of the foamed asphalt stabilized base course panel.

The average of the sublot density measurements will be compared to the maximum density from the approved mix design to determine the acceptability of the lot. Once the average density of the lot has been determined, the Contractor will not be permitted to provide additional compaction to raise the average. The Department shall notify the Contractor of density results as soon as possible. If two consecutive sublots produce density results less than 98.0% of the target density, the Contractor shall institute corrective action as described in the QC Plan or as recommended by the Foamed Asphalt Technician. Payment will be made according to Table 318-2.

TABLE 318-2: PAYMENT SCHEDULE FOR LOT DENSITIES.

Percent of Maximum Density from Approved Mix Design	Percent of Payment
98.0 or greater	100
97.0 to less than 98.0	90
96.0 to less than 97.0	75
Less than 96.0	See below

If the lot density falls below 96.0%, the lot will be rejected and shall be removed, replaced, or reworked as directed by Engineer at the Contractor's expense.

When test results have failed to meet specifications, retest of acceptance tests for density may be requested provided the quality control requirements of Subsection 318-4.3 are met. Only one sublot retest per lot will be permitted. Deliver this request in writing to the Engineer, within 48 hours of receipt of the final test of the lot. The Engineer will mark the locations for the density retest within a 5-foot radius of the original density locations. The original average density result will be discarded and the retest result will be used in the payment schedule regardless of whether the result gives a higher or lower percent of payment.

BASIS OF PAYMENT

318-6.1 FOAMED ASPHALT STABILIZED BASE COURSE. At the contract unit price per square yard as full compensation for furnishing all materials, except asphalt binder or Portland cement, tack coat and for all preparation, delivering, placing, and mixing of these materials; and for all labor, equipment, tools and incidentals necessary to complete the item. Density adjustment for each lot per Table 318-2 under subsection 318-5.5.

318-6.2 ASPHALT BINDER. At the contract unit price per ton as full compensation for furnishing asphalt binder and for all delivery, placing, and incorporation of this material, and for all labor, equipment, tools, and incidentals necessary to complete the item. Removal of excess asphalt binder from the project area is subsidiary to the contract and no separate payment will be made.

318-6.3 PORTLAND CEMENT. At the contract unit price per ton as full compensation for furnishing Portland cement and for all delivery, placing, and incorporation of this material, and for all labor, equipment, tools, and incidentals necessary to complete the item.

318-6.4 FOAMED ASPHALT TECHNICIAN. Payment is subsidiary to Foamed Asphalt Stabilized Base Course.

Payment will be made under:

Item P318.020.0000	Foamed Asphalt Stabilized Base Course – per square yard
Item P318.040.0000	Asphalt Binder – per ton
Item P318.050.0000	Portland Cement – per ton

TEST REQUIREMENTS

ATM 213	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods
ATM 304	Sieve Analysis of Fine and Coarse Aggregates and Materials finer than 75-µm (No. 200) Sieve in Mineral Aggregate by Washing
AASHTO T 26	Quality of Water to be Used in Concrete

MATERIAL REQUIREMENTS

ASTM C150	Standard Specification for Portland Cement
AASHTO M 320	Performance-Graded Asphalt Binder

FLEXIBLE PAVEMENT ITEMS

ITEM P-401 ASPHALT MIX PAVEMENT [Reserved]

RIGID PAVEMENT ITEMS

ITEM P-501 CEMENT CONCRETE PAVEMENT

DESCRIPTION

501-1.1 This work shall consist of pavement composed of cement concrete with and without reinforcement constructed on a prepared underlying surface in accordance with these Specifications and shall conform to the lines, grades, thickness, and typical cross-sections shown on the Plans. The terms cement concrete, hydraulic cement concrete, and concrete are interchangeable in this specification.

MATERIALS

501-2.1 AGGREGATES.

a. Reactivity. Fine and Coarse aggregates to be used in PCC on this project shall be tested and evaluated by the Contractor for alkali-aggregate reactivity in accordance with both ASTM C1260 and ASTM C1567. Tests must be representative of aggregate sources which will be providing material for production. ASTM C1260 and ASTM C1567 tests may be run concurrently.

(1) Coarse aggregate and fine aggregate shall be tested separately in accordance with ASTM C1260, however, the length of test shall be extended to 28 days (30 days from casting). Tests must have been completed within 6 months of the date of the concrete mix submittal.

(2) The combined coarse and fine aggregate shall be tested in accordance with ASTM C1567, modified for combined aggregates, using the proposed mixture design proportions of aggregates, cementitious materials, and/or specific reactivity reducing chemicals. If the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

(3) If lithium nitrate is proposed for use with or without supplementary cementitious materials, the aggregates shall be tested in accordance with Corps of Engineers (COE) Concrete Research Division (CRD) C662 in lieu of ASTM C1567. If lithium nitrate admixture is used, it shall be nominal 30% ±0.5% weight lithium nitrate in water. If the expansion does not exceed 0.10% at 28 days, the proposed combined materials will be accepted. If the expansion is greater than 0.10% at 28 days, the aggregates will not be accepted unless adjustments to the combined materials mixture can reduce the expansion to less than 0.10% at 28 days, or new aggregates shall be evaluated and tested.

b. Fine aggregate. Grading of the fine aggregate, as delivered to the mixer, shall conform to the requirements of ASTM C33 and the parameters identified in the fine aggregate material requirements below. Fine aggregate material requirements and deleterious limits are shown in Tables 501-1 and 501-2, below.

TABLE 501-1. FINE AGGREGATE MATERIAL REQUIREMENTS

MATERIAL TEST	REQUIREMENT	STANDARD
Soundness of Aggregates by Use of Sodium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate	ASTM C88
Sand Equivalent	45 minimum	ASTM D2419
Fineness Modulus (FM)	2.50 ≤ FM ≤ 3.40	ASTM C136

TABLE 501-2. LIMITS FOR DELETERIOUS SUBSTANCES IN FINE AGGREGATE FOR CONCRETE

MATERIAL TEST	REQUIREMENT	STANDARD

Clay lumps and friable particles	1.0% maximum	ASTM C142
Coal and lignite	0.5% max., using a medium with a density of Sp. Gr. of 2.0	ASTM C123
Total Deleterious Material	1.0% maximum	

c. Coarse aggregate. The maximum size coarse aggregate shall be 1-1/2-inch.

Aggregates delivered to the mixer shall be clean, hard, uncoated aggregates consisting of crushed stone, crushed or uncrushed gravel, air-cooled iron blast furnace slag, crushed recycled concrete pavement, or a combination. The aggregates shall have no known history of detrimental pavement staining. Steel blast furnace slag shall not be permitted. Coarse aggregate material requirements and deleterious limits are shown in Tables 501-3 and 501-4, below; washing may be required to meet aggregate requirements.

TABLE 501-3. COARSE AGGREGATE MATERIAL REQUIREMENTS

MATERIAL TEST	REQUIREMENT	STANDARD
Resistance to Degradation	Loss: 40% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate	ASTM C88
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles at 5:1 for any size group coarser than 3/8 sieve [1]	ASTM D4791
Bulk density of slag [2]	Weigh not less than 70 pounds per cubic foot	ASTM C29

[1] A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

[2] Only required if slag is specified.

The amount of deleterious material in the coarse aggregate shall not exceed the limits in Table 501-4:

TABLE 501-4. LIMITS FOR DELETERIOUS SUBSTANCES IN COARSE AGGREGATE

DELETERIOUS MATERIAL	STANDARD	PERCENTAGE BY MASS
Clay Lumps and friable particles	ASTM C142	1.0
Material finer than No. 200 sieve	ASTM C117	1.0[1]
Lightweight particles	ASTM C123 using a medium with a density of Sp. Gr. of 2.0	0.5
Chert[2] (less than 2.40 Sp Gr.)	ASTM C123 using a medium with a density of Sp. Gr. of 2.40)	0.1[3]

[1] The limit for material finer than 75-µm is allowed to be increased to 1.5% for crushed aggregates consisting of dust of fracture that is essentially free from clay or shale. Test results supporting acceptance of increasing limit to 1.5% with statement indicating material is dust of fracture must be submitted with Concrete mix. Acceptable techniques to characterizing these fines include methylene blue adsorption or X-ray diffraction analysis.

[2] Chert and aggregates with less than 2.4 specific gravity.

[3] The limit for chert may be increased to 1.0 percent by mass in areas not subject to severe freeze and thaw.

d. Combined aggregate gradation. This specification is targeted for a combined aggregate gradation developed following the guidance presented in United States Air Force Engineering Technical Letter (ETL) 97-5: Proportioning Concrete Mixtures with Graded Aggregates for Rigid Airfield Pavements. Base the aggregate grading upon a combination of all the aggregates (coarse and fine) to be used for the mixture proportioning. Three aggregate sizes may be required to achieve an optimized combined gradation that will produce a workable concrete mixture for its intended use. Use aggregate gradations that produce concrete mixtures with well-graded or optimized aggregate combinations. The Contractor shall submit complete mixture information necessary to calculate the volumetric components of the mixture. The combined aggregate grading shall meet the following requirements:

(1) The materials selected and the proportions used shall be such that when the Coarseness Factor (CF) and the Workability Factor (WF) are plotted on a diagram as described in Subsection 501-2.1d(4) below, the point thus determined shall fall within the parallelogram described therein.

(2) The CF shall be determined from the following equation:

CF = (cumulative percent retained on the 3/8 in. sieve)(100) /
(cumulative percent retained on the No. 8 sieve)

(3) The WF is defined as the percent passing the No. 8 sieve based on the combined gradation. However, WF shall be adjusted, upwards only, by 2.5 percentage points for each 94 pounds of cementitious material per cubic meter yard greater than 564 pounds per cubic yard.

(4) A diagram shall be plotted using a rectangular scale with WF on the Y-axis with units from 20 (bottom) to 45 (top), and with CF on the X-axis with units from 80 (left side) to 30 (right side). On this diagram a parallelogram shall be plotted with corners at the following coordinates (CF-75, WF-28), (CF-75, WF-40), (CF-45, WF-32.5), and (CF-45, WF-44.5). If the point determined by the intersection of the computed CF and WF does not fall within the above parallelogram, the grading of each size of aggregate used and the proportions selected shall be changed as necessary. The point determined by the plotting of the CF and WF may be adjusted during production ±3 WF and ±5 CF. Adjustments to gradation may not take the point outside of the parallelogram.

e. Contractors combined aggregate gradation. The Contractor shall submit their combined aggregate gradation using the format shown in Table 501-5:

TABLE 501-5. CONTRACTOR'S COMBINED AGGREGATE GRADATION

SIEVE SIZE	CONTRACTOR'S CONCRETE MIX GRADATION (PERCENT PASSING BY WEIGHT)
2 inch	*
1-1/2 inch	*
1 inch	*
3/4 inch	*
1/2 inch	*
3/8 inch	*
No. 4	*
No. 8	*
No. 16	*
No. 30	*
No. 50	*

SIEVE SIZE	CONTRACTOR'S CONCRETE MIX GRADATION (PERCENT PASSING BY WEIGHT)
No. 100	*

501-2.2 CEMENT. Cement shall conform to the requirements of ASTM C150 Type II, including the low-alkali requirement.

501-2.3 CEMENTITIOUS MATERIALS.

a. **Fly ash.** Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 15% and a total alkali content less than 3% per ASTM C311. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the Engineer.

b. **Slag cement (ground granulated blast furnace (GGBF)).** Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

c. **Raw or calcined natural pozzolan.** Natural pozzolan shall be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and shall have a loss on ignition not exceeding 6%. Class N pozzolan for use in mitigating Alkali-Silica Reactivity shall have a total available alkali content less than 3%.

501-2.4 JOINT SEAL. The joint seal for the joints in the concrete pavement shall meet the requirements of Item P-605 and shall be of the type specified on the Plans.

501-2.5 ISOLATION JOINT FILLER. Premolded joint filler for isolation joints shall conform to the requirements of ASTM D1751 or ASTM D1752 and shall be where shown on the Plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the Engineer. When the use of more than one piece is required for a joint, the abutting ends shall be fastened securely and held accurately to shape by stapling or other positive fastening means satisfactory to the Engineer.

501-2.6 STEEL REINFORCEMENT. Reinforcing shall consist of deformed steel bars conforming to the requirements of ASTM A615, Grade 60. Welded wire fabric shall be furnished in flat sheets only.**501-2.7 DOWEL AND TIE BARS.** Dowel bars shall be plain steel bars conforming to ASTM A615 and shall be free from burring or other deformation restricting slippage in the concrete.

a. **Dowel Bars**. Before delivery to the construction site each dowel bar shall be epoxy coated per ASTM A1078, Type 1, with a coating thickness after curing greater than 10 mils. Patched ends are not required for Type 1 coated dowels. The dowels shall be coated with a bond-breaker recommended by the manufacturer. Dowel sleeves or inserts are not permitted. Grout retention rings shall be fully circular metal or plastic devices capable of supporting the dowel until the grout hardens.

b. **Tie Bars.** Tie bars shall be deformed steel bars and conform to the requirements of ASTM A615. Tie bars designated as Grade 60 in ASTM A615 or ASTM A706 shall be used for construction requiring bent bars.

501-2.8 WATER. Water used in mixing or curing shall be potable. If water is taken from other sources considered non-potable, it shall meet the requirements of ASTM C1602.

501-2.9 MATERIAL FOR CURING CONCRETE. Curing materials shall conform to one of the following specifications:

a. Liquid membrane-forming compounds for curing concrete shall conform to the requirements of ASTM C309, Type 2, Class A, or Class B.

b. White polyethylene film for curing concrete shall conform to the requirements of ASTM C171.

c. White burlap-polyethylene sheeting for curing concrete shall conform to the requirements of ASTM C171.

d. Waterproof paper for curing concrete shall conform to the requirements of ASTM C171.

501-2.10 ADMIXTURES. Admixtures shall conform to the following specifications:

a. **Air-entraining admixtures.** Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entraining agent and any water reducer admixture shall be compatible.

b. **Water-reducing admixtures.** Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D.

c. **Other admixtures.** The use of set retarding and set-accelerating admixtures shall be approved by the Engineer prior to developing the concrete mix design. Retarding admixtures shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating admixtures shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

d. **Lithium Nitrate.** The lithium admixture shall be a nominal 30% aqueous solution of Lithium Nitrate, with a density of 10 pounds/gallon, and shall have the approximate chemical form as shown in Table 501-6, below:

TABLE 501-6. LITHIUM ADMIXTURE

CONSTITUENT	LIMIT (PERCENT BY MASS)
LiNO3 (Lithium Nitrate)	30 ±0.5
SO4 (Sulfate Ion)	0.1 (max)
Cl (Chloride Ion)	0.2 (max)
Na (Sodium Ion)	0.1 (max)
K (Potassium Ion)	0.1 (max)

The lithium nitrate admixture dispensing and mixing operations shall be verified and certified by the lithium manufacturer's representative.

501-2.11 EPOXY-RESIN. All epoxy-resin materials shall be two-component materials conforming to the requirements of ASTM C881, Class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:

a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.

b. Material for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.

c. Material for use for injecting cracks shall be Type IV, Grade 1.

d. Material for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type V, Grade as approved.

501-2.12 BOND BREAKER. Not required.

501-2.13 SURFACE SEALER. Provide a liquid applied, water soluble hydrophobic pore lining impregnate that is specifically formulated to protect concrete from the detrimental effects of moisture intrusion, freeze-thaw cycles, chloride ion penetration, and deicing chemicals. Provide Pavix CCC100 manufactured by Chem-Crete, Hydrozo Enviroseal 40 by Chemrex, or an equal product containing 40 percent silane meeting AASHTO T 259, ASTM C 642, and ASTM C 672.

501-2.14 ELASTOMERIC CONCRETE. Elastomeric concrete shall consist of two component polyurethane product mix, sand aggregate, fiber, and priming compound per the manufacturer's recommendations. Material shall be Delpatch as manufactured by D.S. Brown Company, or pre-approved equal. Product shall have a minimum tensile strength of 600 psi, and a minimum shore D hardness of 50 per ASTM D2240. Elastomeric concrete shall be used when the concrete surface temperature is 45°F or above and ambient air temperature is 45°F and rising.

CONCRETE MIX

501-3.1. GENERAL. No concrete shall be placed until an acceptable concrete mix design has been submitted to the Engineer for review and the Engineer has approved the concrete mix design in writing. The Engineer's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

501-3.2 CONCRETE MIX LABORATORY. The laboratory used to develop the concrete design mix shall be accredited in accordance with ASTM C1077. The laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for developing the concrete mix design must be included in the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Engineer prior to start of construction.

501-3.3 CONCRETE MIX PROPORTIONS. Develop the mix using the procedures contained in Portland Cement Association (PCA) publication, "Design and Control of Concrete Mixtures". Concrete shall be proportioned to achieve a 28-day flexural strength that meets or exceeds the acceptance criteria contained in Subsection 501-6.6 for a flexural strength of 650 psi per ASTM C78.

The minimum cementitious material shall be adequate to ensure a workable, durable mix. The minimum cementitious material (cement plus fly ash, or slag cement) shall be 470 pounds per cubic yard. The ratio of water to cementitious material, including free surface moisture on the aggregates but not including moisture absorbed by the aggregates shall be between 0.38 – 0.45 by weight.

Flexural strength test specimens shall be prepared in accordance with ASTM C192 and tested in accordance with ASTM C78. At the start of the project, the Contractor shall determine an allowable slump as determined by ASTM C143 not to exceed 2 inches for slip-form placement. For fixed-form placement, the slump shall not exceed 3 inches. For hand placement, the slump shall not exceed 4 inches.

The results of the concrete mix design shall include a statement giving the maximum nominal coarse aggregate size and the weights and volumes of each ingredient proportioned on a one cubic yard (meter) basis. Aggregate quantities shall be based on the mass in a saturated surface dry condition.

If a change in source(s) is made, or admixtures added or deleted from the mix, a new concrete mix design must be submitted to the Engineer for approval.

The Engineer may request samples at any time for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

501-3.4 CONCRETE MIX SUBMITTAL. The concrete mix design shall be submitted to the Engineer at least 45 days prior to the start of operations. The submitted concrete mix design shall not be more than

180 days old and must use the materials to be used for production for the project. Production shall not begin until the concrete mix design is approved in writing by the Engineer.

Each of the submitted concrete mixes (i.e, slip form, side form machine finish and side form hand finish) shall be stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items and quantities as a minimum:

a. Certified material test reports for aggregate in accordance with Subsection 501-2.1. Certified reports must include all tests required; reporting each test, test method, test result, and requirement specified (criteria).

b. Combined aggregate gradations and analysis; and including plots of the fine aggregate fineness modulus.

c. Reactivity Test Results.

d. Coarse aggregate quality test results, including deleterious materials.

e. Fine aggregate quality test results, including deleterious materials.

f. Mill certificates for cement and supplemental cementitious materials.

g. Certified test results for all admixtures, including Lithium Nitrate if applicable.

h. Specified flexural strength, slump, and air content.

i. Recommended proportions/volumes for proposed mixture and trial water-cementitious materials ratio, including actual slump and air content.

j. Flexural and compressive strength summaries and plots, including all individual beam and cylinder breaks.

k. Correlation ratios for acceptance testing and Contractor QC testing, when applicable.

l. Historical record of test results documenting production standard deviation, when applicable.

501-3.5 CEMENTITIOUS MATERIALS.

a. Fly ash. When fly ash is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If fly ash is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement may be used. The slag cement, or slag cement plus fly ash if both are used, may constitute between 25 to 55% of the total cementitious material by weight.

c. Raw or calcined natural pozzolan. Natural pozzolan may be used in the concrete mix design. When pozzolan is used as a partial replacement for cement, the replacement rate shall be determined from laboratory trial mixes, and shall be between 20 and 30% by weight of the total cementitious material. If pozzolan is used in conjunction with slag cement the maximum replacement rate shall not exceed 10% by weight of total cementitious material.

501-3.6 ADMIXTURES.

a. Air-entraining admixtures. Air-entraining admixtures are to be added in such a manner that will ensure uniform distribution of the agent throughout the batch. The air content of freshly mixed air-entrained concrete shall be based upon trial mixes with the materials to be used in the work

adjusted to produce concrete of the required plasticity and workability. The percentage of air in the mix shall be 5.5%. Air content shall be determined by testing in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag and other highly porous coarse aggregate.

b. Water-reducing admixtures. Water-reducing admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted with the materials to be used in the work, in accordance with ASTM C494.

c. Other admixtures. Set controlling, and other approved admixtures shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements. Tests shall be conducted with the materials to be used in the work, in accordance with ASTM C494.

d. Lithium nitrate. Lithium nitrate shall be added to the mix in the manner recommended by the manufacturer and in the amount necessary to comply with the specification requirements in accordance with Subsection 501-2.10d.

501-3.7 PRE-PAVING MEETING. A pre-paving meeting will be conducted after approval of the mix design. This meeting will be attended by the Contractor, material suppliers, subcontractors associated with the concrete, the Engineer and the testing laboratory. The mix design, paving plan, procedures for construction, curing process to be used, calibration and inspection of equipment, testing and inspection during full production paving will be discussed. The chain of command for both the Contractor and the State will be outlined. Contingency scenarios will also be discussed.

501-3.8 PAVING PLAN. Prior to the pre-paving meeting the Contractor shall submit a paving plan that includes all paving operations to the Engineer. The plan shall detail the paving operations including, material delivery, forming methods, anticipated material quantities to be placed per pour and list of project submittals that must be completed before paving.

CONSTRUCTION METHODS

501-4.1 CONTROL STRIP. The control strip(s) shall be to the next planned joint after the initial 250 feet (75 m) of each type of pavement construction (slip-form pilot lane, slip-form fill-in lane, or fixed form). The Contractor shall demonstrate, in the presence of the Engineer, that the materials, concrete mix design, equipment, construction processes, and quality control processes meet the requirements of the Specifications. The concrete mixture shall be extruded from the paver meeting the edge slump tolerance and with little or no finishing. Pilot, fill-in, and fixed-form control strips will be accepted separately. Minor adjustments to the mix design may be required to place an acceptable control strip. The production mix will be the adjusted mix design used to place the acceptable control strip. Upon acceptance of the control strip by the Engineer, the Contractor must use the same equipment, materials, and construction methods for the remainder of concrete paving. Any adjustments to processes or materials must be approved in advance by the Engineer. The acceptable control strip shall be paid for in accordance with Subsection 501-6.6.

501-4.2 EQUIPMENT. The Contractor is responsible for the proper operation and maintenance of all equipment necessary for handling materials and performing all parts of the work to meet this specification.

a. Plant and equipment. The plant and mixing equipment shall conform to the requirements of ASTM C94 and/or ASTM C685. Each truck mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades. The truck mixers shall be examined daily for changes in condition due to accumulation of hard concrete or mortar or wear of blades. The pickup and throwover blades shall be replaced when they have worn down 3/4 inch or more. The

Contractor shall have a copy of the manufacturer's design on hand showing dimensions and arrangement of blades in reference to original height and depth.

Equipment for transferring and spreading concrete from the transporting equipment to the paving lane in front of the finishing equipment shall be provided. The equipment shall be specially manufactured, self-propelled transfer equipment which will accept the concrete outside the paving lane and will spread it evenly across the paving lane in front of the paver and strike off the surface evenly to a depth which permits the paver to operate efficiently.

b. Finishing equipment.

(1) Slip-form. The standard method of constructing concrete pavements shall be with an approved slip-form paving equipment designed and operated to spread, consolidate, screed, and finish the freshly placed concrete in one complete pass of the machine so that the end result is a dense and homogeneous pavement which is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self-propelled machine designed specifically for paving and finishing high quality concrete pavements.

(2) Fixed-form. On projects requiring less than 500 square yards of concrete pavement or irregular areas at locations inaccessible to slip-form paving equipment, concrete pavement may be placed with equipment specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by the Engineer. Hand screeding and float finishing may only be used on small irregular areas as allowed by the Engineer.

c. Vibrators. Vibrator shall be the internal type. The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without segregation or voids. The number, spacing, and frequency shall be as necessary to provide a dense and homogeneous pavement and meet the recommendations of American Concrete Institute (ACI) 309R, Guide for Consolidation of Concrete. Adequate power to operate all vibrators shall be available on the paver. The vibrators shall be automatically controlled so that they shall be stopped as forward motion ceases. The Contractor shall provide an electronic or mechanical means to monitor vibrator status. The checks on vibrator status shall occur a minimum of two times per day or when requested by the Engineer.

Hand held vibrators may only be used in irregular areas and shall meet the recommendations of ACI 309R, Guide for Consolidation of Concrete.

d. Concrete saws. The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations.

e. Fixed forms. Straight side fixed forms shall be made of steel and shall be furnished in sections not less than 10 feet in length. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used, except as approved by the Engineer. The top face of the form shall not vary from a true plane more than 1/8 inch in 10 feet, and the upstanding leg shall not vary more than 1/4 inch. The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting. Wood forms may be used under special conditions, when approved by the Engineer. The forms shall extend the full depth of the pavement section.

501-4.3 FORM SETTING. Forms shall be set to line and grade as shown on the Plans, sufficiently in advance of the concrete placement, to ensure continuous paving operation. Forms shall be set to

withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the concrete placement.

501-4.4 BASE SURFACE PREPARATION PRIOR TO PLACEMENT. Any damage to the prepared base, subbase, and subgrade shall be corrected full depth by the Contractor prior to concrete placement. The underlying surface shall be entirely free of frost when concrete is placed. The prepared grade shall be moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from concrete.

501-4.5 HANDLING, MEASURING, AND BATCHING MATERIAL. Aggregate stockpiles shall be constructed and managed in such a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the concrete batch plant. Aggregates that have become segregated or mixed with earth or foreign material shall not be used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled or binned for draining at least 12 hours before being batched. Store and maintain all aggregates at a uniform moisture content prior to use. A continuous supply of materials shall be provided to the work to ensure continuous placement.

501-4.6 MIXING CONCRETE. The concrete may be mixed at the work site, in a central mix plant or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials are placed into the drum until the drum is emptied into the truck. All concrete shall be mixed and delivered to the site in accordance with the requirements of ASTM C94 or ASTM C685.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or non-agitating trucks. The elapsed time from the addition of cementitious material to the mix until the concrete is discharged from the truck should not exceed 30 minutes when the concrete is hauled in non-agitating trucks, nor 90 minutes when the concrete is hauled in truck mixers or truck agitators. In no case shall the temperature of the concrete when placed exceed 90°F. Retempering concrete by adding water or by other means will not be permitted. With transit mixers additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements provided the addition of water is performed within 45 minutes after the initial mixing operations and provided the water/cementitious ratio specified is not exceeded.

501-4.7 WEATHER LIMITATIONS ON MIXING AND PLACING. No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

a. Cold weather. Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40°F and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F.

The aggregate shall be free of ice, snow, and frozen lumps before entering the mixer. The temperature of the mixed concrete shall not be less than 50°F at the time of placement. Concrete shall not be placed on frozen material nor shall frozen aggregates be used in the concrete.

When concreting is authorized during cold weather, water and/or the aggregates may be heated to not more than 150°F. The apparatus used shall heat the mass uniformly and shall be arranged to preclude the possible occurrence of overheated areas which might be detrimental to the materials.

Curing during cold weather shall be in accordance with Subsection 501-4.13d.

b. Hot weather. During periods of hot weather when the maximum daily air temperature exceeds 85°F, the following precautions shall be taken.

The forms and/or the underlying surface shall be sprinkled with water immediately before placing the concrete. The concrete shall be placed at the coolest temperature practicable, and in no case shall the temperature of the concrete when placed exceed 90°F. The aggregates and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

The concrete placement shall be protected from exceeding an evaporation rate of 0.2 psf per hour. When conditions are such that problems with plastic cracking can be expected, and particularly if any plastic cracking begins to occur, the Contractor shall immediately take such additional measures as necessary to protect the concrete surface. If the Contractor's measures are not effective in preventing plastic cracking, paving operations shall be immediately stopped.

Curing during hot weather shall be in accordance with Subsection 501-4.13e.

c. Temperature management program. Prior to the start of paving operation for each day of paving, the Contractor shall provide the Engineer with a Temperature Management Program for the concrete to be placed to assure that uncontrolled cracking is avoided. (Federal Highway Administration HIPERPAV 3 is one example of a temperature management program.) As a minimum, the program shall address the following items:

(1) Anticipated tensile strains in the fresh concrete as related to heating and cooling of the concrete material.

(2) Anticipated weather conditions such as ambient temperatures, wind velocity, and relative humidity; and anticipated evaporation rate using Figure 19-9, PCA, Design and Control of Concrete Mixtures.

(3) Anticipated timing of initial sawing of joint.

(4) Anticipated number and type of saws to be used.

d. Rain. The Contractor shall have available materials for the protection of the concrete during inclement weather. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, all paving operations shall stop and all available personnel shall begin covering the surface of the unhardened concrete with the protective covering.

501-4.8 CONCRETE PLACEMENT. At any point in concrete conveyance, the free vertical drop of the concrete from one point to another or to the underlying surface shall not exceed 3 feet. The finished concrete product must be dense and homogeneous, without segregation and conforming to the standards in this specification. Backhoes and grading equipment shall not be used to distribute the concrete in front of the paver. Front end loaders will not be used. All concrete shall be consolidated without voids or segregation, including under and around all load-transfer devices, joint assembly units, and other features embedded in the pavement. Hauling equipment or other mechanical equipment can be permitted on adjoining previously constructed pavement when the concrete strength reaches a flexural strength of 550 psi or a compressive strength of 3,100 psi, based on the average of four field cured specimens per 2,000 cubic yards of concrete placed. The Contractor must determine that the above minimum strengths are adequate to protection the pavement from overloads due to the construction equipment proposed for the project.

The Contractor shall have available materials for the protection of the concrete during cold, hot and/or inclement weather in accordance with Subsection 501-4.7.

a. Slip-form construction. The concrete shall be distributed uniformly into final position by a self-propelled slip-form paver without delay. The alignment and elevation of the paver shall be

regulated from outside reference lines established for this purpose. The paver shall vibrate the concrete for the full width and depth of the strip of pavement being placed and the vibration shall be adequate to provide a consistency of concrete that will stand normal to the surface with sharp well-defined edges. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The plastic concrete shall be effectively consolidated by internal vibration with transverse vibrating units for the full width of the pavement and/or a series of equally placed longitudinal vibrating units. The space from the outer edge of the pavement to longitudinal unit shall not exceed 9 inches for slipform and at the end of the dowels for the fill-in lanes. The spacing of internal units shall be uniform and shall not exceed 18 inches.

The term internal vibration means vibrating units located within the specified thickness of pavement section.

The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without, segregation, voids, or vibrator trails and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least one foot. The frequency of vibration or amplitude should be adjusted proportionately with the rate of travel to result in a uniform density and air content. The paving machine shall be equipped with a tachometer or other suitable device for measuring and indicating the actual frequency of vibrations.

The concrete shall be held at a uniform consistency. The slip-form paver shall be operated with as nearly a continuous forward movement as possible and all operations of mixing, delivering, and spreading concrete shall be coordinated to provide uniform progress with stopping and starting of the paver held to a minimum. If for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels on which the bearing surface is offset to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

Not more than 15% of the total free edge of each 500-foot segment of pavement, or fraction thereof, shall have an edge slump exceeding 1/4 inch, and none of the free edge of the pavement shall have an edge slump exceeding 3/8 inch. (The total free edge of 500 feet of pavement will be considered the cumulative total linear measurement of pavement edge originally constructed as nonadjacent to any existing pavement; that is, 500 feet of paving lane originally constructed as a separate lane will have 1,000 feet of free edge, 500 feet of fill-in lane will have no free edge, etc.). The area affected by the downward movement of the concrete along the pavement edge shall be limited to not more than 18 inches from the edge.

When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump will be removed the full width of the slip form lane and replaced at the expense of the Contractor as directed by the Engineer.

b. Fixed-form construction. Forms shall be drilled in advance of being placed to line and grade to accommodate tie bars / dowel bars where these are specified.

Immediately in advance of placing concrete and after all subbase operations are completed, side forms shall be trued and maintained to the required line and grade for a distance sufficient to prevent delay in placing.

Side forms shall remain in place at least 12 hours after the concrete has been placed, and in all cases until the edge of the pavement no longer requires the protection of the forms. Curing compound shall be applied to the concrete immediately after the forms have been removed.

Side forms shall be thoroughly cleaned and coated with a release agent each time they are used and before concrete is placed against them.

Concrete shall be spread, screed, shaped and consolidated by one or more self-propelled machines. These machines shall uniformly distribute and consolidate concrete without segregation so that the completed pavement will conform to the required cross-section with a minimum of handwork.

The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to that of concrete delivery. The equipment must be specifically designed for placement and finishing using stationary side forms. Methods and equipment shall be reviewed and accepted by the Engineer.

Concrete for the full paving width shall be effectively consolidated by internal vibrators. The rate of vibration of each vibrating unit shall be sufficient to consolidate the pavement without segregation, voids, or leaving vibrator trails.

Power to vibrators shall be connected so that vibration ceases when forward or backward motion of the machine is stopped.

c. Consolidation. Concrete shall be consolidated with the specified type of lane-spanning, gang-mounted, mechanical, immersion type vibrating equipment mounted in front of the paver, supplemented, in rare instances as specified, by hand-operated vibrators. The vibrators shall be inserted into the concrete to a depth that will provide the best full-depth consolidation but not closer to the underlying material than 2 inches. Vibrators shall not be used to transport or spread the concrete. For each paving train, at least one additional vibrator spud, or sufficient parts for rapid replacement and repair of vibrators shall be maintained at the paving site at all times. Any evidence of inadequate consolidation (honeycomb along the edges, large air pockets, or any other evidence) or over-consolidation (vibrator trails, segregation, or any other evidence) shall require the immediate stopping of the paving operation and adjustment of the equipment or procedures as approved by the Engineer.

If a lack of consolidation of the hardened concrete is suspected by the Engineer, referee testing may be required. Referee testing of hardened concrete will be performed by the Engineer by cutting cores from the finished pavement after a minimum of 24 hours curing. The Engineer shall visually examine the cores for evidence of lack of consolidation. Density determinations will be made by the Engineer based on the water content of the core as taken. ASTM C642 shall be used for the determination of core density in the saturated-surface dry condition. When required, referee cores will be taken at the minimum rate of one for each 500 cubic yards of pavement, or fraction. The Contractor shall be responsible for all referee testing cost if cores fail to meet the required density.

The average density of the cores shall be at least 97% of the original concrete mix density, with no cores having a density of less than 96% of the original concrete mix density. Failure to meet the referee tests will be considered evidence that the minimum requirements for vibration are inadequate for the job conditions. Additional vibrating units or other means of increasing the effect of vibration shall be employed so that the density of the hardened concrete conforms to the above requirements.

501-4.9 STRIKE-OFF OF CONCRETE AND PLACEMENT OF REINFORCEMENT. Following the placing of the concrete, it shall be struck off to conform to the cross-section shown on the Plans and to an elevation that when the concrete is properly consolidated and finished, the surface of the pavement shall be at the elevation shown on the Plans. When reinforced concrete pavement is placed in two layers, the bottom layer shall be struck off to such length and depth that the sheet of reinforcing steel fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off, and screed. If any portion of the bottom layer of concrete has been placed

more than 30 minutes without being covered with the top layer or if initial set has taken place, it shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the reinforcement may be positioned in advance of concrete placement or it may be placed in plastic concrete by mechanical or vibratory means after spreading.

Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale or a combination of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile properties of a hand wire-brushed test specimen are not less than the applicable ASTM specification requirements.

501-4.10 JOINTS. Joints shall be constructed as shown on the Plans and in accordance with these requirements. All joints shall be constructed with their faces perpendicular to the surface of the pavement and finished or edged as shown on the Plans. Joints shall not vary more than 1/2-inch from their designated position and shall be true to line with not more than 1/4-inch variation in 10 feet. The surface across the joints shall be tested with a 12-foot straightedge as the joints are finished and any irregularities in excess of 1/4 inch shall be corrected before the concrete has hardened. All joints shall be so prepared, finished, or cut to provide a groove of uniform width and depth as shown on the Plans.

a. Construction. Longitudinal construction joints shall be slip-formed or formed against side forms as shown in the Plans.

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for more than 30 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. The installation of the joint shall be located at a planned contraction or expansion joint. If placing of the concrete is stopped, the Contractor shall remove the excess concrete back to the previous planned joint.

b. Contraction. Contraction joints shall be installed at the locations and spacing as shown on the Plans. Contraction joints shall be installed to the dimensions required by forming a groove or cleft in the top of the slab while the concrete is still plastic or by sawing a groove into the concrete surface after the concrete has hardened. When the groove is formed in plastic concrete the sides of the grooves shall be finished even and smooth with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The groove shall be finished or cut clean so that spalling will be avoided at intersections with other joints. Grooving or sawing shall produce a slot at least 1/8 inch wide and to the depth shown on the Plans.

c. Isolation (expansion). Isolation joints shall be installed as shown on the Plans. The premolded filler of the thickness as shown on the Plans, shall extend for the full depth and width of the slab at the joint. The filler shall be fastened uniformly along the hardened joint face with no buckling or debris between the filler and the concrete interface, including a temporary filler for the sealant reservoir at the top of the slab. The edges of the joint shall be finished and tooled while the concrete is still plastic

d. Dowels and Tie Bars for Joints

(1) Tie bars. Tie bars shall consist of deformed bars installed in joints as shown on the Plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the Plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth and within the tolerances in Subsection 501-4.10d (3). When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. Tie bars shall not be painted, greased, or enclosed in sleeves. When slip-form operations call for tie bars, two-piece hook bolts can be installed.

(2) Dowel bars. Dowel bars shall be placed across joints in the proper horizontal and vertical alignment as shown on the Plans. The dowels shall be coated with a bond-breaker or other lubricant recommended by the manufacturer and approved by the Engineer. Dowels bars at longitudinal construction joints shall be bonded in drilled holes.

(3) Placing dowels and tie bars. Horizontal spacing of dowels shall be within a tolerance of ±3/4 inch. The vertical location on the face of the slab shall be within a tolerance of ±1/2-inch. The method used to install dowels shall ensure that the horizontal and vertical alignment will not be greater than 1/4-inch per feet, except for those across the crown or other grade change joints. Dowels across crowns and other joints at grade changes shall be measured to a level surface. Horizontal alignment shall be checked perpendicular to the joint edge. The portion of each dowel intended to move within the concrete or expansion cap shall be wiped clean and coated with a thin, even film of lubricating oil or light grease before the concrete is placed. Dowels shall be installed as specified in the following Subsections.

Dowels and tie bars shall not be placed closer than 0.6 times the dowel bar or tie bar length to the planned joint line. If the last regularly spaced longitudinal dowel and/or tie bar is closer than that dimension, it shall be moved away from the joint to a location 0.6 times the dowel bar and/or tie bar length, but not closer than 6 inches to its nearest neighbor.

(a) Contraction joints. Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place by means of rigid metal frames or basket assemblies of an approved type. The basket assemblies shall be held securely in the proper location by means of suitable pins or anchors. Do not cut or crimp the dowel basket tie wires.

At the Contractor's option, dowels and tie bars in contraction joints may be installed by insertion into the plastic concrete using approved equipment and procedures per the paver manufacturer's design. Approval of installation methods will be based on the results of the control strip showing that the dowels and tie bars are installed within specified tolerances as verified by cores or non-destructive rebar location devices approved by the Engineer.

(b) Construction joints. Install dowels and tie bars by the cast-in- place or the drill-and-dowel method. Installation by removing and replacing in preformed holes will not be permitted. Dowels and tie bars shall be prepared and placed across joints where indicated, correctly aligned, and securely held in the proper horizontal and vertical position during placing and finishing operations, by means of devices fastened to the forms.

(c) Joints in hardened concrete. Install dowels in hardened concrete by bonding the dowels into holes drilled into the concrete. The concrete shall have cured for seven (7) days or reached a minimum compressive strength of 3100 psi or flexural strength of 450 psi before drilling begins. Holes 1/8 inch greater in diameter than the dowels shall be drilled into the hardened concrete using rotary-core drills. Rotary-percussion drills may be used, provided that excessive spalling does not occur. Spalling beyond the limits of the grout retention ring will require modification of the equipment and operation. Depth of dowel hole shall be within a tolerance of ±1/2-inch of the dimension shown on the drawings. On completion of the drilling operation, the dowel hole shall be blown out with oil-free, compressed air. Dowels shall be bonded in the drilled holes using epoxy resin. Epoxy resin shall be injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel will not be permitted. The dowels shall be held in alignment at the collar of the hole by means of a suitable metal or plastic grout retention ring fitted around the dowel.

e. **Sawing of joints.** Sawing shall commence, without regard to day or night, as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing and before uncontrolled shrinkage cracking of the pavement occurs and shall continue without interruption until all joints have been sawn. All slurry and debris produced in the sawing of joints shall be removed from the joints and adjacent areas by vacuuming and washing or flushing with a jet of water. Curing compound or system shall be reapplied after each saw-cut and maintained for the remaining cure period.

   Joints shall be cut in locations as shown on the Plans. The initial joint cut shall be a minimum 1/8 inch wide and to the depth shown on the Plans. Prior to placement of joint sealant or seals, the top of the joint shall be widened by sawing as shown on the Plans.

   Temporary backer rod shall be inserted into the joint following the initial sawcut. The backer rod shall be one size larger than the initial sawcut and no more than 1/4-inch below the top surface of the slab. Temporary backer rods shall be maintained in place until the second sawcut in preparation for joint sealing. Temporary backer material shall not be reused as part of the joint sealing operation.

501-4.11 FINISHING. Finishing operations shall be a continuing part of placing operations starting immediately behind the strike-off of the paver. Initial finishing shall be provided by the transverse screed or extrusion plate. The sequence of operations shall be transverse finishing, longitudinal machine floating if used, straightedge finishing, edging of joints, and then texturing. Finishing shall be by the machine method. The hand method shall be used only on isolated areas of odd slab widths or shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Any machine finishing operation which requires appreciable hand finishing, other than a moderate amount of straightedge finishing, shall be immediately stopped and proper adjustments made or the equipment replaced. Equipment, mixture, and/or procedures which produce more than 1/4-inch of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. Compensation shall be made for surging behind the screeds or extrusion plate and settlement during hardening and care shall be taken to ensure that paving and finishing machines are properly adjusted so that the finished surface of the concrete (not just the cutting edges of the screeds) will be at the required line and grade. Finishing equipment and tools shall be maintained clean and in an approved condition. At no time shall water be added to the surface of the slab with the finishing equipment or tools, or in any other way. Fog (mist) sprays or other surface applied finishing aids specified to prevent plastic shrinkage cracking, approved by the Engineer, may be used in accordance with the manufacturers requirements.

a. **Machine finishing with slipform pavers.** The slipform paver shall be operated so that only a very minimum of additional finishing work is required to produce pavement surfaces and edges meeting the specified tolerances. Any equipment or procedure that fails to meet these specified requirements shall immediately be replaced or modified as necessary. A self-propelled non-rotating pipe float may be used while the concrete is still plastic, to remove minor irregularities and score marks. Only one pass of the pipe float shall be allowed. Equipment, mixture, and/or procedures which produce more than 1/4-inch of mortar-rich surface shall be immediately modified as necessary to eliminate this condition or operations shall cease. Remove excessive slurry from the surface with a cutting straightedge and wipe off the edge. Any slurry which does run down the vertical edges shall be immediately removed by hand, using stiff brushes or scrapers. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

b. **Machine finishing with fixed forms.** The machine shall be designed to straddle the forms and shall be operated to screed and consolidate the concrete. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

c. **Other types of finishing equipment.** Clary screeds, other rotating tube floats, or bridge deck finishers are not allowed on mainline paving, but may be allowed on irregular or odd-shaped slabs, and near buildings or trench drains, subject to the Engineer's approval.

   Bridge deck finishers shall have a minimum operating weight of 7500 pounds and shall have a transversely operating carriage containing a knock-down auger and a minimum of two immersion vibrators. Vibrating screeds or pans shall be used only for isolated slabs where hand finishing is permitted as specified, and only where specifically approved.

d. **Hand finishing.** Hand finishing methods will not be permitted, except under the following conditions: (1) in the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade and (2) in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical.

e. **Straightedge testing and surface correction.** After the pavement has been struck off and while the concrete is still plastic, it shall be tested for trueness with a 12-foot finishing straightedge swung from handles capable of spanning at least one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Any excess water and laitance in excess of 1/8 inch thick shall be removed from the surface of the pavement and wasted. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the smoothness requirements. Straightedge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross-section. The use of long-handled wood floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment.

f. **Slab Numbering**. Each PCC slab, including stepped slabs, shall be numbered with a unique numeral embossed to a depth of 1/2 inch, in the plastic concrete with a premade stenciling system. The numerals shall be 5 to 6 inches in height. They shall be placed in alignment perpendicular to the taxiway centerline, in the northeast corner of the slab, three feet from each joint. The numbers shall be finished even with the surrounding area, any heaving of PCC resulting from pressing the stencils into the concrete shall be removed leaving a flush finish across the embossed numbers.

   The numbering system shall begin at the threshold. It shall indicate the row, starting with numeral "1" followed with a dash and then a numeral indicating the position from left to right. Formatted "1-1", "1-2", "1-3", "1-4", then the second row "2-1", "2-2", "2-3", "2-4" etc.

   Each day's work shall record the slab numbers that were poured on that day.

501-4.12 SURFACE TEXTURE. The surface of the pavement shall be finished with either a brush or broom finish for all newly constructed concrete pavements. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. The texture shall be uniform in appearance and approximately 1/16 inch in depth. Any imperfections resulting from the texturing operation shall be corrected to the satisfaction of the Engineer.

The finish shall be applied when the water sheen has practically disappeared. The equipment shall operate transversely across the pavement surface.

501-4.13 CURING. Immediately after finishing operations are completed and bleed water is gone from the surface, all exposed surfaces of the newly placed concrete shall be cured for a 7-day cure period in accordance with one of the methods below. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or lack of water to adequately take care of both curing and other

requirements, shall be cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than 1/2 hour during the curing period.

When a two-saw-cut method is used to construct the contraction joint, the curing compound shall be applied to the saw-cut immediately after the initial cut has been made. The sealant reservoir shall not be sawed until after the curing period has been completed. When the one cut method is used to construct the contraction joint, the joint shall be cured with wet rope, wet rags, or wet blankets. The rags, ropes, or blankets shall be kept moist for the duration of the curing period.

a. **Impervious membrane method.** Curing with liquid membrane compounds should not occur until bleed and surface moisture has evaporated. All exposed surfaces of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. The curing compound shall not be applied during rainfall. Curing compound shall be applied by mechanical sprayers under pressure at the rate of one gallon to not more than 150 square feet. The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application, the compound shall be stirred continuously by mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms will be permitted. When hand spraying is approved by the Engineer, a double application rate shall be used to ensure coverage. Should the film become damaged from any cause, including sawing operations, within the required curing period, the damaged portions shall be repaired immediately with additional compound or other approved means. Upon removal of side forms, the sides of the exposed slabs shall be protected immediately to provide a curing treatment equal to that provided for the surface.

b. **White burlap-polyethylene sheets.** The surface of the pavement shall be entirely covered with the sheeting. The sheeting used shall be such length (or width) that it will extend at least twice the thickness of the pavement beyond the edges of the slab. The sheeting shall be placed so that the entire surface and both edges of the slab are completely covered. The sheeting shall be placed and weighted to remain in contact with the surface covered, and the covering shall be maintained fully saturated and in position for seven (7) days after the concrete has been placed.

c. **Water method.** The entire area shall be covered with burlap or other water absorbing material. The material shall be of sufficient thickness to retain water for adequate curing without excessive runoff. The material shall be kept wet at all times and maintained for seven (7) days. When the forms are stripped, the vertical walls shall also be kept moist. It shall be the responsibility of the Contractor to prevent ponding of the curing water on the subbase.

d. **Concrete protection for cold weather.** Maintain the concrete at a temperature of at least 50°F (10°C) for a period of 72 hours after placing and at a temperature above freezing for the remainder of the 7-day curing period. The Contractor shall be responsible for the quality and strength of the concrete placed during cold weather; and any concrete damaged shall be removed and replaced at the Contractor's expense.

e. **Concrete protection for hot weather.** Concrete should be continuous moisture cured for the entire curing period and shall commence as soon as the surfaces are finished and continue for at least 24 hours. However, if moisture curing is not practical beyond 24 hours, the concrete surface shall be protected from drying with application of a liquid membrane-forming curing compound while the surfaces are still damp. Other curing methods may be approved by the RPR.

501-4.14 REMOVING FORMS. Unless otherwise specified, forms shall not be removed from freshly placed concrete until it has hardened sufficiently to permit removal without chipping, spalling, or tearing. After the forms have been removed, the sides of the slab shall be cured in accordance with Subsection 501-4.13.

If honeycombed areas are evident when the forms are removed, materials, placement, and consolidation methods must be reviewed and appropriate adjustments made to assure adequate consolidation at the edges of future concrete placements. Honeycombed areas that extend into the slab less than approximately 1 inch, shall be repaired with an approved grout, as directed by the Engineer. Honeycombed areas that extend into the slab greater than a depth of 1 inch shall be considered as defective work and shall be removed and replaced in accordance with Subsection 501-4.19.

501-4.15 SAW-CUT GROOVING. If shown on the Plans, grooved surfaces shall be provided in accordance with the requirements of Item P-621.

501-4.16 SEALING JOINTS. The joints in the pavement shall be sealed in accordance with Item P-605.

501-4.17 PROTECTION OF PAVEMENT. The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents until accepted by the Engineer. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of foreign material, etc. Any damage to the pavement occurring prior to final acceptance shall be repaired or the pavement replaced at the Contractor's expense.

Aggregates, rubble, or other similar construction materials shall not be placed on airfield pavements. Traffic shall be excluded from the new pavement by erecting and maintaining barricades and signs until the concrete is at least seven (7) days old, or for a longer period if directed by the Engineer.

In paving intermediate lanes between newly paved pilot lanes, operation of the hauling and paving equipment will be permitted on the new pavement after the pavement has been cured for seven (7) days, the joints are protected, the concrete has attained a minimum field cured flexural strength of 450 psi, and the slab edge is protected.

All new and existing pavement carrying construction traffic or equipment shall be kept clean and spillage of concrete and other materials shall be cleaned up immediately.

Damaged pavements shall be removed and replaced at the Contractor's expense. Slabs shall be removed to the full depth, width, and length of the slab.

501-4.18 OPENING TO CONSTRUCTION TRAFFIC. The pavement shall not be opened to traffic until test specimens molded and cured in accordance with ATM 506 have attained a flexural strength of 450 psi when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Prior to opening the pavement to construction traffic, all joints shall either be sealed or protected from damage to the joint edge and intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to protect the joints from foreign matter intrusion.

501-4.19 REPAIR, REMOVAL, OR REPLACEMENT OF SLABS. New pavement slabs that are broken or contain cracks or are otherwise defective or unacceptable as defined by acceptance criteria in Subsection 501-6.6 shall be removed and replaced or repaired, as directed by the Engineer, at the Contractor's expense. Spalls along joints shall be repaired as specified. Removal of partial slabs is not permitted. Removal and replacement shall be full depth, shall be full width of the slab, and the limit of removal shall be normal to the paving lane and to each original transverse joint. The Engineer will determine whether cracks extend full depth of the pavement and may require cores to be drilled on the crack to determine depth of cracking. Such cores shall be have a diameter of 2 inches to 4 inches, shall be drilled by the Contractor and shall be filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with a bonding agent, using approved procedures. Drilling of cores and refilling holes shall be at no expense to the Department. Repair of cracks as described in this section shall not be allowed if in the opinion of the Engineer the overall condition of the pavement indicates that such repair is unlikely to achieve an acceptable and durable finished pavement. No repair of cracks shall be allowed in any panel that demonstrates segregated aggregate with an absence of coarse aggregate in the upper 1/8 inch (3 mm) of the pavement surface.

a. Shrinkage cracks. Shrinkage cracks which do not exceed one-third of the pavement depth shall be cleaned and either high molecular weight methacrylate (HMWM) applied; or epoxy resin (Type IV, Grade 1) pressure injected using procedures recommended by the manufacturer and approved by the Engineer. Sandblasting of the surface may be required following the application of HMWM to restore skid resistance. Care shall be taken to ensure that the crack is not widened during epoxy resin injection. All epoxy resin injection shall take place in the presence of the Engineer. Shrinkage cracks which exceed one-third the pavement depth shall be treated as full depth cracks in accordance with Subsections 501-4.19b and 501-4.19c.

b. Slabs with cracks through interior areas. Interior area is defined as that area more than 6 inches (150 mm) from either adjacent original transverse joint. The full slab shall be removed and replaced at no cost to the Owner, when there are any full depth cracks, or cracks greater than one-third the pavement depth, that extend into the interior area.

c. Cracks close to and parallel to joints. All full-depth cracks within 6 inches (either side of the joint and essentially parallel to the original joints, shall be treated as follows.

(1) Full depth cracks and original joint not cracked. The full-depth crack shall be treated as the new joint and the original joint filled with an epoxy resin.

i. Full-depth crack. The joint sealant reservoir for the crack shall be formed by sawing to a depth of 3/4 inches, ±1/16 inch, and to a width of 5/8 inch, ±1/8 inch. The crack shall be sawed with equipment specially designed to follow random cracks. Any equipment or procedure which causes raveling or spalling along the crack shall be modified or replaced to prevent raveling or spalling. The joint shall be sealed with sealant in accordance with P-605 or as directed by the Engineer.

ii. Original joint. If the original joint sealant reservoir has been sawed out, the reservoir and as much of the lower saw cut as possible shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void using approved procedures.

If only the original narrow saw cut has been made, it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1, using approved procedures.

Where a parallel crack goes part way across paving lane and then intersects and follows the original joint which is cracked only for the remained of the width, it shall be treated as specified above for a parallel crack, and the cracked original joint shall be prepared and sealed as originally designed.

(2) Full depth cracks and original joint cracked. If there is any place in the lane width where a parallel crack and a cracked portion of the original joint overlap, the entire slab containing the crack shall be removed and replaced.

d. Removal and replacement of full slabs. Make a full depth cut perpendicular to the slab surface along all edges of the slab with a concrete saw cutting any dowels or tie-bars. Remove damaged slab protecting adjacent pavement from damage. Damage to adjacent slabs may result in removal of additional slabs as directed by the Engineer at the Contractor's expense.

The underlying material shall be repaired, re-compacted and shaped to grade.

Dowels of the size and spacing specified for other joints in similar pavement on the project shall be installed along all four (4) edges of the new slab in accordance with Subsection 501-4.10d.

Placement of concrete shall be as specified for original construction. The joints around the new slab shall be prepared and sealed as specified for original construction.

e. Spalls along joints.

(1) Spalls less than one inch wide and less than the depth of the joint sealant reservoir, shall be filled with joint sealant material.

(2) Spalls larger than one inch and/or deeper than the joint reservoir, but less than 1/2 the slab depth, and less than 25% of the length of the adjacent joint shall be repaired as follows:

i. Make a vertical saw cut at least one inch outside the spalled area and to a depth of at least 2 inches. Saw cuts shall be straight lines forming rectangular areas surrounding the spalled area.

ii. Remove unsound concrete and at least 1/2 inch of visually sound concrete between the saw cut and the joint or crack with a light chipping hammer. Hydrodemolition, utilizing equipment capable of delivering up to 30,000 psi water pressure, may be used to remove the 1/2-inch of visually sound concrete on the perimeter of the repair area, instead of the light chipping hammer, provided the hydrodemolition effort does not damage sound concrete adjacent to the repair area.

iii. Clean cavity with high-pressure water jets supplemented with compressed air as needed to remove all loose material.

iv. Apply a prime coat of material recommended by the patch material's manufacturer, to the dry, cleaned surface of all sides and bottom of the cavity, except any joint face in a manner recommended by the manufacturer.

v. Fill the cavity with low slump concrete or mortar or with epoxy resin concrete or mortar using proportions and mixing and placing procedures as recommended by the manufacturer and approved by the Engineer. Any spall less than 0.1 cu. ft. shall be repaired only with epoxy resin mortar or a Grade III epoxy resin. Elastomeric concrete shall be used for spalls, not filled with epoxy materials.

vi. An insert or other bond-breaking medium shall be used to prevent bond at all joint faces.

vii. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints, or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and sealed with the sealer specified for the joints.

(3) Spalls deeper than 1/2 of the slab depth or spalls longer than 25% of the adjacent joint require replacement of the entire slab.

f. Diamond grinding of Concrete surfaces. Diamond grinding shall be completed prior to pavement grooving. Diamond grinding of the hardened concrete should not be performed until the concrete is at least 14 days old and has achieved full minimum strength. Equipment that causes ravels, aggregate fractures, spalls or disturbance to the joints will not be permitted. The depth of diamond grinding shall not exceed 1/2 inch and all areas in which diamond grinding has been performed will be subject to the final pavement thickness tolerances specified.

Diamond grinding shall be performed with a machine specifically designed for diamond grinding capable of cutting a path at least 3 feet wide. The saw blades shall be 1/8-inch wide with sufficient number of flush cut blades that create grooves between 0.090 and 0.130 inches wide; and peaks and ridges approximately 1/32-inch higher than the bottom of the grinding cut. The Contractor shall determine the number and type of blades based on the hardness of the aggregate. Contractor shall demonstrate to the Engineer that the grinding equipment will produce satisfactory results prior to making corrections to surfaces.

Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. All grinding shall be at the expense of the Contractor.

501-4.20 SURFACE SEALER. Apply over the entire surface of the concrete after completing the sealer manufacturer's recommended curing period. Comply with the sealer manufacturer's recommendations for concrete surface preparation, sealer application temperature, rate, and method.

CONTRACTOR QUALITY CONTROL (CQC)

501-5.1 QUALITY CONTROL PROGRAM. The Contractor shall develop a Quality Control Program in accordance with GCP Section 100.

501-5.2 CONTRACTOR QUALITY CONTROL (CQC). Not Used.

501-5.3 CONTRACTOR QC TESTING. The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to this specification and as set forth in the CQCP. The testing program shall include, but not necessarily be limited to, tests for aggregate gradation, aggregate moisture content, slump, and air content. A QC Testing Plan shall be developed and approved by the Engineer as part of the CQCP.

The Engineer may at any time, notwithstanding previous plant acceptance, reject and require the Contractor to dispose of any batch of concrete mixture which is rendered unfit for use due to contamination, segregation, or improper slump. Such rejection may be based on only visual inspection. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the Engineer, and if it can be demonstrated in the laboratory, in the presence of the Engineer, that such material was erroneously rejected, payment will be made for the material at the contract unit price**.**

a. Fine aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C70 or ASTM C566. If an electronic moisture sensor is used, a control chart shall be produced indicating moisture readings and calibration reports entered for the project records.

(3) Deleterious substances. Fine aggregate as delivered to the mixer shall be tested for deleterious substances in fine aggregate for concrete as specified in Subsection 501-2.1b, prior to production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

b. Coarse Aggregate.

(1) Gradation. A sieve analysis shall be made at least twice daily for each size of aggregate. Tests shall be made in accordance with ASTM C136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.

(2) Moisture content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C566. If an electronic moisture sensor is used, a control chart shall be produced indicating moisture readings and calibration reports entered for the project records.

(3) Deleterious substances. Coarse aggregate as delivered to the mixer shall be tested for deleterious substances in coarse aggregate for concrete as specified in Subsection 501-2.1c,

prior to production of the control strip, and a minimum of every 30-days during production or more frequently as necessary to control deleterious substances.

c. Slump. One test shall be made for each sublot. Slump tests shall be performed in accordance with ASTM C143 from material randomly sampled from material discharged from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

d. Air content. One test shall be made for each sublot. Air content tests shall be performed in accordance with ASTM C231 for gravel and stone coarse aggregate and ASTM C173 for slag or other porous coarse aggregate, from material randomly sampled from trucks at the paving site. Material samples shall be taken in accordance with ASTM C172.

e. Unit weight and Yield. One test shall be made for each sublot. Unit weight and yield tests shall be in accordance with ASTM C138. The samples shall be taken in accordance with ASTM C172 and at the same time as the air content tests.

f. Temperatures. Temperatures shall be checked at least four times per lot at the job site in accordance with ASTM C1064.

g. Smoothness for Contractor Quality Control. The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than 1/4 inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues

The Contractor may use a 12-foot straightedge, a rolling inclinometer meeting the requirements of ASTM E2133, or rolling external reference device that can simulate a 12-foot straightedge approved by the Engineer. Straight-edge testing shall start with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Testing shall be continuous across all joints. The surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between the two high points. If the rolling inclinometer or external reference device is used, the data may be evaluated using either the FAA profile program, ProFAA, or FHWA profile program ProVal, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement shall be evaluated separately for conformance with the Plans.

(1) Transverse measurements. Transverse measurements shall be taken for each day's production placed. Transverse measurements shall be taken perpendicular to the pavement centerline each 50 feet or more often as determined by the Engineer. The joint between lanes shall be tested separately to facilitate smoothness between lanes.

(2) Longitudinal measurements. Longitudinal measurements shall be taken for each day's production placed. Longitudinal tests shall be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet; and at the third points of paving lanes when widths of paving lanes are 20 feet or greater. When placement abuts previously placed material the first measurement shall start with one half the length of the straight edge on the previously placed material.

Deviations on the final surface course in either the transverse or longitudinal direction that will trap water greater than 1/4 inch shall be corrected with diamond grinding per Subsection 501-4.19f or by removing and replacing the surface course to full depth. Grinding shall be tapered in

all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in Subsection 501-6.6.

Control charts shall be kept to show area of each day's placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If the Contractor's machines and/or methods produce significant areas that need corrective actions in excess of 10 percent of a day's production, production shall be stopped until corrective measures are implemented by the Contractor.

h. Grade. Grade will be evaluated prior to and after placement of the concrete surface.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and Plans. The final surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the Plans by more than 1/2-inch vertically and 0.1 feet laterally. The documentation will be provided by the Contractor to the Engineer by the end of the following working day.

Areas with humps or depression that that exceed grade or smoothness and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2-inch less than the thickness specified on the Plans. If these areas cannot be corrected with grinding then the slabs that are retaining water must be removed and replaced in accordance with Subsection 501-4.19d. Grinding shall be in accordance with Subsection 501-4.19f. All corrections will be at the Contractors expense.

501-5.4 CONTROL CHARTS. The Contractor shall maintain linear control charts for fine and coarse aggregate gradation, slump, and air content, within limits shown in Table 501-7. The Contractor shall also maintain a control chart plotting the coarseness factor/workability factor from the combined gradations in accordance with Subsection 501-2.1d.

Control charts shall be posted in a location satisfactory to the Engineer and shall be kept up to date at all times. 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, or Specification 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 potential problem and the Contractor is not taking satisfactory corrective action, the Engineer may halt production or acceptance of the material.

a. Fine and coarse aggregate gradation. The Contractor shall record the running average of the last five gradation tests for each control sieve on linear control charts. Superimposed on the control charts shall be the Action and Suspension Limits. Gradation tests shall be performed by the Contractor per ASTM C136. The Contractor shall take at least two samples per lot to check the final gradation. Sampling shall be per ASTM D75 from the flowing aggregate stream or conveyor belt.

b. Slump and air content. The Contractor shall maintain linear control charts both for individual measurements and range (that is, difference between highest and lowest measurements) for slump and air content in accordance with the following Action and Suspension Limits.

c. Combined gradation. The Contractor shall maintain a control chart plotting the coarseness factor and workability factor on a chart in accordance with Subsection 501-2.1d.

TABLE 501-7. CONTROL CHART LIMITS[1]

Control Parameter	Individual Measurements	
	Action Limit	Suspension Limit
Gradation[2]	*[3]	*[3]

Coarseness Factor (CF)	±3.5	±5
Workability Factor (WF)	±2	±3
Slump	+0.5 to -1 inch	+1 to -1.5 inch
Air Content	±1.5%	±2.0%

[1] Control charts shall developed and maintained for each control parameter indicated.
[2] Control charts shall be developed and maintained for each sieve size.
[3] Action and suspension limits shall be determined by the Contractor.

501-5.5 CORRECTIVE ACTION AT SUSPENSION LIMIT. The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of control. The CQCP shall detail what action will be taken to bring the process into control and shall contain sets of rules to gauge when a process is out of control. As a minimum, a process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

a. Fine and coarse aggregate gradation. When two consecutive averages of five tests are outside of the suspension limits, immediate steps, including a halt to production, shall be taken to correct the grading.

b. Coarseness and Workability factor. When the CF or WF reaches the applicable suspension limits, the Contractor, immediate steps, including a halt to production, shall be taken to correct the CF and WF.

c. Fine and coarse aggregate moisture content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5%, the scale settings for the aggregate batcher and water batcher shall be adjusted.

d. Slump. The Contractor shall halt production and make appropriate adjustments whenever:

(1) one point falls outside the Suspension Limit line for individual measurements

OR

(2) two points in a row fall outside the Action Limit line for individual measurements.

e. Air content. The Contractor shall halt production and adjust the amount of air-entraining admixture whenever:

(1) one point falls outside the Suspension Limit line for individual measurements

OR

(2) two points in a row fall outside the Action Limit line for individual measurements.

MATERIAL ACCEPTANCE

501-6.1 QUALITY ASSURANCE (QA) ACCEPTANCE SAMPLING AND TESTING. All acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be directed by the Engineer. The Contractor shall perform the casting and initial curing of the flexural strength specimens as described in Subsection 501-6.5a. After initial curing, the Contractor shall deliver the specimens to the Central Region Materials Laboratory (5750 E. Tudor Road, Anchorage, Alaska), the Northern Region Central Materials Laboratory (2301 Peger Road, Fairbanks, Alaska), or the Southcoast Region Materials Laboratory (6860 Glacier Highway, Juneau, Alaska) for final curing and acceptance testing. The Contractor shall core samples for thickness measurement as described in Subsection 501-6.5b(1) and deliver to the Engineer for measurement. The Contractor shall provide adequate facilities for

the initial curing of beams. The Contractor shall bear the cost of providing initial curing facilities and coring and filling operations, per paragraph 501-6.5b(1).

The samples will be transported while in the molds. The curing, except for the initial cure period, will be accomplished using the immersion in saturated lime water method. During the 24 hours after molding, the temperature immediately adjacent to the specimens must be maintained in the range of 60° to 80°F, and loss of moisture from the specimens must be prevented. The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather, or in heavyweight closed plastic bags, or using other suitable methods, provided the temperature and moisture loss requirements are met.

501-6.2 QUALITY ASSURANCE (QA) TESTING LABORATORY. Quality assurance testing organizations performing these acceptance tests will be accredited in accordance with ASTM C1077. The quality assurance laboratory accreditation must be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing must be listed on the lab accreditation. A copy of the laboratory's current accreditation and accredited test methods will be submitted to the Engineer prior to start of construction.

501-6.3 LOT SIZE. Concrete will be accepted for strength and thickness on a lot basis. A lot will consist of 1,000 cubic yards. Each lot will be divided into five equal sublots. Where three sublots are produced, they will constitute a lot. Where one or two sublots are produced, they will be incorporated into the previous or next lot. Where more than one plant is simultaneously producing concrete for the job, the lot sizes will apply separately for each plant.

501-6.4 PARTIAL LOTS. When operational conditions cause a lot to be terminated before the specified number of tests have been made for the lot or for overages or minor placements to be considered as partial lots, the following procedure will be used to adjust the lot size and the number of tests for the lot.

Where three sublots have been produced, they will constitute a lot. Where one or two sublots have been produced, they will be incorporated into the next lot or the previous lot and the total number of sublots will be used in the acceptance criteria calculation, that is, n=5 or n=6.

501-6.5 ACCEPTANCE SAMPLING AND TESTING.

a. Strength.

(1) Sampling. One sample will be taken for each sublot from the plastic concrete delivered to the job site. Sampling locations will be determined by the Engineer in accordance with random sampling procedures contained in ASTM D3665. The concrete will be sampled in accordance with ASTM C172. Beams shall be constructed using rigid steel forms.

(2) Test Specimens. The Contractor shall perform the casting and initial curing of specimens in accordance with ATM 506, and shall transport specimens to the Regional Materials Lab, as directed by the Engineer. Final curing will be performed at the Regional Materials Lab. Two (2) specimens will be made from each sample and slump, air content, unit weight, and temperature tests will be conducted for each set of strength specimens. Within 24 to 48 hours, the samples will be transported from the field to the laboratory while in the molds. Samples will be cured in saturated lime water.

The strength of each specimen will be determined in accordance with ASTM C78. The strength for each sublot will be computed by averaging the results of the two test specimens representing that sublot.

(3) Acceptance. Acceptance of pavement for strength will be determined by the Engineer in accordance with Subsection 501-6.6b(1). All individual strength tests within a lot will be checked for outliers in accordance with ASTM E178, at a significance level of 5%. Outliers

will be discarded and the remaining test values will be used to determine percentage of material within specification limits (PWL) for acceptance.

b. Pavement thickness.

(1) Sampling. One core will be taken by the Contractor for each sublot in the presence of the Engineer. Sampling locations will be determined by the Engineer in accordance with random sampling procedures contained in ASTM D3665. Areas, such as thickened edges, with planned variable thickness, will be excluded from sample locations.

Cores shall be a minimum 4 inch in diameter neatly cut with a core drill. The Contractor will furnish all tools, labor, and materials for cutting samples and filling the cored hole. Core holes will be filled by the Contractor with a non-shrink grout approved by the Engineer within one day after sampling.

(2) Testing. The thickness of the cores will be determined by the Engineer by the average caliper measurement in accordance with ASTM C174. Each core shall be photographed and the photograph included with the test report.

(3) Acceptance. Acceptance of pavement for thickness will be determined by the Engineer in accordance with Subsection 501-6.6.

c. Yield, Cement Content, and Air Content. Acceptance of pavement for yield, cement content, and air content will be determined by the Engineer according to Subsection 501-6.6b(8) at the testing rate of 1 test series per 200 cubic yards.

501-6.6 ACCEPTANCE CRITERIA.

a. General. Acceptance will be based on the following characteristics of the completed pavement discussed in Subsection 501-6.6b:

(1) Strength

(2) Thickness

(3) Grade

(4) Profilograph smoothness Not used.

(5) Adjustments for repairs

(6) Adjustments for grinding

(7) Dowel bar alignment

(8) Yield, cement content, and air content

Acceptance for strength, thickness, and grade, will be based on the criteria contained in accordance with Subsections 501-6.6b(1), 501-6.6b(2), and 501-6.6b(3), respectively.

Production quality must achieve 90 PWL or higher to receive full payment.

Strength and thickness will be evaluated for acceptance on a lot basis using the method of estimating PWL. Production quality must achieve 90 PWL or higher to receive full pavement. The PWL will be determined in accordance with procedures specified in Item GCP Section 110.

The lower specification tolerance limit (L) for strength and thickness will be as shown in Table 501-8:

TABLE 501-8. LOWER SPECIFICATION TOLERANCE LIMIT (L)

CRITERIA	LOWER TOLERANCE LIMIT
Strength	0.93 × strength specified in Subsection 501-3.3
Thickness	Lot Plan Thickness in inches, - 0.50 in

b. Acceptance criteria.

(1) Strength. If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with Subsection 501-8.1.

(**2) Thickness.** If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment for the lot will be determined in accordance with Subsection 501-8.1.

(3) Grade. The final finished surface of the pavement of the completed project will not vary from the gradeline elevations and cross-sections shown on the Plans by more than 1/2-inch vertically or 0.1 feet laterally. The documentation, stamped and signed by a licensed surveyor shall be in accordance with Subsection 501-5.3h. Payment for sublots that do not meet grade for over 25% of the sublot shall be reduced by 5% and not be more than 95%.

The Contractor shall pay the cost of surveying of the level runs that shall be performed by a licensed surveyor. The documentation shall include calculated differences between the planned and finished pavement elevations. The documentation stamped and signed by a licensed surveyor, shall be provided by the Contractor to the Engineer.

The Contractor shall provide to the Engineer at no additional cost, a daily pavement elevation summary presenting the previous day's pavement grades compared to the planned design elevations. The daily summary shall present the differences between the planned grades and the constructed grades at the corners of each numbered panel.

The work area shall be divided into sample lot areas not less than 1,000 square yards unless approved by the Engineer. The lot size for each sample area shall be all the measurements taken within that area.

Sample lines shall be located at the edges and middle of all slabs, at all joints, and at grade breaks. In areas covered by design grading plans the locations of grid sampling points shall match the points shown on the Plans. Additional sample lines shall be located at offsets as determined by the Engineer. The grid angles may be adjusted and grid intervals decreased at the Engineers discretion.

Measurements shall be made at the intersection of all sample lines and as directed by the Engineer.

All measurements shall be recorded in a bound note book. Records for each area's measurements shall include the location, date, air temperature, wind direction and approximate speed, cloud condition, precipitation, and operators' names. Records for each measurement shall include station, offset, and elevation to the nearest 0.01 foot.

(4) Profilograph roughness for QA Acceptance. Not used.

(5) Adjustments for repair. Sublots with spall repairs, crack repairs, or partial panel replacement, will be limited to no more than 95% payment.

(6) Adjustment for grinding. For sublots with grinding over 25% of a sublot, payment will be reduced 5%.

(7) Dowel Bar Alignment. Dowel bars and assemblies will be checked for position and alignment. The maximum permissible tolerance on dowel bar alignment in each plane, horizontal and vertical, shall not exceed 2% (or 1/4 inch per foot) of a dowel bar.

(8) Yield, Cement Content, and Air Content. Yield, cement content, and air content will be determined according to ATM 504 and ATM 505 and will be evaluated for acceptance based on approved mix design.

(c) Final Acceptance and Payment. Final acceptance and payment shall be determined based on a combination of the foregoing factors and such other tests and criteria as shall be necessary to determine before final acceptance and payment that the in-place concrete pavement meets all requirements set forth in this section and the Contract as a whole and represents concrete pavement of the highest quality as required herein. Such additional testing may include but is not limited to petrographic examination conducted pursuant to ASTM C856. Any one or any combination of the following factors in addition to the acceptance criteria set forth herein shall be sufficient cause for precluding final acceptance and rescission of prior interim acceptance:

Concrete which evidences aggregate loss with any risk of foreign object debris (FOD) shall be considered unacceptable. The tolerance for FOD generation shall be considered zero.

(1) Concrete which is not of a uniform consistency and/or presents segregation or does not demonstrate even distribution of coarse and fine aggregate particles shall be considered unacceptable.

(2) Concrete which is cracked, spalled, raveled or torn shall be considered unacceptable unless it is in the sole judgment of the Engineer repairable as set forth herein.

METHOD OF MEASUREMENT

501-7.1. Concrete pavement shall be measured by the number of cubic yards of either plain or reinforced pavement as specified in-place, completed and accepted.

BASIS OF PAYMENT

501-8.1 PAYMENT. Payment for concrete pavement meeting all acceptance criteria as specified in Subsection 501-6.6. Acceptance Criteria shall be based on results of strength, and thickness tests. Payment for acceptable lots of concrete pavement shall be adjusted in accordance with Subsection 501-8.1a for strength and thickness; 501-8.1b for repairs; 501-8.1c for grinding; and 501-8.1d for smoothness, subject to the limitation that:

The total project payment for concrete pavement shall not exceed 105 percent of the product of the contract unit price and the total number of cubic yards of concrete pavement used in the accepted work (See Note 1 under Table 501-9 Price Adjustment Schedule, below).

Payment shall be full compensation for all labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and on the drawings. All costs associated with steel reinforcement, dowel bars, and concrete surface sealer are subsidiary to the Portland cement concrete pavement item.

a. Basis of adjusted payment. The pay factor for each individual lot shall be calculated in accordance with the Price Adjustment Schedule in Table 501-9, below. A pay factor shall be calculated for both strength and thickness. The lot pay factor will be the lower of the two pay factors.

TABLE 501-9. PRICE ADJUSTMENT SCHEDULE[1]

Percentage of Materials Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)

Percentage of Materials Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96 – 100	106
90 – 95	PWL + 10
75 – 90	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject[2]

[1] Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment in excess of 100% shall be subject to the total project payment limitation specified in Subsection 501-8.1.

[2] The lot shall be removed and replaced unless, after receipt of FAA concurrence, the Owner and Contractor agree in writing that the lot will remain; the lot paid at 50% of the contract unit price; and the total project payment limitation reduced by the amount withheld for that lot.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in Subsection 501-8.1. Payment in excess of 100% for accepted lots of concrete pavement shall be used to offset payment for accepted lots of concrete pavement that achieve a lot pay factor less than 100%; except for rejected lots which remain in place and/or sublots with adjustments for repairs.

b. Adjusted payment for repairs. The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots which contain repairs in accordance with Subsection 501-4.19 on more than 20% of the slabs within the sublot. Payment factors greater than 100 percent for the strength and thickness cannot be used to offset adjustments for repairs.

c. Adjusted payment for grinding. The PWL lot pay factor shall be reduced by 5% and be no higher than 95% for sublots with grinding over 25% of a sublot.

d. Profilograph Roughness. Not used.

e. Payment. Payment will be made under:

Item P501.010.0000 Portland Cement Concrete Pavement - per cubic yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A615 Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

ASTM A706 Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

ASTM A1078 Epoxy-Coated Steel Dowels for Concrete Pavement

ASTM C29 Bulk Density (“Unit Weight”) and Voids in Aggregate

ASTM C33 Concrete Aggregates

ASTM C70 Surface Moisture in Fine Aggregate

ASTM C78 Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)

ASTM C88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C94	Ready-Mixed Concrete
ASTM C117	Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C123	Lightweight Particles in Aggregate
ASTM C131	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C138	Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C142	Clay Lumps and Friable Particles in Aggregates
ASTM C143	Slump of Hydraulic-Cement Concrete
ASTM C150	Portland Cement
ASTM C171	Sheet Materials for Curing Concrete
ASTM C172	Sampling Freshly Mixed Concrete
ASTM C173	Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C174	Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Air-Entraining Admixtures for Concrete
ASTM C309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C311	Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland Cement Concrete
ASTM C494	Chemical Admixtures for Concrete
ASTM C566	Total Evaporable Moisture Content of Aggregates by Drying
ASTM C618	Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C642	Density, Absorption, and Voids in Hardened Concrete
ASTM C685	Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C856	Petrographic examination of Hardened Aggregate
ASTM C881	Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C989	Slag Cement for Use in Concrete and Mortars
ASTM C1064	Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1077	Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1260	Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)

ASTM C1567 Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)

ASTM C1602 Mixing Water Used in the Production of Hydraulic Cement Concrete

ASTM D75 Sampling Aggregates

ASTM D1751 Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D1752 Preformed Sponge Rubber and Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

ASTM D2419 Sand Equivalent Value of Soils and Fine Aggregate

ASTM D3665 Random Sampling of Construction Materials

ASTM D4791 Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

ASTM E178 Dealing with Outlying Observations

ASTM E2133 Using a Rolling Inclinometer to Measure Longitudinal and Transverse Profiles of a Traveled Surface

American Concrete Institute (ACI)

ACI 309R Guide for Consolidation of Concrete

Federal Highway Administration (FHWA)

HIPERPAV 3, version 3.2

Portland Concrete Association (PCA)

PCA Design and Control of Concrete Mixtures, 16th Edition

American Association of State Highway and Transportation Officials

AASHTO T 259 Resistance of Concrete to Chloride Ion Penetration

Alaska Test Methods Manual

ATM 504 WAQTC FOP for AASHTO T 121 Density (Unit Weight), Yield & Air Content (Gravimetric) of Concrete*.

ATM 505 WAQTC FOP for AASHTO T 152 Air Content of Freshly Mixed Concrete by the Pressure Method*

ATM 506 WAQTC FOP for AASHTO T 23 Making and Curing Concrete Test Specimens in the Field*

ITEM P-560 POZZOLONIC CEMENT GROUT

DESCRIPTION

560-1.1 Drill holes through existing steel-reinforced portland cement concrete, provide and pump grout into voids observed beneath the slabs. Clean and patch the drilled holes.

MATERIALS

560-2.1 GENERAL. Use a grout mixture and a patch material with the following components proportioned by volume. Obtain test results and approvals as stated.

560-2.2 POZZOLONIC CEMENT GROUT. Provide pozzolonic-cement grout consisting of the following:

- **a.** Portland Cement, type I or II (ASTM C150 or AASHTO M 85)-one part.
- **b.** Fly-Ash Pozzolon (ASTM C618 or AASHTO M 295)-three parts.
- **c.** Potable Water as required for fluidity.

Measure fluidity by the Corps of Engineers flow cone method (CRD-C-611). (10-16 seconds efflux time) Additives as needed, such as plasticizers or water reducers.

Submit a 5-pound sample of the proposed grout mixture components. Proportion this total weight according to the proposed mix. Deliver sample materials for testing to the Department Regional Materials Lab. Deliver these materials between 8 am and 4 pm at least 4 weeks before scheduled field use. The test results must show that the components are compatible. If test results do not confirm that the components are compatible, a new submittal of components of a revised mix may be required. Fieldwork will be delayed during the time needed for testing revised mix designs. The required minimum compressive strength is 600 psi, as measured according to ASTM C109 (AASHTO T 106).

560-2.3 PORTLAND CEMENT PATCH. Use concrete pavement patch material that consists of the following:

- **a.** Portland Cement, type I or II -(ASTM C150 or AASHTO M 85)-one part.
- **b.** Sand-three parts.
- **c.** Potable Water-the minimum amount needed to moisten the dry components.

The required minimum compressive strength is 600 psi, as measured according to ASTM C109 (AASHTO T 106).

CONSTRUCTION REQUIREMENTS

560-3.1 The plan layout was developed from sounding the intact slabs. This layout may be modified in the field, depending on the voids verified or discovered during drilling.

Provide the machinery and labor to accomplish the following sequence. Drill holes using core bits through the existing steel-reinforced concrete pavement. Mix and inject under low pressure the pozzolonic-cement grout into any voids below the slab. Begin injection near the center of slabs and work outwards. Stop pumping if pressures rise or as grout appears in communicating holes. Provide mixing and pumping apparatus, including working gages, hoses and fittings such as nozzles and packers that are needed to complete the task. Place tightly fitted tapering wooden plugs flush with the top of concrete in each hole that is not immediately patched. To patch the slab, clean foreign material, including grout, from boreholes. Redrill to slightly larger diameter, any holes that exhibit spalled edges in the top 1-inch, and tamp them full of patching mixture. Finish patched holes smooth and flush.

METHOD OF MEASUREMENT

560-4.1 This item will not be measured for payment.

BASIS OF PAYMENT

560-5.1 Payment will be made at the contract lump sum price.

Payment will be made under:

Item P560.010.0000	Pozzolonic Cement Grout – per lump sum
Item P560.020.0000	Portland Cement Grout – per lump sum

MISCELLANEOUS ITEMS

ITEM P-602 EMULSIFIED ASPHALT PRIME COAT

DESCRIPTION

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

MATERIALS

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

TABLE 602-1. MATERIALS

Type and Grade	Specification	Application Temperatures \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	AASHTO M 208	70-160	0.27 to 0.53
CMS-2	AASHTO M 208	70-160	0.27 to 0.53
CMS-2s	\2\	70-160	0.22 to 0.44
Cutback Asphalt			
RC-30	ASTM D2028	80+	0.27 to 0.53
RC-70	ASTM D2028	120+	0.27 to 0.53
RC-250	ASTM D2028	165+	0.27 to 0.53
MC-30	ASTM D2027	80+	0.11 to 0.33

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

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

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

CONSTRUCTION METHODS

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

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

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

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

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

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

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

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

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

TESTING REQUIREMENTS

AASHTO T59	Test for Emulsified Asphalts

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

MATERIAL REQUIREMENTS

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

ITEM P-603 EMULSIFIED ASPHALT TACK COAT

DESCRIPTION

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

MATERIALS

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

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

TABLE 603-1. MATERIALS

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

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

TESTS ON EMULSION

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

TESTS ON RESIDUE

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

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

CONSTRUCTION METHODS

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

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

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

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

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

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

The distributor shall be equipped with a hand sprayer.

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

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

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

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

TABLE 603-2. APPLICATION RATE

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

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

References

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

ITEM P-605 JOINT SEALANTS FOR PAVEMENTS

DESCRIPTION

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

MATERIALS

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

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

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

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

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

CONSTRUCTION METHODS

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

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

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

b. Concrete saw. Provide a self-propelled power saw, with water-cooled diamond or abrasive saw blades, for cutting joints to the depths and widths specified.

c. Sandblasting equipment. The Contractor must demonstrate sandblasting equipment including the air compressor, hose, guide, and nozzle size, under job conditions, before approval in accordance with subsection 605-3.3. The Contractor shall demonstrate, in the presence of the Engineer, that the method cleans the joint and does not damage the joint.

d. Waterblasting equipment. The Contractor must demonstrate waterblasting equipment including the pumps, hose, guide, and nozzle size, under job conditions, before approval in accordance with subsection 605-3.3. The Contractor shall demonstrate, in the presence of the Engineer, that the method cleans the joint and does not damage the joint.

e. Hand tools. Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces. Hand tools should be carefully evaluated for potential spalling effects prior to approval for use.

f. Hot-poured sealing equipment. The unit applicators used for heating and installing ASTM D6690 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

g. Cold-applied, single-component sealing equipment. The equipment for installing ASTM D5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

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

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by tractor-mounted routing equipment, concrete saw, sandblasting (if permitted), waterblasting, or by wire brushing. Upon completion of cleaning, the joints shall be blown out with compressed air. The joint faces shall be surface dry when the seal is applied.

c. Backer Rod. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a backer rod or backup material to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backer rod or backup material is placed at the specified depth and is not stretched or twisted during installation.

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

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

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

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

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

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

TESTING REQUIREMENTS

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

MATERIAL REQUIREMENTS

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

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

DESCRIPTION

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

EQUIPMENT AND MATERIALS

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

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

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

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

TABLE 606-1. PROPERTY REQUIREMENTS

Physical or Electrical Property	Minimum	Maximum	ASTM Method
Tensile			
Portland Cement Concrete	1,000 psi		D638
Asphalt Concrete	500 psi		
Elongation			
Portland Cement Concrete	8% \1\		D638
Hot Mix Asphalt	50%		D638
Coef. of cub. exp., cm3/cm3/°C	0.00090	0.00120	D1168-08
Coef. of lin. exp., cm/cm/°C	0.00030	0.00040	D1168-08
Dielectric strength, short time test	350 volts/mil.		D149
Arc resistance	125 secs.		D495
Pull-off			
Adhesion to steel	1,000 psi		
Adhesion to Portland cement concrete	200 psi		
Adhesion to asphalt concrete	(no test available)		
Adhesion to aluminum	250 psi		

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

SAMPLING, INSPECTION, AND TEST PROCEDURES

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

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

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

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

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

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

606-3.6 ADHESION TO PORTLAND CEMENT CONCRETE.

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

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

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

TABLE 606-2. AGGREGATE FOR BOND TEST BLOCKS

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

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

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

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

Item P606.010.0000	Adhesive Compound – per pound

TESTING REQUIREMENTS

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

ITEM P-608-R RAPID CURE SEAL COAT

DESCRIPTION

608-R-1.1 This item shall consist of the application of an asphalt surface treatment composed of natural and refined asphalt materials, additives, and light oils, for taxiways and runways with the application of a suitable aggregate to maintain adequate surface friction; and airfield secondary and tertiary pavements including aprons, shoulders, overruns, roads, parking areas, and other general applications with or without aggregate applied as designated on the Plans.

The terms seal coat, asphalt sealer, and asphalt material are interchangeable throughout this specification. The term asphalt means natural and refined asphalt materials in this specification.

MATERIALS

608-R-2.1 AGGREGATE. The fine-aggregate material shall be a dry, clean, sound, durable, angular shaped, with highly textured surfaces, manufactured specialty abrasive aggregate. It shall have 100% fractured faces, SiO2 content of 55% minimum, CaO of 3% max, with a sand equivalent greater than 85 and a Mohs hardness of 7 or greater. Additional characteristics as outlined in Table 608-R-1. The Contractor shall submit specialty aggregate manufacturer's technical data and the specialty aggregate manufacturer's certification indicating that the specialty aggregate meets the requirements of the specification to the Engineer prior to start of construction. The aggregate must be approved for use by the Engineer and shall meet the gradation limits in Table 608-R-2 when tested in accordance with ASTM C136:

TABLE 608-R-1. AGGREGATE CHARACTERISTICS

Test	Standard	Range
Micro-Deval	ASTM D7428	15% max
Magnesium Sulfate Soundness	ASTM C88	2% max
Aggregate Angularity	ASTM C1252 – Test Method A	45% min
Moisture Content (%)	ASTM C566	2% max
Bulk Dry Specific Gravity	ASTM C128	2.6 – 3.0
Absorption (%)	ASTM D2216	3% max
Mohs Hardness	Mohs Scale	7 min

TABLE 608-R-2. AGGREGATE GRADATION REQUIREMENTS

Sieve	Percent Passing by Weight
No. 8	100
No. 14	98 - 100
No. 16	85 - 100
No. 30	15- 45
No. 50	0 – 8
No. 70	0 - 2

The Contractor shall provide a certification of analysis (COA) showing analysis and properties of the material delivered for use on the project. The Contractor's certification may be subject to verification by testing the material delivered for use on the project.

608-R-2.2 ASPHALT MATERIAL. The asphalt material base residue shall contain not less than 40% gilsonite, or uintaite, and shall not contain any tall oil pitch or coal tar material. The material shall be

compatible with asphalt pavement, and have a 5-year minimum proven aviation performance record at airports with similar climatic conditions.

The solvent-based rapid cure material shall meet the following properties:

Kinematic Viscosity at 140°F, ASTM D4402, cSt.	10-30
Percent Residue by Distillation, ASTM D402, or Evaporation	30-45%

The residue from distillation shall have the following properties:

Penetration at 77°F, ASTM D5, dmm	2-12
Softening Point, ASTM D36	180-200
Solubility in 1,1,1 Trichloroethylene, ASTM D2042	99% min.

The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the asphalt sealer delivered to the project. If the asphalt sealer is diluted at other than the manufacturer's facility, the Contractor shall provide a supplemental COA from an independent laboratory verifying the asphalt sealer properties. The COA shall be provided to and approved by the Engineer before the asphalt material is applied. The furnishing of the vendor's certified test report for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

The asphalt sealing material must be applied in an undiluted form. The material may be stored at ambient temperature for long periods of time if necessary. Storage will follow industry standard recommendations due to the flammability of the material; avoid sparks and open flames to come into contact with the material or any gasses that might be escaping the storage vessel.

Contractor shall provide a list of airport pavement projects, exposed to similar climate conditions, where this product has been successfully applied within at least 5 years of the project.

608-R-2.3 SEAL COAT WITH AGGREGATE. The Contractor shall submit friction test data from at least two (2) airport projects identified under subsection 608-R-2.2. The test data must be from the same project and include technical details on application rates, aggregate rates, and point of contact at the airport to confirm use and success of sealer with aggregate.

Friction test data in accordance with the Federal Aviation Administration (FAA) Advisory Circular *(AC) 150/5320-12, Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces*, at 40 or 60 miles per hour (mph) wet, must include as a minimum; the friction value prior to sealant application; two values, between 24 and 96 hours after application, with a minimum of 24 hours between tests; and one value between 180 days and 360 days after the application. The results of the tests between 24 and 96 hours shall indicate friction is increasing at a rate to obtain similar friction value of the pavement surface prior to application, and the long-term test shall indicate no apparent adverse effect with time relative to friction values and existing pavement surface.

Seal coat material submittal without required friction performance will not be approved. Friction tests performed on this project cannot be used as a substitute of this requirement.

COMPOSITION AND APPLICATION RATE

608-R-3.1 APPLICATION RATE. The approximate amounts of materials per square yard (square meter) for the asphalt surface treatment shall be as provided in the table for the treatment area(s) at the specified rate(s) as noted on the plans. The actual application rates will vary within the range specified to suit field conditions and will be recommended by the manufacturer's representative for control strip evaluations, and approved by the Engineer from the test area/sections evaluation.

TABLE 608-R-3. APPLICATION RATE

Dilution Rate	Quantity of Sealer gal/yd^2	Quantity of Aggregate lb/yd^2

N/A	0.08-0.15	0.40-0.50

608-R-3.2 CONTROL AREAS AND CONTROL STRIPS. A qualified manufacturer's representative shall be present in the field to assist the Contractor in applying control areas and/or control strips to determine the appropriate application rate of both sealer and aggregate to be evaluated and approved by the Engineer.

A test area and/or section shall be applied for each differing asphalt pavement surface identified in the project. The control area(s) and/or control strip(s) shall be used to determine the material application rate(s) of both sealer and aggregate prior to full production. The same equipment and method of operation shall be utilized on the control area(s) and/or control strip(s) as will be utilized on the remainder of the work.

a. For Taxiway, Taxilane and Apron Surfaces. Prior to full application, the Contractor shall place test areas at varying application rates as recommended by the Contractor's manufacturer's representative to determine appropriate application rate(s). The test areas will be located on representative section(s) of the pavement to receive the asphalt surface treatment designated by the Engineer.

b. For Runway and High-Speed Exit Taxiway Surfaces. Prior to full application, the Contractor shall place a series of control strips a minimum of 300 feet long by 12 feet wide, or width of anticipated application, whichever is greater, at varying application rates as recommended by the manufacturer's representative and acceptable to the Engineer to determine appropriate application rate(s). The control strips should be separated by a minimum of 200 feet between control strips. The area to be tested will be located on a representative section of the pavement to receive the asphalt surface treatment designated by the Engineer. The control strips should be placed under similar field conditions as anticipated for the actual application. Before beginning the control strip(s), the skid resistance of the existing pavement shall be determined for each control strip with a continuous friction measuring equipment (CFME). The skid resistance of existing pavement can be immediately adjacent to the control strip or at the same location as the control strip if testing prior to application.

The Contractor may begin testing the skid resistance of runway and high-speed exit taxiway control strips after application of the asphalt surface treatment has fully cured. If seal coat is to be applied when atmospheric and pavement surface temperatures are below 55°F and rising, consult with the manufacturer's representative regarding time for seal coat to fully cure. Aircraft shall not be permitted on the runway or high-speed exit taxiway control strips until such time as the Contractor validates that its surface friction meets the maintenance planning friction levels in AC 150/5320-12, Table 3-2 when tested at speeds of 40 and 60 mph wet with approved CFME.

Prior to full application on runway and high speed exit taxiway surfaces, submit to the Engineer written documentation of skid resistance of the control area/control strip measured according to AC 150/5320-12.

c. Control Strip. If the control strip should prove to be unsatisfactory, necessary adjustments to the application rate, placement operations, and equipment shall be made. Additional control strips shall be placed and additional skid resistance tests performed and evaluated. Full production shall not begin without the Engineer's approval of an appropriate application rate(s). Acceptable control strips shall be paid for in accordance with subsection 608-R-8.1.

CONSTRUCTION METHODS

608-R-4.1 WORKER SAFETY. The Contractor shall obtain a Safety Data Sheet (SDS) for both the asphalt sealer product and aggregate and require workmen to follow the manufacturer's recommended safety precautions. All additional industry standard safety precautions regarding the storage and applications of solvent based asphalts should be understood and followed by the Contractor.

608-R-4.2 WEATHER LIMITATIONS. The asphalt sealer shall be applied only when the existing pavement surface is dry and when the weather is not foggy, rainy, or when the wind velocity will prevent the uniform application of the material. No material shall be applied when dust or aggregate is blowing or when rain is anticipated within 4 hours of application completion. The atmospheric temperature and the pavement surface temperature shall both be at, or above 40°F and rising. If seal coat is to be applied when atmospheric and pavement surface temperatures are below 55°F and rising, consult with the manufacturer's representative regarding time for seal coat to fully cure. The sealer shall not be applied when pavement temperatures are expected to exceed 160°F within the subsequent 72 hours, if traffic will be opened on pavement within those 72 hours. During application, account for wind drift. Cover existing buildings, structures, runway edge lights, taxiway edge lights, informational signs, retro-reflective marking and in-pavement duct markers as necessary to protect against overspray before applying the sealer. Should sealer get on any light or marker fixture, promptly clean the fixture. If cleaning is not satisfactory to the Engineer, the Contractor shall replace any light, sign or marker with equivalent equipment at no cost to the Department.

Contractor shall submit an overspray shielding plan to the Engineer for approval prior to beginning surface treatment. Shielding shall be used when working near parked aircraft, in windy conditions, or as directed by the Engineer.

608-R-4.3 EQUIPMENT AND TOOLS. The Contractor shall furnish all equipment, tools, and machinery necessary for the performance of the work.

a. Pressure Distributor. The sealer shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the sealer. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under 8 mph or 700 feet per minute (fpm).

The Contractor will provide verification of truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate for application per nozzle manufacturer, spray-bar height and pressure and pump speed appropriate for the viscosity and temperature of sealer material, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use. The distributor truck shall be equipped with a 12-foot, minimum, spray bar with individual nozzle control. The distributor truck shall be capable of specific application rates in the range of 0.05 to 0.25 gallons per square yard.

These rates shall be computer-controlled rather than mechanical. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the sealer, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy.

The distributor truck shall effectively mix the material prior to application.

The distributor shall be equipped with a hand sprayer to spray the sealer in areas not accessible to the distributor truck.

b. Aggregate Spreader. The asphalt distributor truck will be equipped with an aggregate spreader mounted to the distributor truck that can apply aggregate to the sealer in a single pass operation without driving through wet sealer. The aggregate spreader shall be equipped with a variable

control system capable of uniformly distributing the aggregate at the specified rate at varying application widths and speeds.

The aggregate spreader must be adjusted to produce an even and accurate application of specified aggregate. Prior to any seal coat application, the aggregate spreader will be calibrated onsite to ensure acceptable uniformity of spread. The Engineer will observe the calibration and verify the results. The aggregate spreader will be re-calibrated each time the aggregate rate is changed either during the application of test strips or production. The Contractor may consult the seal coat manufacturer representative for procedure and guidance. The aggregate spreader shall have a minimum hopper capacity of 3,000 pounds of aggregate. Push-type hand spreaders will be allowed for use around lights, signs and other obstructions, if necessary.

c. **Power Broom/Blower.** A power broom and/or blower shall be provided for removing loose material from the surface to be treated.

d. **Equipment Calibration.** Asphalt distributors must be calibrated within the same construction season in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the Engineer.

608-R-4.4 PREPARATION OF ASPHALT PAVEMENT SURFACES. Clean pavement surface immediately prior to placing the seal coat so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film. Remove oil or grease from the asphalt pavement by scrubbing with a detergent, washing thoroughly with clean water, and treating these areas with the oil spot primer. Patch or prepare asphalt pavement surfaces, and remove markings for seal coat as follows:

a. **Patching and Repair.** Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new asphalt pavement similar to that of the existing pavement. Materials and methods of construction shall comply with the applicable sections of these Specifications.

b. **Crack Sealing and Preparation.** Remove all vegetation and debris from cracks to a minimum depth of 1-inch. If extensive vegetation exists, treat the specific area with a concentrated solution of a water-based herbicide approved by the Engineer. Fill all cracks wider than 1/4-inch with a crack sealant meeting ASTM D6690, Type IV. The crack sealant, preparation, and application shall be compatible with the surface treatment/overlay to be used. To minimize contamination of the asphalt with the crack sealant, underfill the crack sealant a minimum of 1/8-inch, not to exceed 1/4-inch. Any excess joint or crack sealant shall be removed from the pavement surface.

c. **Painted Marking Removal.** All painted stripes or markings identified on the Plans for removal from the surface to be treated shall be removed according to subsection P-620-3.3.

d. **New Asphalt Pavement Surfaces.** Allow new asphalt pavement surfaces to cure so that there is no concentration of oils on the surface. A period of at least 30 days at 70°F daytime temperatures should elapse between the placement of a hot mixed asphalt concrete surface course and the application of the surface treatment.

Perform a water-break-free test to confirm that the surface oils have degraded and dissipated. Cast approximately one gallon of clean water out over the surface. The water should sheet out and wet the surface uniformly without crawling or showing oil rings. If signs of crawling or oil rings are apparent on the pavement surface, additional time must be allowed for additional curing and retesting of the pavement surface prior to treatment.

Existing construction or transverse joints shall receive an initial application of seal coat 18 inches wide, centered on the joint.

608-R-4.5 APPLICATION OF ASPHALT SEALER. The asphalt sealer shall be applied using a pressure distributor upon the properly prepared, clean and dry surface at the application rate recommended by the manufacturer's representative and approved by the Engineer from the test area/sections evaluation for each designated treatment area. Recommended material temperature for application is 70°F to 90°F, but depending on the application equipment used, good material dispersion and pavement coverage may be achieved at lower material temperatures. The material should not be heated above 100°F.

Pavement surfaces which have excessive runoff of seal coat due to excessive amount of material being applied or excessive surface grade shall be treated in two or more applications, if feasible, to the specified application rate at no additional cost to the Owner. Each additional application shall be performed after the prior application of material has penetrated into the pavement.

If low spots and depressions greater than 1/2-inch in depth in the pavement surface cause ponding or puddling of the applied materials, the pavement surface shall be lightly broomed with a broom or brush type squeegee. Brooming shall continue until the pavement surface is free of any pools of excess material. Ponding and/or puddling shall not cause excessive pavement tackiness and/or additional distress.

During all applications, the surfaces of adjacent structures shall be protected to prevent their being spattered or marred. Asphalt materials shall not be discharged into borrow pits or gutters or on the airport area.

608-R-4.6 APPLICATION OF AGGREGATE MATERIAL. Immediately following the application of the asphalt sealer, aggregate at the rate recommended by the manufacturer's representative and approved by the Engineer from the test area/sections evaluation for each designated application area, shall be spread uniformly over the asphalt sealer in a single-pass operation simultaneous with the sealer application. The sealer material and aggregate shall be applied simultaneously in a single pass operation, so as to not drive through the applied fresh sealer. The aggregate shall be spread to the same width of application as the asphalt material and shall not be applied in such thickness as to cause blanketing.

Sprinkling of additional aggregate material, and spraying additional asphalt material over areas that show up having insufficient cover or bitumen, shall be done by hand whenever necessary. In areas where hand work is necessitated, the aggregate shall be applied before the sealant begins to break.

Minimize aggregate from being broadcast and accumulating on the untreated pavement adjacent to an application pass. Prior to the next application pass, the Contractor shall clean areas of excess or loose aggregate and remove from project site.

QUALITY CONTROL (QC)

608-R-5.1 MANUFACTURER'S REPRESENTATION. The manufacturer's representative knowledgeable of the material, procedures, and equipment described in the specification is responsible to assist the Contractor and Engineer in determining the appropriate application rates of the emulsion and aggregate, as well as recommendations for proper preparation and start-up of seal coat application. Documentation of the manufacturer representative's experience and knowledge for applying the seal coat product shall be furnished to the Engineer a minimum of 10 work days prior to placement of the control strips. The cost of the manufacturer's representative shall be included in the Contractor's bid price.

608-R-5.2 CONTRACTOR'S QUALIFICATIONS. The Contractor shall provide the Engineer with the seal coat Contractor's qualifications for applicators, personnel and equipment. The Contractor shall also provide documentation that the seal coat Contractor is qualified to apply the seal coat and has made at least 3 applications similar to this project in the past 2 years.

MATERIAL ACCEPTANCE

608-R-6.1 APPLICATION RATE. The rate of application of the asphalt emulsion shall be verified at least twice per day.

608-R-6.2 FRICTION TESTS. Friction tests in accordance with AC 150/5320-12 shall be accomplished on all runway and high-speed taxiways that have received a seal coat. Friction testing shall not be performed until seal coat is fully cured. Each test includes performing friction tests at 40 mph and 60 mph both wet, 15 feet to each side of runway centerline. The Contractor shall coordinate testing with the Engineer and provide the Engineer a written report of friction test results. The Engineer shall be present for testing.

METHOD OF MEASUREMENT

608-R-7.1 The quantity of asphalt surface treatment shall be measured according to GCP Section 90, and by the square yards of material applied in accordance with the Plans and specifications and accepted by the Engineer.

The Contractor must furnish the Engineer with the certified weigh bills when materials are received for the asphalt material used under this contract. The Contractor must not remove material from the tank car or storage tank until initial amounts and temperature measurements have been verified.

Initial application of seal coat to longitudinal and transverse joints shall be subsidiary to Pay Item P608.210.0000 Asphalt Surface Treatment, Rapid Cure.

BASIS OF PAYMENT

608-R-8.1 Payment shall be made at the contract unit price per square yard for the asphalt surface treatment applied and accepted by the Engineer. This price shall be full compensation for all surface preparation, furnishing all materials, delivery and application of these materials, for all labor, equipment, tools, and incidentals necessary to complete the item, including the friction testing and all work required to meet AC 150/5320-12, initial joint application, and any costs associated with furnishing a qualified manufacturer's representative to assist with control strips.

Payment will be made under:

Item P608.210.0000	Asphalt Surface Treatment, Rapid Cure – per square yard

TESTING REQUIREMENTS

ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C128	Standard Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM C1252	Standard Test Methods for Uncompacted Void Content of Fine Aggregate
ASTM D5	Standard Test Method for Penetration of Asphalt Materials
ASTM D36	Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)

ASTM D402	Standard Test Method for Distillation of Cutback Asphalt
ASTM D2042	Standard Test Method for Solubility of Asphalt Materials in Trichloroethylene
ASTM D2216	Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D2995	Standard Practice for Estimating Application Rate of Bituminous Distributors
ASTM D4402	Standard Test Method for Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer
ASTM D6690	Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM D7428	Standard Test Method for Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

ITEM P-610 CONCRETE FOR MISCELLANEOUS STRUCTURES

DESCRIPTION

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

MATERIALS

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

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

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

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

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

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

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

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

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

610-2.5 CEMENTITIOUS MATERIALS.

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

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

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

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

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

a. **Air-entraining admixtures**. Air-entraining admixtures shall meet the requirements of AASHTO M 154 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. **Water-reducing admixtures**. Water-reducing admixture shall meet the requirements of AASHTO M 194, Type A, B, or D. AASHTO M 194, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used. Water-reducing admixtures shall be added at the mixer separately from air-entraining admixtures according to the manufacturer's printed instructions.

c. **Other chemical admixtures**. The use of set retarding, and set-accelerating admixtures shall be approved by the Engineer. Retarding shall meet the requirements of AASHTO M 194, Type A, B, or D and set-accelerating shall meet the requirements of AASHTO M 194, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

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

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

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

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

TABLE 610-1. MATERIALS FOR CURING CONCRETE

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

CONSTRUCTION METHODS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ACCEPTANCE TESTING

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

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

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

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

METHOD OF MEASUREMENT

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

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

BASIS OF PAYMENT

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

Payment will be made under:

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

References

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

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

ITEM P-620 RUNWAY AND TAXIWAY MARKING

DESCRIPTION

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

MATERIALS

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

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

TABLE 620-1. MARKING MATERIALS

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

[1] See subsection 620-2.2a
[2] See subsection 620-2.2b

a. Paint

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

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

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

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

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

Glass beads shall comply with Table 620-1.

CONSTRUCTION METHODS

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

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

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

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

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

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

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

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

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

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

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

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

TABLE 620-2. MARKING DIMENSIONS AND SPACING TOLERANCE

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

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

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

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

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

620-3.6 NOT USED.

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

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

TABLE 620-3. MINIMUM RETRO-REFLECTANCE VALUES

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

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

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

METHOD OF MEASUREMENT

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

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

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

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

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

BASIS OF PAYMENT

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

Payment will be made under:

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

TESTING REQUIREMENTS

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

MATERIAL REQUIREMENTS

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

Advisory Circular 150/5320-12	Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces

ITEM P-621 SAW-CUT GROOVES

DESCRIPTION

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

CONSTRUCTION METHODS

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

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

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

a. Alignment tolerance. Plus or minus 1-1/2 inches in alignment for 75 feet.

b. Groove tolerance.

(1) Depth. The standard depth is 1/4-inch. At least 90 percent of the grooves must be at least 3/16 inch, at least 60 percent of the grooves must be at least 1/4 inch, and not more than 10 percent of the grooves may exceed 5/16-inch.

(2) Width. The standard width is 1/4-inch. At least 90 percent of the grooves must be at least 3/16-inch, at least 60 percent of the grooves must be at least 1/4-inch, and not more than 10 percent of the grooves may exceed 5/16-inch.

c. Center-to-center spacing. The standard spacing is 1-1/2 inches.

(1) Minimum spacing 1-3/8 inches.

(2) Maximum spacing 1-1/2 inches.

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

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

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

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

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

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

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

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

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

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

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

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

ACCEPTANCE

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

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

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

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

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

TABLE 621-1. DEFINITION OF MEASUREMENT ZONES

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

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

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

ITEM P-633 SAND SEAL

DESCRIPTION

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

MATERIALS

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

TABLE 633-1

REQUIREMENTS FOR GRADING OF SAND

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

Manufacturer certification will be used for acceptance.

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

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

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

The residue from distillation shall have the following properties:

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

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

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

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

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

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

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

Saybolt furol viscosity at 77 degrees Fahrenheit (25°C), ASTM D7496, seconds..... 10-50
Residue by distillation, ASTM D6997, or evaporation, ASTM D6934, % 28-42
Sieve test, ASTM D6933, % ..... . 0.1 max
Pumping stability test, ... pass
Hot water temperature at or above 100 degrees.

The residue from distillation shall have the following properties:

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

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

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

CONSTRUCTION REQUIREMENTS

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

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

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

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

a. The distributor equipment shall include the following:

1) Computerized control of liquid asphalt spread rates to automatically deliver specified delivery rates and capable of changing rates when so directed.

2) Computer monitoring of spread rate, truck speed and distance traveled.

3) A thermometer for measuring temperatures of the tank's contents, readily visible from outside the truck cab.

4) Each nozzle in the spray bar shall be turned to make the constant angle with the longitudinal axis of the spray bar that is recommended by the manufacturer of the distributor. All nozzles in the spray bar shall be of the same manufacture, type and size. The spray bar height shall provide triple overlap of the asphalt being applied by the spray nozzles.

b. Before the application of asphalt, the Contractor shall ensure that the distributor meets the following requirements:

1) The spray bar can be maintained at a constant height throughout the entire operation.

2) Spray bar nozzles are clean and in good working condition and sized for the application rate.

3) The spray bar has been provided with a positive shutoff to prevent dribbling.

4) The distributor is capable of maintaining a uniform speed.

c. Calibration and adjustment requirements will include:

1) The distributor will be inspected by the Engineer prior to the commencement of the operation. Any adjustments, maintenance and other requirements shall be performed prior to being used.

2) The distributor shall be calibrated in accordance with the manufacturer's recommendations. The Engineer may require the Contractor to prove the accuracy of the distributor prior to commencing the asphalt application and any time thereafter if deemed necessary by the Engineer. Any change in settings on the distributor after calibrating will require that the distributor be recalibrated.

3) Should any of the nozzles on the spray bar fail to provide a constant, uniform flow during the application of asphalt material, the distributor shall immediately cease application of the asphalt material. The distributor shall not be allowed to resume applying asphalt material until all of the nozzles are in good working order. Nozzle adjustments and/or repairs must be approved by the Engineer.

4) The distributor truck shall be equipped with a 12-foot (3.6 m), minimum length, spreader bar with individual nozzle control. The distributor shall be equipped to hand spray areas identified by the Engineer.

d. For sand applications:

1) A sander shall be mounted directly on the back of the asphalt distributor

2) The sander shall be equipped with a variable control system to ensure reasonably even distribution of the sand at varying application widths and speeds. The sander controls shall be located in the cab of the distributor.

3) The sanding unit must have the ability to apply sand to the sealant without driving through the wet sealant.

4) The sander must have variable control mechanisms to regulate sand distribution, and should have a minimum hopper capacity of at least 3,000 pounds of sand.

5) Calibrate the sander prior to the start of the sand sealing.

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

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

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

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

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

Payment will be made under:

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

TESTING REQUIREMENTS

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

ITEM P-634 LONGITUDINAL JOINT REPAIR

DESCRIPTION

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

MATERIALS

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

CONSTRUCTION REQUIREMENTS

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT.

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

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

Payment will be made under:

Item P634.010.0000 Longitudinal Joint Repair – per linear foot

ITEM P-635 PAVEMENT CRACK FILLING

DESCRIPTION

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

MATERIALS

635-2.1 CRACK FILLERS.

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

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

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

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

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

635-2.2 PREPARATORY MATERIALS.

a. Backer Rope. Provide rope material that is strong, non-raveling, and similar to upholstery cord. Use rope with a diameter that is approximately 1/8-inch larger than the width of the crack.

b. Tack Coat. Provide tack coat that meets the requirements of section P-603.

CONSTRUCTION REQUIREMENTS

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

635-3.2 PREPARATION.

a. Routing. Rout out all cracks selected by the Engineer that are to be filled with sealant. Rout out cracks to a nominal 3/4-inch width and to a nominal depth of 1-1/2 inch. Avoid routing to a width greater than specified. Avoid any damage or raveling of the adjacent pavement surface.

b. Cleaning. After routing and immediately prior to filling, use compressed air to remove any debris and moisture from cracks.

c. **Tack Coat.** For cracks to be filled with hot mix asphalt, apply tack coat after cleaning and immediately prior to filling. Apply in accordance with section P-603.

d. **Backer Rope.** Use of backer rope is optional with the Contractor. For cracks to be filled with crack sealant, place the rope after cleaning and prior to filling. Place the rope deep enough to leave approximately 1-1/4 inch from the surface of the pavement to the top of the rope.

635-3.3 FILLING.

a. **Sealant.** Heat crack sealant material in a double wall oil bath heater equipped with an agitator, a temperature controller, and a recirculating pump. Place sealant in the crack to within 1/4-inch of the surface of the pavement. Remove any material that overfills to the surface of the pavement. Heat and apply crack sealant material in accordance with the manufacturer's instructions.

b. **Hot Mix Asphalt.** Fill cracks with hot mix asphalt in accordance with section P-401.

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

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

ITEM P-636 HIGH FLOAT SURFACE TREATMENT

DESCRIPTION

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

MATERIALS

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

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

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

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

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

a. Gradation testing:

(1) Acceptance Testing: Determine the gradation by AASHTO T 27. Testing will be done upon notification by the Contractor that the crusher is ready for production.

(2) Assurance Testing: Determine the gradation by AASHTO T 27 and AASHTO T 88 except dry the material for the T 88 test within a temperature range of 90° to 100° F.

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

TABLE 636-1

REQUIREMENTS FOR GRADING OF COVER AGGREGATE

FOR HIGH FLOAT SURFACE TREATMENT

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

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

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

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

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

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

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

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

CONSTRUCTION REQUIREMENTS

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

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

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

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

636-3.3 EQUIPMENT.

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

Provide distributor equipment that meets the following:

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

(2) A thermometer for measuring temperatures of the tank's contents, readily visible from outside the truck cab.

(3) Each nozzle in the spray bar is turned to make the constant angle with the longitudinal axis of the spray bar that is recommended by the manufacturer of the distributor. All nozzles in the spray bar are of the same manufacture, type and size. The spray bar height provides triple overlap of the asphalt emulsion being applied by the spray nozzles.

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

(4) The spray bar can be maintained at a constant height throughout the entire operation.

(5) Spray bar nozzles are clean and in good working condition.

(6) The spray bar is provided with a positive shutoff to prevent dribbling.

(7) The distributor is capable of maintaining a uniform speed.

Calibration and adjustment requirements include:

(8) The distributor will be inspected by the Engineer prior to the commencement of the operation. Perform any adjustments, maintenance and other requirements prior to use.

(9) Calibrate the distributor in accordance with the manufacturer's recommendations. The Engineer may require the Contractor to prove the accuracy of the distributor prior to commencing the asphalt application and any time thereafter if deemed necessary by the Engineer. Any change in settings on the distributor after calibrating will require that the distributor be recalibrated.

(10) Should any of the nozzles on the spray bar fail to provide a constant, uniform flow during the application of asphalt material, immediately cease application of the asphalt material. Do not allow the distributor to resume application of the asphalt material until all of the nozzles are in good working order. Nozzle adjustments and/or repairs must be approved by the Engineer.

b. Aggregate Spreader. Provide an aggregate spreader that is capable of evenly applying cover aggregate material to the specified roadway, runway, or taxiway width in a maximum of two passes. Provide an aggregate spreader that is computer controlled to automatically maintain the specified delivery rate of cover aggregate regardless of variations in machine speed. Provide a spreader with sufficient size feed system to maintain cover aggregate in the spread hopper at all times. Provide a spread hopper that is equipped with augers or other approved equipment to prevent segregation of the cover aggregate materials.

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

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

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

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

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

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

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

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

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

Do not spread0 asphalt material more than 6 inches wider then the width covered by the cover aggregate from the spreader. Do not allow operations to proceed in a manner that allows asphalt material to chill, set up, dry, or otherwise impair retention of the cover aggregate.

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

Apply asphalt material at temperatures between 15OºF and 180ºF.

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

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

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

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

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

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

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

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

METHOD OF MEASUREMENT

636-4.1 See Section 90.

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

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

BASIS OF PAYMENT

636-5.1 Water for emulsified asphalt is subsidiary.

Payment will be made under:

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

TESTING REQUIREMENTS

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

MATERIAL REQUIREMENTS

AASHTO M 140	Emulsified Asphalt

ITEM P-640 SEGMENTED CIRCLE

DESCRIPTION

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

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

MATERIALS

640-2.1 BARREL-TYPE.

a. Barrels. Cylindrical, steel, 55-gallon, undamaged, contaminant-free, and rust-free.

b. Primer Paint. Zinc Oxide, raw linseed oil, and alkyd primer, meeting SSPC-Paint 25.

c. Finish Paint. Aviation Gloss Orange, No. 12197, meeting Federal Standard 595.

640-2.2 PANEL-TYPE.

a. Panels. Sheet aluminum with a reflective covering and meeting the following requirements:

(1) Use 0.080-inch thick, alloy 6061-T6, 5052-H36, 5052-H38, or recycled aluminum meeting alloy 3105, as specified in ASTM B209.

(2) Make each panel a continuous sheet for the length and width shown on the Plans. Furnish panels that are cut to size and shape and free of buckles, warp, dents, cockles, burrs and any other defects resulting from fabrication. Complete all possible fabrication including shearing, cutting and hole punching prior to preparing the base metal for painting and application of reflective sheeting.

(3) Treat the aluminum base metal sheets with coating for aluminum conforming to the requirements of ASTM B921, Class 2. After cleaning and coating operations, protect the panels at all times from contact or exposure to greases, oils, dust or other contaminants.

(4) Prepare both sides of each panel and cover with orange retroreflective sheeting, meeting the requirements of ASTM D4956, Type IV, as recommended by the manufacturer in the configuration shown on the plans.

b. Frames. Perforated, galvanized, square steel tubing with the dimensions shown on the Plans and meeting the following requirements:

(1) Fabricate square tube with cold-rolled carbon steel sheets, 12 gage, commercial quality, meeting ASTM A653, coating designation G 90. Form tubes, roll to size, and continuously weld for the entire length.

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

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

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

c. Hardware and Fasteners. Hardware and fasteners shall meet the following requirements:

(1) Gusset and splice plates shall be 1/4-inch thick steel, ASTM A36, galvanized.

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

CONSTRUCTION METHODS

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

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

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

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

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

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

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

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

Payment will be made under:

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

MATERIAL REQUIREMENTS

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

ITEM P-641 EROSION, SEDIMENT, AND POLLUTION CONTROL

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

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

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

Temporary control measures shall be designed, installed and maintained:

a. outside of safety areas of active runways and taxiways, and

b. to minimize the creation of wildlife attractants that have the potential to attract hazardous wildlife on or near airports.

DEFINITIONS AND TERMS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

641-1.3 PLAN AND PERMIT SUBMITTALS.

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

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

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

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

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

b. Hazardous Material Control Plan. The HMCP Template can be found at the following webpage: http://www.dot.state.ak.us/stwddes/dcsconst/pop_constforms.shtml. Submit an electronic copy and three hard copies of the HMCP, as an appendix to the SWPPP, to the Engineer for approval. The HMCP submittal and review timeline, and signature requirements are the same as the SWPPP.

c. Spill Prevention, Control and Countermeasure Plan. When a SPCC Plan is required under Subsection 641-2.3, submit an electronic copy and three signed hard copies of the SPCC Plan to the Engineer. Deliver these documents to the Engineer at least 21 days before beginning Construction Activity. The Department reserves the right to review the SPCC Plan and require modifications.

d. CGP Coverage. The Contractor is responsible for permitting of Contractor and subcontractor Construction Activities related to the Project. Do not use the SWPPP for Construction Activities

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

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

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

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

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

e. **Ending CGP Coverage**. Submit an eNOT to DEC within 30 days after the Engineer has determined the conditions listed in Subsection 641-3.1.f have been met. Submit a copy of the signed eNOT and DEC's acknowledgement letter to the Department within three days of filing the eNOT or receiving a written response.

f. **DEC SWPPP Review**. When CGP Part 2.1.3, requires DEC SWPPP review:

(1) Transmit a copy of the Department-approved SWPPP to DEC using delivery receipt confirmation;

(2) Transmit a copy of the delivery receipt confirmation to the Engineer within seven (7) days of receiving the confirmation; and

(3) Retain a copy of delivery receipt confirmation in the SWPPP.

g. **Local Government SWPPP Review**. When local government or the CGP Part 2.1.4, requires local government review:

(1) Transmit a copy of the Department-approved SWPPP and other information as required to local government, with the required fee. Use delivery receipt confirmation;

(2) Transmit a copy of the delivery receipt confirmation to the Engineer within seven days of receiving the confirmation;

(3) Transmit a copy of any comments by the local government to the Engineer within seven days of receipt;

(4) Amend the SWPPP as necessary to address local government comments and transmit SWPPP Amendments to the Engineer within seven days of receipt of the comments;

(5) Include a copy of local government SWPPP review letter in the SWPPP; and

(6) File a notification with local government that the project is ending.

h. **Modifying Contractor's eNOI**. When required by the CGP Part 2.7, modify your eNOI to update or correct information within 30 calendar days of the change. Reasons for modification include a change in start or end dates, change in Owner/Operator address and contact information, change in

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

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

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

a. The SWPPP Preparer:

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

(a) Current certification as a Certified Professional in Erosion and Sediment Control (CPESC);

(b) Current certification as AK-CESCL, and at least two years' experience in erosion and sediment control, as a SWPPP Manager or SWPPP writer, or equivalent. Provide documentation including project names, project timelines, and work responsibilities demonstrating the experience requirement; or

(c) Professional Engineer registered in the State of Alaska with current certification as AK-CESCL.

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

b. The Superintendent must meet the following qualifications:

(1) Current certification as AK-CESCL; and

(2) Duly authorized representative, as defined in the CGP, Appendix A, Part 1.12.3.

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

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

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

(1) CPESC, Certified Professional in Erosion and Sediment Control; or

(2) CISEC, Certified Inspector in Sediment and Erosion Control.

641-1.5 SIGNATURE/CERTIFICATION REQUIREMENTS AND DELEGATIONS.

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

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

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

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

c. Subcontractor Certification. Subcontractors must certify on Form 25D-105, that they have read and will abide by the CGP and the conditions of the project SWPPP.

d. Signatures and Initials. Handwrite signatures or initials on CGP documents and SWPPP forms, wherever a signature or initial is required.

641-1.6 RESPONSIBILITY FOR STORM WATER PERMIT COVERAGE.

a. The Department and the Contractor are jointly responsible for permitting and permit compliance within the Project Zone.

b. The Contractor is responsible for permitting and permit compliance outside the Project Zone. The Contractor has sole responsibility for compliance with DEC, COE and other applicable federal, state, and local requirements, and for securing all necessary clearances, rights, and permits. GCP Subsection 70-02 describes the requirement to obtain permits, and to provide permit documents to the Engineer.

c. An entity that owns or operates, a commercial plant (as defined in GCP Subsection 80-01.d. or material source or disposal site outside the Project Zone, is responsible for permitting and permit compliance. The Contractor has sole responsibility to verify that the entity has appropriate permit coverage. GCP Subsection 70-02 describes the requirement to obtain permits, and to provide permit documents to the Engineer.

d. The Department is not responsible for permitting or permit compliance, and is not liable for fines resulting from noncompliance with permit conditions:

(1) For areas outside the Project Zone;

(2) For Construction Activity and Support Activities outside the Project Zone; and

(3) For commercial plants, commercial material sources, and commercial disposal sites.

641-1.7 UTILITY. (RESERVED FOR REGIONS)

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

a. SWPPP Preparer and Pre-Construction Site Visit.

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

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

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

(1) Opportunities to phase construction activities;

(2) Appropriate BMPs and their sequencing; and

(3) Sediment controls that must be installed prior to beginning Construction Activities.

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

b. Developing the SWPPP.

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

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

(1) Obtain the following forms after they have been completed by the Department and include them in the SWPPP:

(a) SWPPP Delegation of Signature Authority – DOT&PF (25D-107)

(b) SWPPP Certification for DOT&PF (25D-109)

(c) SWPPP Delayed Action Item Report (25D-113), if needed

(2) Use the following Department forms for recording information in the SWPPP:

(a) SWPPP Amendment Log (25D-114)

(b) SWPPP Certification for Contractor (25D-111)

(c) SWPPP Construction Site Inspection Report (25D-100)

(d) SWPPP Corrective Action Log (25D-112)

(e) SWPPP Daily Record of Rainfall (25D-115)

(f) SWPPP Delegation of Signature Authority – Contractor (25D-108)

(g) SWPPP Grading and Stabilization Activities Log (25D-110)

(h) SWPPP Pre-Construction Site Visit (25D-106)

(i) SWPPP Project Staff Tracking (25D-127)

(j) SWPPP Subcontractor Certification (25D-105)

(k) SWPPP Training Log (25D-125)

(l) SWPPP Noncompliance (25D-143)

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

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

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

c. SWPPP Considerations and Contents.

(1) The SWPPP must provide erosion and sediment control measures for all Construction Activity within the Project Zone. Construction activity outside the Project Zone must have permit coverage, using a separate SWPPP2, and separate Contractor Inspections.

(2) The SWPPP must consider the activities of the Contractor and all subcontractors and utility companies performing work in the Project Zone. The SWPPP must describe the roles and responsibilities of the Contractor, subcontractors, utility companies, and the Department with regard to implementation of the SWPPP. The SWPPP must identify all operators for the Project, including utility companies performing Construction Activity, and identify the areas:

(a) Over which each operator has operational control; and

(b) Where the Department and Contractor are co-operators.

(3) For work outside the Project Zone the SWPPP must identify the entity that has stormwater permit coverage, the operator, and the areas that are:

(a) Dedicated to the Project and where the Department is not an operator; and

(b) Not dedicated to the project, but used for the project.

(4) Account for the Contractor's construction methods and phasing. Identify the amount of mean annual precipitation.

(5) Comply with the CGP Part 1.4.3 Authorized Non-Storm Water Discharges. List locations where authorized non-stormwater will be used, including the types of water that will be used on-site.

(6) Include the Department's Antidegradation Analysis in the SWPPP if stormwater from the Project Zone discharges into receiving water that is considered a high quality water and that constitutes an outstanding national resource, according to CGP Part 2.1.6.

(7) Where the project intersects a Public Water System (PWS), the Engineer will notify the PWS contact for the Department and Contractor according to the CGP Part 4.10. Contractor Amend a copy of the communications in Appendix Q.

(8) There are special requirements in the CGP Part 3.2, for stormwater discharges into an impaired water body, and they may include monitoring of stormwater discharges. For Projects meeting the permit criteria, the Contractor shall implement a monitoring plan approved by the Department for the stormwater within the Project Zone, and shall provide the required information and reports for inclusion in the SWPPP. The Contractor is responsible for monitoring and reporting outside the Project Zone.

(9) Preserve natural topsoil unless infeasible. Delineate the site according to CGP Part 4.2.1. Use stakes, flags, or silt fence, etc. to identify areas where land disturbing activities will occur and areas that will be left undisturbed. Minimize the amount of soil exposed during Construction activity according to CGP Part 4.2.2.

(10) Comply with CGP Part 4.4, and the DEC General Permit for Excavation Dewatering (AKG002000), requirements for dewatering for trenches and excavations.

(11) The SWPPP must identify specific areas where potential erosion, sedimentation, or pollution may occur. The potential for wind erosion must be addressed. The potential for erosion at drainage structures must be addressed.

(12) Describe methods and time limits, to initiate temporary or final soil stabilization, CGP Part 4.5.1.1. Begin stabilization no later than the end of the next work day, following the day when the earth-disturbing activities have permanently ceased on any portion of the site or temporarily ceased on any portion of the site and will not resume for a period exceeding:

(a) Seven days for areas with mean annual precipitation 40 inches or greater; or

(b) Fourteen days for areas with mean annual precipitation less than 40 inches.

(c) Time allotted to complete temporary and final stabilization, Subsection 641-2.1(c)(13)

(13) Within seven days of initiating final stabilization, CGP Part 4.5.1.4, either complete final stabilization or continue maintenance of work until final stabilization is complete. Complete temporary stabilization within fourteen days of initiating stabilization, CGP Part 4.5.1.2.

(14) Include in the "Stabilize Soils" section of the SWPPP, a description of how you will minimize the amount of disturbed and unstabilized ground in the fall season. Identify anticipated dates of fall freeze-up and spring thaw. Describe how you will stabilize areas when it is close to or past the seasonal time of snow cover or frozen conditions, and before the first seasonal thaw. Include a plan for final stabilization.

(15) Plans for Active Treatment Systems must be submitted to DEC for review at least 14 days prior to use of the system and the Operator of the ATS identified in the SWPPP. Any use of treatment chemicals must be identified on the NOI, documented in the SWPPP, and meet with the requirements in the CGP Part 4.6.

(16) The SWPPP must provide designated areas for equipment and wheel washing, equipment fueling and maintenance, chemical storage, staging or material storage, waste or disposal sites, concrete washouts, paint and stucco washouts, and sanitary toilets. These activities must be done in designated areas that are located, to the extent practicable, away from drain inlets, conveyance channels, and waters of the US. No discharges are allowed from concrete washout, paint and stucco washout; or from release oils, curing compounds, fuels, oils, soaps, and solvents. Equipment and wheel washing water that doesn't contain detergent may be discharged on-site if it is treated before discharge.

(17) Design temporary BMPs for a 2 year 24 hour precipitation amount. Describe BMPs in the SWPPP and in SWPPP Amendments, including source controls, sediment controls, discharge points, and temporary and final stabilization measures. Describe the design, placement, installation, and maintenance of each BMP, using words and drawings as appropriate. Describe the design capacity of sediment basins (including sediment ponds and traps). Provide a citation to the BMP Manual or publication used as a source for the BMP, including the manufacturer's or BMP manual specifications for installation (CGP Part 5.3.6.2). If no published source was used to select or design a BMP, then the SWPPP or SWPPP amendment must state that "No BMP manual or publication was used for this design."

(18) Describe the sequence and timing of activities that disturb soils and of BMP implementation and removal. Phase earth disturbing activities to minimize unstabilized areas, and to achieve temporary or final stabilization quickly. Whenever practicable incorporate final stabilization work into excavation, embankment and grading activities. Include drawings showing each phase of the project with the BMPs implemented in the phase.

(19) Provide a legible site map or set of maps in the SWPPP, showing the entire site and identifying boundaries of the property where construction and earth-disturbing activities will occur, as described in the CGP Part 5.3.5. Include all BMPs on the site map.

(20) Identify the inspection frequency in the SWPPP.

(a) For areas of the state where the mean annual precipitation is less than 40 inches:

(1) Inspect at least once every seven calendar days; or

(2) Inspect at least once every 14 calendar days and within 24 hours of the end of a storm event that resulted in a discharge from the site.

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

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

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

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

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

d. Recording Personnel and Contact Information in the SWPPP.

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

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

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

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

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

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

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

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

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

b. Designate a Contractor's Spill Response Field Representative with 24-hour contact information. Designate a Subcontractor Spill Response Coordinator for each subcontractor. The Superintendent and Contractor's Spill Response Field Representative must have 24-hour contact information for each Subcontractor Spill Response Coordinator and the Utility Spill Response Coordinator.

c. List and give the location and estimated quantities of hazardous materials (Including materials or substances listed in 40 CFR 117 and 302, and petroleum products) to be used or stored on the Project. Hazardous materials must be stored in covered storage areas. Include secondary containment for all hazardous material storage areas.

d. Identify the locations where fueling and maintenance activities will take place, describe the activities, and list controls to prevent the accidental spillage of petroleum products and other hazardous materials. Controls include placing absorbent pads or other suitable containment under fill ports while fueling, under equipment during maintenance or repairs, and under leaky equipment.

e. List the types and approximate quantities of response equipment and cleanup materials available on the Project. Include a list and location map of cleanup materials, at each different work site and readily available off site (materials sources, material processing sites, disposal sites, staging areas, etc.). Spill response materials must be stored in sufficient quantity at each work location, appropriate to the hazards associated with that site.

f. Describe procedures for containment and cleanup of hazardous materials. Describe a plan for the prevention, containment, cleanup, and disposal of soil and water contaminated by spills. Describe a plan for dealing with contaminated soil and water encountered during construction. Clean up spills or contaminated surfaces immediately.

g. Describe methods of disposing of waste petroleum products and other hazardous materials generated by the Project, including routine maintenance. Identify haul methods and final disposal areas. Assure final disposal areas are permitted for hazardous material disposal.

h. Describe methods of complying with the requirements of AS 46.04.010-900, Oil and Hazardous Substances Pollution Control, and 18 AAC 75. Include contact information for reporting hazardous materials and petroleum product spills to the Project Engineer and reporting to federal, state, and local agencies.

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

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

a. Oil or petroleum products from a spill may reach navigable waters (as defined in 40 CFR 112); and

b. Total above ground storage capacity for oil and any petroleum products is greater than 1,320 gallons (not including onboard tanks for fuel or hydraulic fluid used primarily to power the movement of a motor vehicle or ancillary onboard oil-filled operational equipment, and not including containers with a storage capacity of less than 55 gallons)

Reference the SPCC Plan in the HMCP and SWPPP.

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

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

The Superintendent may assign certain duties to the SWPPP Manager.

a. Ensuring Contractor's and subcontractor's compliance with the SWPPP and CGP;

b. Ensuring the control of erosion, sedimentation, or discharge of pollutants;

c. Directing and overseeing installation, maintenance, and removal of BMPs;

d. Performing Inspections; and

e. Updating the SWPPP including adding amendments and forms.

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

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

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

641-2.5 MATERIALS.

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

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

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

Use silt fences as specified in Item P-680.

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

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

641-3.1 CONSTRUCTION REQUIREMENTS.

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

a. Before Construction Activity may Begin.

The following actions must be completed before Construction Activity begins:

(1) The SWPPP Preparer must visit the Project, the visit must be documented in the SWPPP Form (25D-106), and the SWPPP must be developed (or amended) with findings from the visit;

(2) The SWPPP must be approved by the Engineer on Form 25D-109;

(3) The Contractor must be authorized to begin by the Engineer;

(4) The Project eNOIs for the Department and for the Contractor, as well as any other eNOIs if there are additional operators, must be listed as Active Status on the DEC website;

(5) The Department approved SWPPP must be submitted to DEC and Local Government (when required); and

(6) The Contractor has transmitted to the Engineer an electronic copy and at least one hardcopy of the approved SWPPP.

(7) The Delegation of Authority (Forms 25D-108 and 25D-107) for both the Contractor and DOT&PF Engineer are signed.

(8) Begin winter construction activity according to CGP Part 4.12.2, provided actions (1), (3), and (7) are completed. If winter construction activities may extend beyond spring thaw, the following actions must be completed before spring thaw:

(a) Actions (1) through (7), listed above, and

(b) Appropriate control measures to minimize erosion and sediment runoff during spring thaw and summer rainfall are installed.

(9) Post notices. Include the following information:

(a) Copy of all eNOIs related to this project;

(b) Location of the SWPPP.

Post notices on the outside wall of the Contractor's project office, and near the main entrances of the construction project. Protect postings from the weather. Locate postings so the public can safely read them without obstructing construction activities or the traveling public (for example, at an existing pullout). Do not use retroreflective signs for the SWPPP posting. Do not locate SWPPP signs in locations where the signs may be confused with traffic control signs or devices. Update the notices if the listed information changes.

(10) Install an outdoor rain gauge per manufacturer's guidance in a readily accessible location on the Project. Projects may utilize the nearest National Weather Service (NWS) precipitation gauge station, if within 20 miles of the project, to determine rainfall amounts during storm events.

(11) Delineate the site for both land disturbing activities and areas that will be left undisturbed.

(12) Install sediment controls and other BMPs that must be placed prior to the initiation of Construction Activity.

b. During Construction.

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

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

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

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

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

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

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

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

c. Pollutant Reporting Requirements.

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

(1) Verbally, immediately report the incident to the Engineer,

(2) Verbally report to DEC within 24 hours after the permittee becomes aware of the incident, and

(3) In writing, report to DEC within five days after the permittee becomes aware of the circumstances. To report in writing, complete the written noncompliance report on Form 25D-143, and file the written report with DEC. Coordinate the report with the Engineer. Include in the report:

(a) A description of the noncompliance and its causes;

(b) The exact dates and times of noncompliance;

(c) If not yet corrected the anticipated time the project will be brought back into compliance; and

(d) The corrective action taken or planned to reduce, eliminate and prevent reoccurrence.

(e) Notify the Engineer and COE Regulatory Program immediately if there is incident of noncompliance with COE Permits.

d. Hazardous Materials Reporting Requirements.

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

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

(1) To water:

(a) Any amount released must be reported immediately to the Engineer, DEC, and the Coast Guard.

(2) To land:

(a) Any release of a petroleum product in excess of 55 gallons must be reported as soon as the person has knowledge of the discharge CGP Part 9.3.2.

(b) Any release of a petroleum product in excess of 10 gallons but less than 55 gallons must be reported to the Engineer and must be reported to DEC within 48 hours after the person has knowledge of the discharge CGP Part 9.3.2.

(c) Any release of a petroleum product in excess of 1 gallon to 10 gallons must be recorded and logged and provided to DEC on a monthly basis.

(3) Use the HMCP and SPCC Plan (if available) for contact information to report spills to regulatory agencies.

(4) Within seven calendar days of knowledge of the release, provide a description of the release, the circumstances leading to the release, and the date of the release to the nearest DEC Area Response Team Office listed CGP Part 9.3.2.

(5) Implement measures to prevent the reoccurrence of and to respond to such releases.

e. Corrective Action and Maintenance of BMPs.

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

(1) Implement corrective action:

(a) If an incident of noncompliance with the SWPPP, or CGP is identified;

(b) If an Inspection or the Engineer identifies the SWPPP or any part of the SWPPP is ineffective in preventing erosion, sedimentation or the discharge of pollutants;

(c) If a required BMP was not installed according to the SWPPP schedule or phasing, or was installed incorrectly, or was not installed according to the CGP Part 4.0;

(d) If a BMP is not operating as intended, has not been maintained in an effective operation condition, or is unable to effectively perform the intended function;

(e) If sediment accumulates more than one-third of the distance of the above-ground height of the silt fence;

(f) If sediment accumulates to more than one-half retention height for an inlet BMP, check dam, berm, wattle, or other control measures;

(g) If a prohibited discharge of pollutants, as specified in CGP Part 4.7, is occurring or will occur; or

(h) If there is accumulation of sediment or other pollutants, that is in or near any stormwater conveyance channels, or that may enter a discharge point or storm sewer system. If there is accumulation of sediment or other pollutants that is being tracked outside the project zone.

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

(a) For conditions that are easily remedied (i.e. removal of tracked sediment, maintenance of control measure, or spill clean-up), initiate corrective action within 24 hours and complete as soon as possible;

(b) If a discharge occurs during a local 2-year, 24-hour storm event, initiate a corrective action the day after the storm event ends;

(c) If installation of a new control measure is needed or an existing control measure requires redesign and reconstruction or replacement to make it operational, the corrective action must be completed within seven calendar days from the time discovered.

(d) For all other conditions initiate corrective actions so both of the following requirements are met:

(1) Corrective action is completed in time to protect water quality; and

(2) Corrective action is completed no later than the Complete-by-Date that was entered in an Inspection Report (see Subsection 641-3.3.b for more information).

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

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

f. Stabilization.

(1) Stabilization may be accomplished using temporary or permanent measures. Initiate stabilization of disturbed soils, erodible stockpiles, disposal sites, and of erodible aggregate layers so that all of the following conditions are satisfied:

(a) Not later than the end of the next work day, following the day when the earth-disturbing activities have temporarily or permanently ceased (CGP 4.5.1.1).

(b) As soon as necessary to avoid erosion, sedimentation, or the discharge of pollutants; and

(c) As identified in the SWPPP.

(2) Land may be disturbed and stabilized multiple times during a project. Coordinate work to minimize the amount of disturbed soil at any one time. Do not disturb more soil than you can stabilize with the resources available.

(3) Temporarily stabilize from wind and water erosion portions of disturbed soils, portions of stockpiles, and portions of disposal sites, that are not in active construction. Temporary stabilization measures may require a combination of measures including but not limited to vegetative cover, mulch, stabilizing emulsions, blankets, mats, soil binders, low-erodible cover, dust palliatives, or other approved methods.

(4) When temporary or permanent seeding is required, provide a working hydro seeding equipment located within 100 miles of the project by road; with 1,000 gallon or more tank capacity, paddle agitation of tank, and the capability to reach the seed areas with an uniform mixture of water, seed, mulch and tackifier. If the project is located in an isolated community the hydro-seeder must be located at the project.

(5) Before applying temporary or permanent seeding, prepare the surface to be seeded to reduce erosion potential and to facilitate germination and growth of vegetative cover. Apply seed and maintain seeded areas. Reseed areas where growth of temporary vegetative cover is inadequate to stabilize disturbed ground.

(6) Apply permanent seed according to Item T-901, within the time periods allowed by the CGP and the contract, at locations where seeding is indicated on the plans and after land-disturbing activity is permanently ceased.

(7) When installing a culvert or other drainage structure where stream bypass is not used, install temporary or final stabilization concurrently or immediately after placing the culvert or drainage structure in a manner that complies with the SWPPP, applicable project permits and prevents discharge of pollutants. Install temporary or final stabilization:

(a) At the culvert or drainage structure inlet and outlet; and

(b) In the areas upstream and downstream that may be disturbed by the process of installing the culvert, culvert end walls, culvert end sections, or drainage structure.

(8) Before deactivating a stream bypass or stream diversion used for construction of a bridge, culvert, or drainage structure, install final or temporary stabilization when approved by the Engineer:

(a) At the inlet and outlet of the culvert, drainage structure, or bridge;

(b) In the area upstream and downstream of the culvert, drainage structure, or bridge, that is disturbed during installation or construction of the culvert, drainage structure, or bridge; and

(c) Under the bridge.

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

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

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

(1) The Engineer will determine the date that all the following conditions for ending CGP coverage have been met within the Project Zone:

(a) Land disturbing activities have ceased;

(b) Final Stabilization has been achieved on all portions of the Project Zone, according to the CGP PART 4.5.2 (including at Department furnished material sources, disposal sites, staging areas, equipment areas, etc.); and

(c) Temporary BMPs have been removed.

(2) After the Engineer has determined the conditions for ending CGP coverage have been met, the Department will:

(a) Send written notice to the Contractor with the date that the conditions were met;

(b) Submit an eNOT to DEC; and

(c) Provide a copy of the eNOT and DEC's acknowledgement letter to the Contractor.

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

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

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

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

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

h. Transmit final SWPPP.

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

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

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

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

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

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

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

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

a. Inspection during Construction.

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

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

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

(2) One of the inspectors is sick;

(3) The project is on a reduced frequency inspection schedule with no staff on site, the only access to the site is by air, and it is economical to send only one inspector; or

(4) When the Engineer determines a safety concern that makes joint inspection impracticable.

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

b. Inspection Reports.

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

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

(1) Section 641-3.1.d, and

(2) The CGP.

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

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

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

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

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

c. Inspection before Seasonal Suspension of Work.

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

d. Reduced Inspection Frequencies.

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

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

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

(1) Soil disturbing activities are suspended; and

(2) Soil stabilizing activities are suspended.

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

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

e. Stabilization before Fall Freeze up and Spring Thaw.

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

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

(1) When stabilization activities are precluded by snow cover or frozen ground conditions prior to the anticipated date of fall freeze up, or

(2) When winter construction activity is authorized by the Engineer and conducted according to the contract.

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

f. Inspection before Project Completion.

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

g. Items and Areas to Inspect.

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

h. SWPPP Amendments and SWPPP Amendment Log.

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

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

SWPPP Amendments must be approved by the Engineer.

Amendments must occur:

(1) Whenever there is a change in design, construction operation, or maintenance at the construction site that has or could cause erosion, sedimentation or the discharge of pollutants that has not been previously addressed in the SWPPP;

(2) If an Inspection identifies that any portion of the SWPPP is ineffective in preventing erosion, sedimentation, or the discharge of pollutants;

(3) Whenever an Inspection identifies a problem that requires additional or modified BMPs

(4) Whenever a BMP is modified during construction, or a BMP not shown in the original SWPPP is added;

(5) If the Inspection frequency is modified (note beginning and ending dates); or

(6) When there is a change in personnel who are named in the SWPPP, according to Subsection 641-2.1.d.

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

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

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

i. Site Maps.

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

j. Corrective Action Log.

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

(1) Identification during an inspection; or

(2) Discovery by the Department's or Contractor's staff, a subcontractor, or a regulatory agency inspector.

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

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

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

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

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

k. Grading and Stabilization Activities Log.

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

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

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

l. Daily Record of Rainfall.

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

m. Staff Tracking Log.

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

641-3.4 FAILURE TO PERFORM WORK.

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

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

(a) Obtain appropriate permits before Construction Activities occur;

(b) Perform SWPPP Administration;

(c) Perform timely Inspections;

(d) Update the SWPPP;

(e) Transmit updated SWPPP, Inspection Reports, and other updated SWPPP forms to the Engineer;

(f) Maintain effective BMPs to control erosion, sedimentation, and pollution in accordance with the SWPPP, the CGP, and applicable local, state, and federal requirements;

(g) Perform duties according to the requirements of Item P-641; or

(h) Meet requirements of the CGP, SWPPP, or other permits, laws, and regulations related to erosion, sediment, or pollution control.

(i) Any other requirements established or included in the contract.

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

641-3.5 ACCESS TO WORK.

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

METHOD OF MEASUREMENT

641-4.1 See Section 90 and as follows:

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

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

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

TABLE 641-1 BMP VALUES – RESERVED

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

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

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

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

Code f* *Liquidated Damages according to Code **f** will not be billed for typographic errors and minor data entry errors, except the liquidated damages will be assessed for these errors when:*
(1) the contractor has previously been notified and subsequent inspection reports repeat the same or similar error,
(2) multiple inspection reports are submitted after the submission due date and the same or similar errors are repeated on multiple overdue reports,
(3) an error in recording the inspector's AK-CESCL certification date results in an inspector performing the inspection during a period when their certification was lapsed or was otherwise invalid.

BASIS OF PAYMENT

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

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

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

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

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

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

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

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

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

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

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

a. Dewatering;

b. Shoring;

c. Bailing;

d. Permanent seeding;

e. Installation and removal of temporary work pads;

f. Temporary accesses;

g. Temporary drainage pipes and structures;

h. Diversion channels;

i. Settling impoundment; and

j. Filtration.

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

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

Payment will be made under:

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

ITEM P-650 AIRCRAFT TIE-DOWN

DESCRIPTION

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

MATERIALS

650-2.1 GENERAL.

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

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

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

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

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

650-2.2 SOIL ANCHOR TIE-DOWNS.

a. **Driven Toggle.** Provide an anchor assembly with a minimum tensile breaking strength of 9,000 pounds, a minimum working load capacity of 3,500 pounds and a minimum field pull-out capacity of 5,000 pounds. Provide anchors equipped with stainless steel cable, swaged eyes at cable ends, and no intermediate connections.

b. **Buried Plate.** Provide an anchor assembly meeting the details shown on the plans.

c. **Helical "Screw" Anchor.** Provide an anchor assembly with minimum tensile breaking strength of 9,000 pounds, a minimum working load capacity of 3,500 pounds, and a minimum field pull-out capacity of 5,000 pounds.

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

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

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

CONSTRUCTION METHODS

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

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

650-3.2 SOIL ANCHOR TIE-DOWNS.

a. **Driven Toggle.** Drive to sufficient depth to develop the minimum pull-out strength according to the manufacturer's installation instructions. Predrilling may be required depending on soil class. Anchor placement shall be achieved by methods recommended in the manufacturer's installation instructions. Backfill material, when required, shall be aggregate compacted to the satisfaction of the Engineer. If the anchor is set in pavement, backfill to a level 2-inchs below finish grade. Two-component sealant shall be used to fill the remainder of the hole to a level 1-inch below finish grade.

b. **Buried Plate.** Install each plate on a level and compacted surface at 5 feet minimum below finish grade. Place backfill with the chain plumb and under tension. Meet the material and compaction requirements for the applicable lift of material involved.

c. **Helical "Screw" Anchor.** Helical anchors shall be handled, stored, and installed in accordance with the manufacturer's recommendations. The helix of the helical anchors shall be installed a minimum of 6 feet below finish grade. Under no circumstances shall the manufacturer's recommended maximum allowable torque be exceeded at any time during installation.

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

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

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

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

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

ITEM P-655 AIRCRAFT RELOCATION

DESCRIPTION

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

REQUIREMENTS

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

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

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

Item P655.010.0000 Aircraft Relocation – per each

ITEM P-660 RETROREFLECTIVE MARKERS AND CONES

DESCRIPTION

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

MATERIALS

660-2.1 MARKERS.

a. Type I Marker. Semi-flush centerline marker conforming to FAA AC 150/5345-39x, "Specification for L-853. Runway and Taxiway Lighting Retroreflective Markers" and certified under AC 150/5345-53 *Airport Lighting Equipment Certification Program.*

b. Type II Marker. Elevated marker for edge marking conforming to FAA AC 150/5345-39x, "Specification for L-853. Runway and Taxiway Lighting Retroreflective Markers" and certified under AC 150/5345-53 *Airport Lighting Equipment Certification Program.* Provide flexible or frangible markers in accordance with the height, marker colors, and retro-reflective colors shown on the plans. If not called on the plans, provide a finished marker height that is 30 inches above finish grade, marker color orange, and retroreflective colors as required by AC 150/5345-39x. If frangible markers are supplied, ensure that the mounting system and tether are certified. When retro-reflective sheeting is used, provide manufacturer applied sheeting.

c. Cone, 18-Inch. Reflective traffic cone, 18 inches in height, orange color. Fit each cone with retro-reflective sheeting to the height specified on the plans. When no height dimension is specified, fit with a 7-inch wide band of retro-reflective sheeting centered on the cone. Use pressure sensitive, flexible, high intensity retroreflective sheeting, conforming to ASTM D4956, Type III. Provide the appropriate sheeting color(s) as indicated on the plans or if none is indicated supply with white colored band. Provide each cone with an anchoring tether of weather and corrosion resistant material capable of securing the assembly to prevent foreign object debris (FOD) hazard to aircraft similar to the tether required for Type II Markers that are frangible.

CONSTRUCTION REQUIREMENTS

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

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

METHOD OF MEASUREMENT

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

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

BASIS OF PAYMENT

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

Payment will be made under:

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

ITEM P-661 STANDARD SIGNS

DESCRIPTION

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

MATERIALS

661-2.1 Use materials that conform to the following:

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

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

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

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

b. Reflective Sheeting. Meet ASTM D4956, for the type specified.

c. Sign Posts. Use the type and size of posts designated on the plans.

(1) Perforated Steel Posts.

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

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

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

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

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

d. Sign Fabrication. Use Type IV reflective sheeting (for lettering, symbols, borders, and background) on sheet aluminum panels.

e. Sign Posts and Bases. Use sign posts and bases of the types specified. The structural aspects of design and materials for sign supports must comply with the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*. Do not splice sign posts.

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

CONSTRUCTION REQUIREMENTS

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

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

a. Surfaces exposed to weathering must be free of defects in the coating that impair serviceability or detract from general appearance or color match.

b. Finished signs must be clean and have no chatter marks, burrs, sharp edges, loose rivets, delaminated reflective sheeting, or aluminum marks. Do not make repairs to the face sheet.

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

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

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

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

Table 661-1

DECAL COLORS

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

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

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

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

ITEM P-670 HAZARDOUS AREA BARRIERS

DESCRIPTION

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

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

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

MATERIALS

670-2.1 Use materials that conform to the following:

a. **Hazard Marker Barrier, Timber.** Provide construction-grade Douglas Fir-Larch with nominal dimensions of 12 inches by 12 inches and a length of 8 feet. All timber that is exposed to weather, water, or soil shall be pressure treated to the current edition of the AWPA Standards, or AASHTO M 133, using preservatives registered with the US Environmental Protection Agency. Products shall be treated according AWPA Standard U1, Use Category System. Use either oil base or latex exterior paint in colors international orange and white.

b. **Hazard Marker Barrier, Plastic.** Provide 10-inch by 10-inch by 8-foot nominal dimension portable water-ballast barriers made from high impact, safety orange and white, UV-resistant, high density polyethylene (HDPE) plastic. Provide barriers with pre-molded flag staff and flasher bracket attachment holes. Provide barriers that are designed as a modular system to allow assembly/disassembly and nesting for compact storage, and to permit the option of physically bolting multiple barriers together to provide a continuous barrier wall. Provide 6-inch by 72-inch reflective striping panel for attachment to one side of each barrier.

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

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

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

b. **Flasher Unit for Plastic Barrier.**

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

CONSTRUCTION REQUIREMENTS

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

a. Hazard Marker Barrier, Timber.

(1) Preparation. Prior to painting, notch the underside of each timber to allow for the use of a forklift. Cut two 4-inch high by 12-inch wide notches spaced 36 inches center to center, centered on the long axis of the timber.

(2) Painting. Apply one coat of primer and one coat of finish white color paint on all sides and the ends followed by two coats of orange finish paint to form the stripes on the sides. Paint orange stripes 24 inches wide and offset by 6 inches from one side to the next giving a "barber pole" effect.

(3) Flag and Flasher Unit. Mount the flag 24 inches from one end of the timber by drilling a hole 1/8-inch larger than the diameter of the staff by 8 inches deep. Mount the flasher unit 24 inches from the opposite end of the timber.

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

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

METHOD OF MEASUREMENT

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

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

BASIS OF PAYMENT

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

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

Payment will be made under:

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

ITEM P-671 RUNWAY AND TAXIWAY CLOSURE MARKERS

DESCRIPTION

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

MATERIALS

671-2.1 Use materials that conform to the following.

a. Vinyl Mesh Panel.

(1) Panel Material. High tenacity vinyl coated polyester mesh fabric, 9 ounces per square yard (oz/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 230 by 200 pounds (lbs) grab method and 200 by 140 lbs strip method. Meet ASTM D 471 for water absorption, 7 days @160°F, 5.0% maximum weight gain and ASTM D 750 for weathering, 2,500 hours, no appreciable change in color, no cracking, minimum crazing.

(2) Seams, Perimeter Hem, and Thread. Double flat felled seams, double stitched, and 3-ply perimeter hem sewn with UV resistant #92 bonded polyester thread.

(3) Grommets. No. 2 brass rolled-rim spur grommets installed through hem at 30-inch intervals along marker perimeter.

(4) Anchors. 3/8-inch diameter deformed reinforcing steel at least 18 inches long, including a hook formed as a 4-inch segment bent perpendicular to the anchor stem.

b. Snow Fence Panel.

(1) Panel Material. Wire-supported wood lathe snow fence, pre-treated with a suitable wood stain.

(2) Paint Type: (select one)

(a) AASHTO M248, Type F (Alkyd resin)

(b) FSS TT-P-19D(1) Paint Latex (Acrylic emulsion, Exterior).

(3) Paint Color: Traffic Yellow, #33538

(4) Anchors: 3/8-inch diameter deformed reinforcing steel at least 18 inches long, including a hook formed as a 4-inch segment bent perpendicular to the anchor stem.

c. Temporary Illuminated Panel.

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

CONSTRUCTION REQUIREMENTS

671-3.1 Meet the following requirements.

a. Vinyl Mesh Panel. Secure by driving anchors into the embankment through all grommets.

b. Snow Fence Panel. Apply to the upper side of the panels, two coats of paint that result in a dense and consistent color. Construct panels double layered, with upper layer wood lathe oriented to lower lathe at right angles to provide a solid yellow appearance.

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

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

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

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

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

Payment will be made under:

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

TESTING REQUIREMENTS

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

ITEM P-675 GUARDRAIL

DESCRIPTION

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

MATERIALS

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

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

675-2.3 METAL BEAM RAIL.

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

b. Box-Beam Guardrail. Meet:

(1) ASTM A500 Grade B, or

(2) ASTM A501.

Galvanize the rail per AASHTO M 111 after fabrication.

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

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

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

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

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

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

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

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

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

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

a. Parallel Terminal.

(1) Provide terminals meeting the following:

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

(b) Length: 50 feet nominal effective length.

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

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

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

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

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

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

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

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

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

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

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

CONSTRUCTION REQUIREMENTS

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

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

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

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

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

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

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

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

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

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

a. At intervals noted on the plans or Alaska Standard Plans, starting with the first mid-span hole beyond terminal sections

b. With the retroreflective sheeting facing approaching traffic

c. With retroreflective sheeting on both sides, on two-way roadways

d. Not on the terminal sections, except as shown on the plans.

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

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

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

a. Selection of Post Materials. Use either wood or steel posts when allowed by the type of guardrail specified, subject to the following:

(1) Use one type of post material on the project unless extending an existing run of guardrail.

(2) Match existing post material to extend an existing run of guardrail.

b. Setting Posts. Set posts as follows:

(1) Set posts plumb, in the location and to the depth shown on the Plans or Alaska Standard Plans.

(2) Choose an installation method that does not damage the post, adjacent pavement, structures, utility conduits, and final slopes. Repair all damage to the satisfaction of the Engineer or replace the damaged item, as per subsection 50-11

(3) Set wood or steel posts in dug, drilled, or pre-punched holes. Steel posts may also be set by ramming or driving if:

(a) the underlying material is no larger than 6-inch; and

(b) the posts are not damaged during installation.

(4) For placement in solid rock or in broken rock embankment greater than 6-inch, set wood or steel posts in pre-dug, pre-drilled or pre-punched holes.

(5) Backfill and compact around posts with material as specified in the typical section, to firmly support the post laterally and vertically. Compact under and around posts to the Engineer's satisfaction.

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

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

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

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

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

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

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

675-3.5 TERMINAL SECTIONS.

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

Follow Item P-152 for excavation and embankment requirements.

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

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

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

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

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

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

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

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

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

METHOD OF MEASUREMENT

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

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

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

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

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

BASIS OF PAYMENT

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

675-5.1 GUARDRAIL.

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

675-5.2 TERMINAL SECTIONS.

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

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

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

Payment will be made under:

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

MATERIAL REQUIREMENTS

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

ITEM P-680 GEOTEXTILE FOR SILT FENCE

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

MATERIALS

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

a. Prefabricated Silt Fence Meet the Plans and Section P-680 requirements.

b. Attachment Devices Staples; wire; self-locking nylon, plastic, wire ties; or other approved means to attach fabric to posts.

c. Support Mesh between Posts 14-gage welded wire fencing, metal chain-link fabric, or geosynthetic mesh with equivalent strength. Use maximum mesh spacing of 6 inches. Use height shown on the Plans, or specified in the Bid Schedule.

d. Posts Wood 1.5-inch x 1.5-inch x 36-inch minimum, steel, or approved synthetic material.

CONSTRUCTION REQUIREMENTS

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

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

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

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

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

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

Payment will be made under:

Item P680.010.0000 Silt Fence – per linear foot

ITEM P-681 GEOTEXTILE FOR SEPARATION AND STABILIZATION

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

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

1. **Separation**. Meet AASHTO M 288 for Separation, except provide a minimum permittivity of 0.50 sec^{-1}, and meet Class 3 Strength Property Requirements.

2. **Stabilization**. Meet AASHTO M 288 for Stabilization, except provides a minimum permittivity of 0.50 sec^{-1}, and meet Class 1 Strength Property Requirements.

3. **Reinforcement**. Meet the requirements in Table 681-1 for Type 1 or Type 2.

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

TABLE 681-1

GEOTEXTILE REINFORCEMENT PROPERTIES

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

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

[b] *Maximum average roll value*

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

CONSTRUCTION REQUIREMENTS

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

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

a. Separation and Stabilization. Lay geotextile for embankment separation and stabilization parallel to roadway centerline. On horizontal curves, place in segment lengths not exceeding those listed in Table 681-1, with butt ends cut to match and sewn or overlapped. On tangents, straighten the geotextile and sew or overlap butt ends. Shingle overlaps in the same direction as fill placement. Prevent overlapped edges from lifting during construction.

b. Reinforcement. Lay the machine direction of the geotextile for embankment reinforcement perpendicular to the roadway centerline or as shown on the Plans. Join segments by sewing or an approved bonding or attachment process. Shingle overlaps in the same direction as fill placement if seams are not sewn. Prevent overlapped edges from lifting during construction.

TABLE 681-2

GEOTEXTILE PLACEMENT ON CURVES

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

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

a. Sew seams with a Butterfly or J-Seam using a double-thread chain stitch (lock stitch). Bring adjacent sections of geotextile together and fold so that the stitching penetrates four layers of geotextile for the full seam length. Make the stitching line 1-1/4 inches (±1/4-inch) from the folded edge of the seam and at least 1/2-inch from the free edge of the geotextile. Sew seams so that they face upward and can be easily inspected by the Engineer. Illustrations showing correct stitch formation and seam configurations are provided in Figure 1-2 (page 1-28) of the FHWA publication, *Geosynthetic Design & Construction Guidelines*, FHWA-NHI-07-092, August 2008.

b. Overlap geotextile sections by a minimum of 3 feet at all longitudinal and transverse joints. Place the beginning of each new roll beneath the end of the previous roll to prevent the advancing fill from lifting the geotextile. Shingle in the direction of construction.

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

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

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

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

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

b. Reinforcement. Sew according to Subsection 681-3.3.a unless joining by overlap is shown on the Plans. Ensure the patch remains in place when cover material is placed over the affected area.

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

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

Payment will be made under:

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

ITEM P-682 GEOTEXTILE FOR DRAINAGE AND EROSION CONTROL

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

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

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

b. Erosion Control. Meet AASHTO M 288 for Permanent Erosion Control and meet Class 1 Strength Property Requirements.

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

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

CONSTRUCTION REQUIREMENTS

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

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

a. Subsurface Drainage. In trenches, after placing the geotextile and material shown on the Plans, fold the geotextile over the top of the material shown on the Plans to produce a minimum overlap of 12 inches, for trenches greater than 12 inches wide. In trenches less than 12 inches wide, make the overlap equal to the width of the trench. Then cover the geotextile with the subsequent course of material.

b. Erosion Control. Place and anchor geotextile on the approved surface so it will not be torn or excessively stretched by placement of the overlying materials. Secure the geotextile to the slope but secure it loosely enough so that the geotextile will not tear when riprap or other cover material is placed on the geotextile. The geotextile shall not be keyed at the top of the slope until the riprap or other cover material is in place at the top of the slope. Anchor the terminal ends of the geotextile using key trenches or aprons with a minimum of 24 inches depth into the soil substrate at the crest and toe of slope, or as shown on the Plans. Place geotextile with the machine direction parallel to the direction of water flow (normally parallel to the slope for erosion control runoff and wave action, and parallel to the stream or channel).

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

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

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

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

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

TABLE 682-1

ALLOWABLE DROP HEIGHT FOR GEOTEXTILE

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

**Protected geotextile is defined as having a gravelly covering (cushion layer) at least 6 inches thick.*
***If stones greater than 250 pounds must be dropped or if a height of drop greater than 3 feet is required, then perform field trials to determine the minimum cushion thickness and/or maximum height of safe drop without damaging the geotextile.*

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

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

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

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

Payment will be made under:

Item P682.010.0000 Geotextile, Drainage – per square yard

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

ITEM P-683 PAVING FABRIC

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

MATERIALS

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

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

TABLE 683-1.

TABLE OF EXCEPTIONS TO PERFORMANCE-GRADED ASPHALT BINDER SPECIFICATION

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

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

The Contractor shall furnish vendor's certificate of compliance and certified test reports for each lot of asphalt binder shipped to the project. The vendor's certified test report for the asphalt binder can be used for acceptance or tested independently by the Engineer.

The following documents shall be furnished at delivery:

a. Manufacturer's certificate of compliance

b. Certified test reports for the lot.

c. Lot number, storage tanks, and shipping containers (if applicable) used.

d. Date and time of load out for delivery.

e. Type, grade, temperature, and quality of asphalt binder loaded.

f. Type and percent of anti-stripping agent added.

All excess asphalt binder shall remain the property of the Contractor. Removal of excess asphalt binder from the project area shall be incidental to the contract and no separate payment will be made.

683-2.3 EMULSIFIED ASPHALT. Meet AASHTO M 140 and the following subsections. Store, mix, and apply emulsified asphalt within the temperature ranges recommended by the manufacturer or as shown in Table 683-2.

a. Cationic Emulsified Asphalt. Meet AASHTO M 208.

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

TESTS ON EMULSION	
Viscosity @ 77 °F, SSF	30, max.
Storage Stability, I day, %	1, max.
Demulsibility, 35 mL 0.8% SDS, %	25, min.
Particle Charge	Positive*
Sieve Test, % Retained	0.10, max.
Distillation Oil by Vol. of Emulsion, %	5, max.
Distillation Residue by Wt. of Emulsion, %	45, min.
TESTS ON RESIDUE	
Penetration @ 77 °F	100-250 (when tested under ASTM D 5)
Ductility @ 77 °F, 5 cm/min., cm	40, min. (when tested under ASTM D 113)
Solubility in TCE, %	97.5, min.

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

TABLE 683-2
STORAGE AND APPLICATION TEMPERATURES

Type and Grade of Material	Spray °F	Mix °F	Storage °F
CSS-1	90-120	90-160*	50-125
STE-1	70-140	70-150	50-125

* *Temperature of the emulsified asphalt in the pugmill mixture.*

CONSTRUCTION

683-3.1. SURFACE PREPARATION. Prepare the surface on which the fabric is to be placed as follows:

a. Remove excess asphalt material, loose aggregate, and other foreign materials from the surface.

b. Fill all potholes and cracks wider than 1/4-inch with emulsified asphalt (CSS-1) sand slurry.

683-3.2. APPLICATION OF SEALANT. Apply asphalt sealant by distributor meeting all requirements set forth under Subsection P-603-3.2. Apply asphalt sealant (emulsified asphalt, tack coat) uniformly at 0.20 to 0.30 gallons per square yard and at a temperature shown in Table 683-2, or as recommended by the Paving Fabric manufacturer. Do not apply asphalt material on a wet surface or when the ambient air temperature is below 45 °F or when other conditions would prevent proper application.

683-3.3. FABRIC LAYDOWN EQUIPMENT. Use approved mechanical laydown equipment to place fabric.

683-3.4. FABRIC PLACEMENT. Place fabric directly on top of the asphalt sealant (emulsified asphalt, tack coat) before the sealant has cooled and lost its tackiness. Lay fabric in full rolls without wrinkles and/or folds. Place the fabric per the manufacturer's recommendations. Overlap geotextile joints to ensure full closure of the joint, but do not exceed 6 inches of overlap. Overlap transverse joints in the direction of paving. Apply 0.20 gallons per square yard of additional asphalt sealant beneath all fabric joints. Remove and replace damaged geotexiltes. Removal and replacement of damaged geotextiles is subsidiary.

683-3.5. BITUMINOUS SURFACE COURSE OVERLAY. Place the bituminous surface course closely following the fabric laydown to avoid exposure of uncovered fabric overnight or to traffic or inclement weather. Do not allow the temperature of the hot-mix asphalt to exceed manufacturer's recommendations. If asphalt sealant bleeds through the fabric before the placement of the overlay, apply sand or bituminous surface course evenly over the affected area to prevent fabric pick-up by construction equipment. Prevent paver or other construction equipment from turning and/or pivoting on the fabric.

683-4.1 METHOD OF MEASUREMENT. By multiplying plan neat line width by the measured length in final position parallel to installation centerline along the ground surface. No allowance will be made for overlap, whether at joints or patches.

683-5.1 BASIS OF PAYMENT.

Item P683.010.0000 Paving Fabric – per square yard

ITEM P-684 FLOATING SILT CURTAIN

DESCRIPTION

684-1.1 Furnish, place, maintain, and remove temporary floating silt curtain as shown on the Plans for control of sediment and debris.

MATERIALS

684-2.1 GENERAL. Provide a silt curtain of commercial manufacture, with demonstrated ability to trap and hold sediment and debris.

684-2.2 SUBMITTALS AND APPROVAL. Submit for approval of the silt curtain that is proposed for use in the work. Obtain approval prior to shipment to the project site. Provide submittals that include certificates of compliance, manufacturer's printed instructions and/or shop drawings and proposed installation/removal procedures.

684-2.3 CURTAIN FABRIC. For curtains used in standing water, provide pervious geotextile meeting AASHTO M 288 for Temporary Silt Fence or impervious coated fabric such as nylon reinforced polyvinyl chloride, treated polypropylene/polyester fabric or approved equal adhering to the following:

Grab tensile strength (ASTM D4632 or equivalent)	200 lb
Maximum apparent opening size (ASTM D4751 or equivalent)	0.008 inch
UV^3 Resistance	Required
Panel Lengths	100 feet or less (for depths less than 13 feet)

684-2.4 FLOTATION. Provide Flotation consisting of rigid, closed cell expanded polystyrene, ethafoam or polyethylene floats attached to the top of the silt curtain along its entire length. Provide flotation material with protection from mechanical damage and deterioration that would cause pollution. Employ flotation that provides the curtain with a minimum of free board without gaps. Ensure that the buoyancy ratio (weight of displaced fluid to barrier weight) is greater than 3 to 1.

Provide high visibility color fabric cover for the flotation devices with a 1-inch minimum width reflective band attached on the side of the flotation covering along the entire length of the boom. Ensure that the flotation is secured to the boom to prevent shifting or slipping. Provide manufacturer installed grommets or equivalents to reinforce stress points and provide attachment points.

684-2.5 LINES AND ATTACHMENT POINTS. Provide a curtain that incorporates anchor lines, top load lines and bottom load lines, as required, that are minimum 1/2-inch diameter nylon rope. Provide a curtain with anchor lines, additional ballast, and floats that are attached to the silt curtain at reinforced attachment points provided by the manufacturer.

684-2.6 ANCHOR/BALLAST. Provide anchor and ballast chain of minimum 1/2-inch diameter galvanized steel with ballast chain sewn into a hem at the bottom of the curtain and secured to the material of the hem to prevent shifting or accidental removal.

CONSTRUCTION REQUIREMENTS

684-3.1 GENERAL. Provide a curtain high enough to extend to the bottom of the water channel plus 10 %. Weight the base of the curtain with ballast so that it will remain in continuous contact with the bottom to prevent sediment and silt migration.

Maintain the silt curtain in a basically vertical position. Allow a minimum of 6 inches free board at the top of the curtain for curtain depths less than 6.5 feet and 12 inches free board for curtain depths more than 6.5 feet at all times along its continuous length.

684-3.2 JOINING PANELS/SECTIONS. For ease of handling and transportation, individual panels/sections may be connected or sewn together in the field. Do not use heat welding methods to join panels. Join the panels in a manner that will prevent silt, sediment, debris or turbidity to migrate from the work area. If joints are sewn together, use heavy duty #350 polyester twine thread to make double row 1/4-inch maximum stitches that will not unravel if broken.

684-3.3 CONDITIONS AND TIMING FOR INSTALLATION. Install silt curtain instead of silt fence when fence free board is anticipated to be less than 1-foot or as directed by the Engineer. Install as soon as open water appears in the spring and before the embankment begins to thaw.

684-3.4 ANCHORS. Provide anchors in the size and number required to maintain the curtain in position for proper and continuous operation once deployed. Mark the vertical position of the anchors with crown buoys to warn of their hazard and facilitate easy recovery.

Attach anchor chains between the anchor line and anchor to prevent line fouling, to lower the angle of load pulling on the anchor, and to act as a shock absorber.

Employ anchor line buoys to help prevent line entanglement and stress on the boom.

Equip each anchor with a minimum of 10 feet of anchor chain.

684-3.5 MAINTENANCE. After installation, maintain the floating silt curtain in proper working order until the embankment has 70 percent vegetative cover. Maintain curtain used to control other areas of the work until sediment in suspension has settled and floating debris has been removed. Removal must be approved by the Engineer. Conduct the removal during periods of calm weather. Remove the curtain carefully to minimize the release of trapped sediment and debris. Do not drag the curtain while in contact with the water channel bottom.

Maintain the integrity of the curtain as long as it is necessary to contain sediment. Inspect daily and correct deficiencies immediately. Remove and dispose of the curtain when adequate vegetative growth insures no further erosion of the slopes.

METHOD OF MEASUREMENT

684-4.1 See Section 90. At the water line along the face of the flotation at the contract price per foot.

BASIS OF PAYMENT

684-5.1 Payment will be made as follows: 60 percent for installation. 25 percent for maintenance and repairs, prorated over the anticipated active construction period with a portion included as part of each interim payment. If the anticipated construction period changes, the remainder for maintenance will be prorated over the new period. 15 percent for removing it from the site.

Payment will be made under:

Item P684.010.0000 Floating Silt Curtain – per linear foot

ITEM P-686 FIBER ROLL

DESCRIPTION

686-1.1 Furnish, place, maintain, and remove fiber rolls as shown on the Plans or as directed.

MATERIALS

686-2.1 FIBER ROLL. Fiber Rolls shall be constructed with a pre-manufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 6 feet and 8 feet in width and between 65 feet and 95 feet in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 6 inches or longer in length. The blanket shall have a photodegradable plastic netting or biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 6 feet apart along the full length of the roll and placed 6 inches from the ends of each roll. The finished roll shall be between 8 inches and 10 inches in diameter, a minimum of 20 feet in length, and shall weigh a minimum of 0.5 pound per linear foot. More than one blanket may be required to achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 6 inches along the length of the blanket.

686-2.2 STAKES. Wood stakes shall be a minimum of 1-inch by 1-inch by 24 inches long in size. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

CONSTRUCTION REQUIREMENTS

686-3.1 Install fiber rolls before excavation or embankment construction begins.

686-3.2 INSTALLATION. Fiber rolls shall be installed as follows:

a. Furrows shall be constructed to a depth between 2 inches and 4 inches, and to a sufficient width to hold the fiber roll. Stakes shall be installed 24 inches apart along the length of the fiber rolls and stopped at 12 inches from each end of the rolls. Stakes shall be driven to a maximum of 2 inches above, or flush with the top of the roll.

b. Fiber rolls shall be placed 10 feet apart along the slope for slope inclination (horizontal:vertical) of 2:1 and steeper, 15 feet apart along the slope for slope inclination of 2:1 and 4:1, 20 feet apart along the slope for slope inclination between 4:1 and 10:1, and a maximum of 50 feet apart along the slope for slope inclination of 10:1 and flatter.

c. The bedding area for the fiber roll shall be cleared of obstructions including rocks, clods, and debris greater than 1-inch in diameter before installation.

d. Fiber rolls shall be installed approximately parallel to the slope contour.

e. Fiber rolls shall be installed before the application of other temporary erosion control or soil stabilization materials in the same area.

686-3.3 MAINTENANCE AND REMOVAL. Fiber rolls shall be maintained to disperse concentrated water runoff and to reduce runoff velocities. Split, torn, or unraveled rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills or other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

When no longer required, as determined by the Engineer, fiber rolls shall be removed and disposed. The fiber rolls may be abandoned in place when approved in writing by the Engineer. If approved, the stakes shall be removed or pounded into the ground.

METHOD OF MEASUREMENT

686-4.1 Fiber rolls shall be measured by the linear foot measured along the centerline of the installed roll. Where fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

BASIS OF PAYMENT

686-5.1 Payment will be made at the contract unit price per linear foot for fiber roll. Payment includes full compensation for furnishing all labor, materials, tolls, equipment, and incidentals, and for doing all the work involved in stalling fiber rolls, complete in place, including furrow excavation and backfill, maintenance, and removal. Damage to fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense. If the following pay item is absent from the bid schedule, no payment will be made. All work, materials, and equipment required to complete the work will be subsidiary to pay item P641.030.0000 Temporary Erosion, Sediment and Pollution Control.

Payment will be made under:

Item P686.010.0000 Fiber Roll – per linear foot

ITEM P-687 GEOGRID FOR EMBANKMENT AND ROADWAY STABILIZATION AND REINFORCEMENT

687-1.01 DESCRIPTION. Furnish and install geogrid material as shown on the Plans.

MATERIALS

687-2.01 GEOGRID MATERIALS. Provide geogrid consisting of a regular network of connected polymer tensile elements with aperture geometry sufficient to provide significant mechanical interlock with the surrounding material. Provide dimensionally stable geogrid that is able to retain its geometry during construction. Provide geogrid structure that resists ultraviolet degradation and all forms of chemical and biological degradation encountered in the material in which it is buried.

Package, label, handle, and store geogrid material according to ASTM D 4873.

1. **Stabilization**. Provide geogrid that meets the survivability requirements in Table 687-1 and meets the physical requirements in Table 687-2.

2. **Reinforcement**. Provide geogrid that meets the survivability requirements in Table 687-1 and as shown on the Plans.

TABLE 687-1

GEOGRID SURVIVABILITY REQUIREMENTS

Property	Test Method	Units	Requirement	
			CLASS 1	CLASS 2
Ultimate Multi-Rib Tensile Strength[a]	ASTM D6637	lb./ft.	1230	820
Junction Strength[a]	ASTM D7737	lb.	25	25
Ultraviolet Stability (Retained Strength)	ASTM D4355	%	50% after 500 hours of exposure	

[a] *Minimum Average Roll Value (MARV) in any rib direction.*

TABLE 687-2

GEOGRID PHYSICAL REQUIREMENTS

Property	Test Method	Units	Requirement	
			CLASS 2	CLASS 1
2% Tensile Strength[a]	ASTM D6637	lb./ft.	≥ 400	≥ 260
5% Tensile Strength[a]	ASTM D6637	lb./ft.	≥ 800	≥ 540
Percent Open Area	COE, CW-02215	%	50 – 80	50 – 80
Aperture Size[b]	Direct measure	in.	0.5 – 3.0	0.5 – 3.0

[a] *Minimum Average Roll Value (MARV) in machine and cross-machine directions.*

[b] *measured as the spacing between parallel ribs.*

CONSTRUCTION REQUIREMENTS

687-3.1 SURFACE PREPARATION.

a. Soft Ground (CBR ≤3). Prepare surface by removal of stumps, brush, boulders, and sharp objects. Fill holes and ruts over 3 inches deep, with material shown on the Plans or as approved by the Engineer.

b. **Firm Ground (CBR >3)**. Compact and finish subgrade or subbase prior to placement of the geogrid.

687-3.2 GEOGRID PLACEMENT. Unroll geogrid directly onto the prepared ground surface in the direction of advancing construction, parallel to the centerline of the roadway or according to the Plans. Do not drag the geogrid across the subgrade. Install the geogrid in the longest continuous practical length, free from folds, creases or wrinkles. Hold the geogrid in place with pins, staples, sandbags or piles of granular material. Do not expose geogrids to sunlight for longer than 14 days after removal of protective covering.

a. **Soft Ground (CBR ≤3)**. Overlap geogrid panels a minimum of 24 inches at all joints with the upper geogrid in the direction that fill will be placed. Tie panels together securely with cable ties or hog rings at 20-foot intervals, or according to the manufacturer's recommendations.

b. **Firm Ground (CBR >3)**. Overlap geogrid panels a minimum of 12 inches at all joints in the direction that fill will be placed. Tie panels together securely with cable ties or hog rings at 20-foot intervals and hand-tension geogrid and stake to the ground at the edges, overlaps, and in the center of each roll, at 30-foot intervals or as shown on the Plans**.**

Place the beginning of each new roll beneath the end of the previous roll to prevent the advancing fill from lifting the geogrid. Stagger end overlaps at least 10 feet from other end overlaps in adjacent rolls.

687-3.3 PLACEMENT OF COVER MATERIAL. Do not operate equipment directly on the unprotected geogrid. Spread fill material in the direction of the fabric overlap. Compact using a smooth drum roller. Do not allow construction equipment to make sudden stops, starts, or turns on the cover material.

a. **Very Soft Ground (CBR < 1)**. End-dump material onto previously placed material and spread over the geogrid with a low ground pressure dozer to the depth permitted. Maintain a minimum depth of 12 inches of cover material at all times between the geogrid and the wheels or tracks of the construction equipment unless otherwise shown on the Plans. Do not dump material directly onto the geogrid. To prevent a mud wave, end-dump fill along the edges of the geogrid to form toe berms or access roads that extend one to two panel widths ahead of the remainder of the embankment fill placement. After constructing the two berms, spread fill in the area between the toe berms by placing material parallel to the alignment and symmetrical from the toe berms inward toward the center to maintain a U-shaped leading edge (i.e., concave outward) to contain the mud wave. Limit height of dumped piles above the geogrid to avoid local bearing failure. Traffic on the first lift should be parallel to the embankment alignment. Do not allow construction equipment to turn on the first lift. Compact first lift by tracking in place with dozers or end-loaders. Compact with specified compaction equipment once embankment is at least 2 feet above the geogrid.

b. **Soft Ground (1 ≤ CBR ≤ 3)**. End-dump material onto previously placed material and spread over the geogrid with a low ground pressure dozer to the depth permitted. Maintain a minimum depth of 6 inches of cover material at all times between the geogrid and the wheels or tracks of the construction equipment unless otherwise shown on the Plans. Place the end-dumped material along the roadway centerline and spread it outward to the roadway edges to prevent the development of wrinkles or movement of the geogrid during construction. Fill in any ruts that form during construction with material shown on the Plans. Do not cut down the fill adjacent to the ruts.

c. **Firm Ground (CBR > 3)**. Maintain a minimum depth of 6 inches of cover material at all times between the geogrid and the wheels or tracks of the construction equipment.

687-3.4 GEOGRID REPAIR. Should the geogrid be torn, punctured, or the overlaps disturbed – as evidenced by visible geogrid damage – remove the backfill around the damaged area and repair or replace the damaged area at no additional expense to the State. Make repairs to the damaged area with a patch of the same type of geogrid originally placed. Overlay torn area with geogrid with a minimum

3-foot overlap around the edges of the torn area and secure as recommended by the geogrid manufacturer.

687-4.1 METHOD OF MEASUREMENT. By multiplying plan neat line width by the measured length in final position parallel to installation centerline along the ground surface. No allowance will be made for overlap, whether at joints or patches.

687-5.1 BASIS OF PAYMENT. Payment will be made at the contract unit price per square yard. Material used to fill ruts and holes will be paid for at the unit price for the type of material used. Payment will be made under:

Item P687.010.1000	Geogrid, Stabilization, Class 1 – per square yard
Item P687.010.2000	Geogrid, Stabilization, Class 2 – per square yard
Item P687.020.1000	Geogrid, Reinforcement, Class 1 – per square yard
Item P687.020.2000	Geogrid, Reinforcement, Class 2 – per square yard

SURFACE TREATMENT ITEMS

ITEM P-609 CHIP SEAL COAT

DESCRIPTION

609-1.1 This item shall consist of a chip seal coat as a wearing course composed of a single or multiple application of liquid asphalt material and aggregate cover placed on the prepared primed base or properly cured wearing surface, according to these Specifications, and shall conform to the dimensions and typical cross section shown on the Plans.

609-1.2 QUANTITIES OF MATERIALS. The approximate amounts of materials per square yard for the chip seal shall be as provided in Table 609-1 for the treatment specified on the Plans. The exact amounts shall be provided to the Engineer for review and approval.

TABLE 609-1. QUANTITIES OF MATERIALS

Application No	Aggregate lbs/yd^2	Asphalt gal/yd^2	Type of Asphalt \1\
1	40-50	0.35-0.45	Asphalt Cement
		0.40-0.50	Emulsified Asphalt
2	20-25	0.15-0.25	Asphalt Cement
		0.20-0.35	Emulsified Asphalt
3	15-20	0.15-0.20	Emulsified Asphalt

\1\ See Table 609-4 for grades of asphalt and spraying temperatures.

MATERIALS

609-2.1 AGGREGATE MATERIALS. The aggregate material shall be either crushed stone or crushed gravel. The cover material shall be screenings; sand may be used when specified.

If the material is to be crushed stone, it shall be manufactured from sound, hard, durable rock of accepted quality and crushed to specification size. All strata, streaks, and pockets of clay, dirt, sandstone, soft rock, or other unsuitable material accompanying the sound rock shall be discarded and not allowed to enter the crusher.

If the material is to be crushed gravel, it shall consist of hard, durable, fragments of stone or gravel of accepted quality and crushed to specification size. All strata, streaks, and pockets of sand, excessively fine gravel, clay, or other unsuitable material including all stones, rocks, and boulders of inferior quality shall be discarded and not allowed to enter the crusher. When tested according to ATM 305, the crushing of the gravel shall result in a product in which the material retained on the separate No. 4, 3/8-inch, and 1/2-inch sieves shall have at least 90% of particles with at least one fractured face.

TABLE 609-2. AGGREGATE MATERIAL REQUIREMENTS

Material Test	Requirement	Standard
L.A. Wear	Loss: 40% maximum	AASHTO T 96
Soundness of Aggregates by Use of Sodium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate	AASHTO T 104
Degradation Value	50 minimum	ATM 313
Percentage of Fractured Particles	Minimum 90% by weight of particles with at least one fractured faces[1]	ATM 305
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles at 3:1	ATM 306

[1] The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces. Fractured faces shall be achieved by crushing.

The crushed aggregate for the applications shall meet the requirements for gradation given in Table 609-3 when tested according to ATM 304.

TABLE 609-3. REQUIREMENTS FOR GRADATION OF AGGREGATE[1]

Sieve Designation (square openings)	Percentage by Weight Passing Sieves		
	Aggregate No. 1	Aggregate No. 2	Aggregate No. 3
1 inch	100		
3/4 inch	90-100		
1/2 inch	20-55	100	
3/8 inch	0-15	85-100	100
No. 4	0-5	10-30	60-85
No. 8		0-10	0-25
No. 16		0-5	0-5
No. 200	0-1	0-1	0-2

[1] Locally available aggregate used for chip seals with similar gradations may be used provided the maximum aggregate size is the same; and the aggregate meets all other quality requirements in these specifications.

The gradations in the table represent the limits which shall determine suitability of aggregate for use for the specified applications from the sources of supply. The final gradations decided on, within the limits designated in the table, shall be uniformly graded from coarse to fine.

The aggregate to be used shall show no evidence of stripping or swell when tested according to according to ATM 414. The use of antistrip agents for the control of stripping shall be used if necessary.

609-2.2 ASPHALT MATERIAL. The types, grades, controlling specifications, and application temperatures for the asphalt materials are shown in Table 609-4. Provide the specific liquid asphalt material designated in the Plans.

TABLE 609-4. ASPHALT MATERIALS

Type and Grade	Specification	Spraying Temperature \1\Deg. F
Asphalt Cement		
PG 52-28	AASHTO M 320	275+
Emulsified Asphalt		
RS-1	AASHTO M 140	70-140
RS-2	AASHTO M 140	125-175
MS-1, HFMS-1	AASHTO M 140	70-160
CRS-1	AASHTO M 208	125-175
CRS-2	AASHTO M 208	125-175
CRS-2P	AASHTO M 316	140-170

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

The Contractor shall provide samples of the asphalt material and a copy of the manufacturer's Certificate of Analysis (COA) for each carload or equivalent of the asphalt material to the Engineer for review and

acceptance before the asphalt material is applied. If the asphalt emulsion is diluted at other than the manufacturer's facility, the Contractor shall provide a supplemental COA from an independent laboratory verifying the asphalt emulsion properties. The furnishing of COA for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

609-2.3 SAMPLING AND TESTING Sampling and testing is the responsibility of the Contractor. Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor, subject to approval by the Engineer. Sampling shall be according to ATM 301 for aggregates and ATM 401 for asphalt material, unless otherwise directed. Perform aggregate gradation tests on each sample according to ATM 304. Perform all other aggregate tests on the initial source samples and repeat tests when there is a change of source. Perform sieve analyses daily from material samples. The tests shall include an analysis of each gradation of material. Submit copies of test results to the engineer, within 24 hours after completion of each test.

CONSTRUCTION METHODS

609-3.1 WEATHER LIMITATIONS. Asphalt material shall be applied only when the existing surface is dry and the atmospheric temperature is above 60°F. No material shall be applied when rain is imminent or when dust or sand is blowing.

609-3.2 EQUIPMENT AND TOOLS. The Contractor shall furnish all equipment, tools, and machines necessary for the performance of the work.

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

b. Aggregate Spreader. The aggregate spreader shall be a self-propelled mechanical spreader or truck-attached mechanical spreader capable of uniformly distributing aggregate at the specified rates.

c. Power Rollers. Power rollers shall be steel-wheeled or pneumatic-tired type, conforming to the following requirements:

(1) Steel-wheeled rollers shall have at least one steel drum and weigh a minimum of 5 tons. Steel wheels of the rollers shall be equipped with adjustable scrapers.

(2) Pneumatic-tired rollers shall be self-propelled and have wheels mounted on two axles in such manner that the rear tires will not follow in the tracks of the forward group. Tires shall be uniformly inflated to not less than 60 psi nor more than 80 psi pressure. The pneumatic-tired rollers shall be equipped with boxes or platforms for ballast loading and shall be loaded so that the tire print width of each wheel is not less than the clear distance between tire prints.

d. Power Broom. A power broom and/or blower shall be provided for removing loose material from the surface to be treated.

609-3.3 PREPARING UNDERLYING COURSE. The surface of the underlying course shall be prepared, shaped, and conditioned to a uniform grade and section, as shown on the Plans and as specified. Loose dirt and other objectionable material shall be removed from the surface.

On those type of bases where a prime coat is required and specified, the prime shall be applied and satisfactorily cured before starting the asphalt surface treatment.

When specified, the Contractor shall be required to patch, with premixed material, any holes or other malformations deviating from the true cross section and grade. The premixed material shall be made of the asphalt material specified and prepared by the method directed by the Engineer. All small patches shall be thoroughly hand tamped while the large patches shall be rolled with a power or pneumatic roller.

609-3.4 CONTROL STRIP. Prior to providing a complete chip seal coat and in the presence of the Engineer, treat three lengths of at least 100-feet for the full width of the distributor bar. Use the appropriate typical application rates shown in Table 609-1 for one surface treatment trial. Make other chip seal coat trials using various amounts of materials, as required by the Engineer.

609-3.5 APPLICATION OF ASPHALT MATERIAL. Asphalt material shall be applied on the properly prepared surface at the rate and temperature specified using a pressure distributor to obtain uniform distribution at all points. To insure proper drainage, the strips shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope. During all applications, the surfaces of adjacent structures shall be protected in such manner as to prevent their being spattered or marred. Asphalt materials shall not be discharged into borrow pits or gutters or upon the airport area.

609-3.6 APPLICATION OF AGGREGATE MATERIAL. Immediately after the application of the asphalt material, or as directed by the Engineer, uniformly spread the aggregates over the asphalt material at the rate specified for each designated application. Trucks spreading aggregate shall be operated backward so that the asphalt material will be covered before the truck wheels pass over it. The aggregate shall be spread in the same width of application as the asphalt material and shall not be applied in such thickness as to cause blanketing. Back-spotting or sprinkling of additional aggregate material, and pouring additional asphalt material over areas that show up having insufficient cover or asphalt, shall be done by hand whenever necessary. Additional spreading of aggregate material shall be done with a motor-patrol grader equipped with broom moldboard, a broom drag, kick broom, or a power broom, as directed by the Engineer.

Immediately after spreading each application, the aggregate shall be rolled. The rolling shall be continued until no more aggregate can be worked into the surface. In the construction of the second and third application, blading with the wire-broom moldboard attachment, kick broom, or broom dragging shall begin as soon as possible after the rolling has started and after the surface has set sufficiently to prevent excessive marking. Further blading and rolling on the strip being placed and on adjacent strips previously placed, shall be done as often as necessary to keep the aggregate material uniformly distributed. These operations shall be continued until the surface is evenly covered and cured to the satisfaction of the Engineer.

Succeeding applications shall not be applied until the preceding application has set and in no case until at least 24 hours have elapsed. If dust, dirt, or other foreign matter accumulates on the surface between the applications, the Contractor shall sweep and clean the surface as specified herein. The asphalt material and the aggregate shall be spread upon the clean and properly cured surface and handled as required. Avoid brooming or tracking dirt or any foreign matter on any portion of the pavement surface under construction.

All surplus aggregate from the final application shall be swept off the surface and removed prior to final acceptance of the work.

609-3.7 CORRECTION OF DEFECTS. Any defects, such as raveling, low centers, lack of uniformity, or other imperfections, shall be corrected to the satisfaction of the Engineer.

All defective materials resulting from over-heating, improper handling, or improper application shall be removed by the contractor and replaced with approved materials according to these specifications.

609-3.8 FREIGHT AND WAYBILLS. Before the final estimate is allowed the Contractor shall file with the Engineer receipted bills where railroad shipments are made, and certified waybills when materials are received in any other manner, of the asphalt and covering materials actually used in the construction

covered by the contract. The Contractor shall not remove asphalt material 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 all freight bills and waybills shall be furnished to the Engineer during the progress of the work.

METHOD OF MEASUREMENT

609-4.1 The asphalt material will be measured by the ton. Water added to emulsified asphalt will not be measured for payment.

609-4.2 The quantity of aggregate material for the first, second, and third application to be paid for will be the number of tons of aggregate used for the accepted work.

609-4.3 Chip Seal Coat, [number of aggregate] Applications. Section 90, by square yard of chip seal coat. Chip seal coat will be measured by the square yard, all preparation, materials, and application, completed and accepted. Liquid asphalt material, aggregate, blotter material, water used for aggregate and preparation, sweeping and dust control are subsidiary to P-609 items. Any areas of asphalt surface treatment found unacceptable by the Engineer shall be removed and reconstructed at the Contractor's expense. The pay unit/payment is for all layers/full depth of the surface treatment.

BASIS OF PAYMENT

609-5.1 Payment will be made at the contract unit price per ton for asphalt material for surface treatment and per ton for the first, second, and third aggregate application, or by the square yard for the completed chip seal coat application, as shown in the Bid Schedule.

Payment will be made under:

Item P609.010.0000	Asphalt Material – per ton
Item P609.020.0000	First Application Aggregate – per ton
Item P609.030.0000	Second Application Aggregate – per ton
Item P609.040.0000	Third Application Aggregate – per ton
Item P609.050.0000	Chip Seal Coat, ____Applications – square yard.

TESTING REQUIREMENTS

ATM 301	Sampling of Aggregates
ATM 304	Sieve Analysis of Aggregates & Soils
ATM 305	Percentage of Fracture in Coarse Aggregate
ATM 306	Percentage of Flat and Elongated Particles in Coarse Aggregate
ATM 313	Degradation Value of Aggregate
ATM 401	Sampling Asphalt Materials
ATM 414	Anti-Strip Requirements of Hot Mix Asphalt
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

MATERIAL REQUIREMENTS

AASHTO M 140	Emulsified Asphalt
AASHTO M 208	Cationic Emulsified Asphalt
AASHTO M 320	Performance Graded Asphalt Binder

ITEM P-626 EMULSIFIED ASPHALT SLURRY SEAL SURFACE TREATMENT

DESCRIPTION

626-1.1 This item shall consist of a mixture of emulsified asphalt, polymer, mineral aggregate, and water properly proportioned, mixed, and spread on an asphalt pavement surface, including airport pavements serving airplanes of 12,500 lbs or less, roads, and other general applications. The application of the surface treatment shall be according to these Specifications and shall conform to the dimensions shown on the Plans or as directed by the Engineer.

626-1.2 ACRONYMS. Also see Subsection GCP-10-02.

ISSA International Slurry Surfacing Association, Washington, DC

MATERIALS

626-2.1 AGGREGATE. The aggregate shall consist of sound and durable manufactured sand, slag, crusher fines, crushed stone, or a combination thereof. The aggregate shall be clean and free from vegetable matter, dirt, and other deleterious substances. The aggregate shall have a sand equivalent of not less than 45 percent when tested according to ATM 307. The aggregate shall show a loss of not more than 35 percent when tested according to AASHTO T 96. The sodium sulfate soundness loss shall not exceed 12 percent, after 5 cycles when tested according to AASHTO T 104. Aggregates shall have a minimum degradation value of 50 when tested according to ATM 313. Aggregate shall be 100% crushed.

The combined aggregate shall conform to the gradation shown in Table 626-1 when tested according to ATM 304. The specific aggregate gradation type will be designated in the Plans.

TABLE 626-1. GRADATION OF AGGREGATES

Sieve Size	Percent by Weight Passing Sieve		
	Type I	Type II	Type III
3/8 in.	100	100	100
No. 4	100	90 - 100	70 - 90
No. 8	90 - 100	65 - 90	45 - 70
No. 16	65 - 90	45 - 70	28 - 50
No. 30	40 - 65	30 - 50	19 - 34
No. 50	25 - 42	18 - 30	12 - 25
No. 100	15 - 30	10 - 21	7 - 18
No. 200	10 - 20	5 - 15	5 - 15
Residual asphalt content, percent dry weight of aggregate	10% - 16%	7.5% - 13.5%	6.5% - 12%

The job mix design (JMD) shall be run using aggregate within the gradation band for the desired type shown in Table 626-1. Once the JMD has been submitted and approved by the Engineer, the aggregate used on the project shall not vary by more than the tolerances shown in Table 626-2. At no time shall the aggregate used go out of the gradation bands in Table 626-1.

The aggregate will be accepted at the job location or stockpile. The aggregate will be accepted based on five gradation test samples according to ATM 301. If the average of the five tests is within the gradation tolerances, the materials will be accepted by the Engineer. If the tests show the material to be out of tolerance, the Contractor has the choice either to remove the material or blend other aggregates with the stockpile material to bring it into specification. Materials used in blending shall meet the quality tests before blending and shall be blended in a manner to produce a consistent gradation. This blending may require a new JMD.

Screening shall be required at the project stockpile site if there are oversize materials in the mix. Precautions shall be taken to prevent segregation of the aggregate in storing and handling. The stockpile shall be kept in areas that drain readily.

a. **Aggregate Tolerance.** Once the JMD has been accepted, the aggregate gradation used on the project may vary from the aggregate gradation used in the JMD on each sieve by the percentages shown in Table 626-2. If the project aggregate fails to remain within this tolerance, a new JMD will be required by the Engineer at the expense of the Contractor.

TABLE 626-2. AGGREGATE TOLERANCE

Sieve Size	Tolerance, percent passing by weight
3/8 in.	± 5
No. 4	± 5
No. 8	± 5
No. 16	± 5
No. 30	± 5
No. 50	± 4
No. 100	± 3
No. 200	± 2
Residual Asphalt, percent dry weight of aggregate	± 1

626-2.2 MINERAL FILLER. If mineral filler, in addition to that naturally present in the aggregate, is necessary, it shall meet the requirements of AASHTO M 17 and shall be used in the amounts required by the JMD. The mineral filler shall be considered as part of the aggregate.

626-2.3 EMULSIFIED ASPHALT. The specific emulsified asphalt is designated in the Plans, and shall conform to the requirements of AASHTO R 5. The cement mixing test is waived for these slurry type emulsions. The type of emulsified asphalt shall be either anionic or cationic, whichever is best suited to the aggregate and job conditions to be encountered.

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

626-2.4 POLYMER. The Contractor shall submit manufacturer's technical data, the manufacturer's certification indicating that the polymer meets the requirements of the specification, and the asphalt material manufacturer's approval of its use to the Engineer.

626-2.4 WATER. All water used in mixing or curing the slurry shall be from potable sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

COMPOSITION AND APPLICATION

626-3.1 COMPOSITION. The slurry seal shall consist of a mixture of emulsified asphalt, mineral aggregate, a minimum of 1% polymer (when specified), additives as necessary, and water.

626-3.2 JOB MIX DESIGN. No slurry seal for payment shall be placed until a JMD has been approved by the Engineer. The JMD shall be developed by a laboratory with experience in designing slurry seal mixes and a signed copy shall be submitted in writing by the Contractor to the Engineer at least 10 days prior to the start of operations.

The laboratory report JMD shall indicate the proportions of aggregates, mineral filler (min. and max.), water (min. and max.), polymer (%), and asphalt emulsion based on the dry aggregate weight. It shall also report the quantitative effects of moisture content on the unit weight of the aggregate (bulking effects). The JMD shall be in effect until modified in writing by the Engineer. Should a change in sources of materials be made, a new JMD shall be established before the new material is used.

The Contractor shall submit to the Engineer for approval a complete JMD on the materials proposed for use, prepared and certified by an approved laboratory. Compatibility of the aggregate, emulsion, mineral filler, and other additives shall be verified by the JMD. The JMD shall be made with the same aggregate and grade of emulsified asphalt that the Contractor will provide on the project. At a minimum the required tests and values needed are shown in Table 626-3:

TABLE 626-3. SLURRY MIX TESTS

TEST	DESCRIPTION	SPECIFICATION
ISSA TB-100	Wet Track Abrasion of Slurry Surfacing Systems, One Hour Soak	50 g/ft² Max
ISSA TB-115	Determination of Slurry Seal Compatibility	Pass

626-3.3 APPLICATION RATE. Unless otherwise specified, the slurry seal shall be applied to at the application rates shown in Table 626-4 for that gradation of material used. The rate of application shall not vary more than ± 2 lb/yd².

TABLE 626-4. SLURRY APPLICATION RATES
(Pounds of mixture per square yard)

Type I	Type II	Type III
8 - 12	12 - 20	18 - 30

626-3.4 CONTROL STRIPS. Control Strips, of 60 yd^2 each, shall be placed prior to the start of the slurry seal work in the presence of the Engineer. The test area will be designated by the Engineer and will be located on the existing pavement. Control strips shall be made by each machine after calibration. Samples of the slurry seal may be taken and the mix consistency verified by using ISSA TB-106 Slurry Seal Consistency test. In addition, the proportions of the individual materials may be verified by the Engineer by using the calibration information provided after machine calibration. If any test does not meet specification requirements, additional tests shall be made at the expense of the Contractor, until an acceptable control strip is placed.

CONSTRUCTION METHODS

626-4.1 WEATHER LIMITATIONS. The slurry seal shall not be applied if the pavement or air temperature is below 50°F and falling but may be applied when both pavement and air temperature are above 45°F and rising. No slurry seal shall be applied when there is danger that the finished product will freeze before 24 hours. Do not apply slurry seal during rain or other adverse weather conditions. The mixture shall not be applied when weather conditions prolong opening to traffic beyond a reasonable time.

626-4.2 EQUIPMENT AND TOOLS. The Contractor shall furnish all equipment, tools, and machinery necessary for the performance of this work.

a. **Slurry Mixing Equipment.** The machine shall be specifically designed and manufactured to lay slurry seal. The material shall be mixed by a self-propelled slurry seal mixing machine of either truck mounted or continuous run design. Either type machine shall be able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler, and water to a revolving mixer and discharge the mixed product on a continuous flow basis. The machine shall have sufficient storage capacity for materials to maintain an adequate supply to the proportioning controls.

   If continuous run equipment is used, the machine shall be equipped to allow the operator to have full control of the forward and reverse speed of the machine during application of the slurry seal,

with a self-loading device, with opposite side driver stations, all part of original equipment manufacturer design.

The aggregate shall be pre-wetted immediately prior to mixing with the emulsion. The mixing unit of the mixing chamber shall be capable of thoroughly blending all ingredients. No excessive mixing shall be permitted. The mixing machine shall be equipped with a fines feeder that provides an accurate metering device or method to introduce a predetermined proportion of mineral filler into the mixer at the same time and location that the aggregate is fed into the mixer.

The mixing machine shall be equipped with a water pressure system and fog-type spray bar adequate for complete fogging of the surface with an application of 0.05 to 0.10 gal/yd² preceding the spreading equipment.

Sufficient machine storage capacity to mix properly and apply a minimum of 5 tons of the slurry shall be provided. Proportioning devices shall be calibrated prior to placing the slurry seal.

b. Slurry Spreading Equipment. The mixture shall be spread uniformly by means of a conventional surfacing spreader box attached to the mixer and equipped to agitate and spread the material evenly throughout the box. A front seal shall be provided to ensure no loss of the mixture at the surface contact point. The rear seal shall act as the final strike-off and shall be adjustable. The spreader box and rear strike-off shall be so designed and operated to produce a free flow of material of uniform consistency to the rear strike-off. The spreader box shall have suitable means provided to side shift the box to compensate for variations in the pavement geometry. A burlap drag or other approved screed may be attached to the rear of the spreader box to provide a uniform mat.

A continuous spreading operation shall be maintained by means of a continuous charging operation so that a minimum of construction joints occur. Continuous operating is defined as one in which the spreading operation progresses prior to initial setting or breaking of the slurry mix, which starts within approximately 15 minutes.

Provide suitable storage facilities for the asphalt emulsion, using containers equipped to prevent water from entering the emulsion. If necessary, suitable heat shall be provided to prevent freezing.

c. Auxiliary Equipment. Other tools or equipment such as brushes, hand squeegees, hose equipment, tank trucks, water distributors and flushers, power blowers, barricades, etc., shall be provided as required.

d. Roller. The roller shall be a self-propelled pneumatic-tired roller capable of exerting a contact pressure during rolling of 50 psi. It shall be equipped with a water spray system, to be used if the slurry is picking up on the tires during rolling.

e. Tack Coat and Distributor. Normally a tack coat is not required unless the surface to be covered is extremely dry and raveled or is concrete or brick. If required, the tack coat should consist of one part emulsified asphalt and three parts water. The emulsified asphalt may be the same as that used in the mix. Pressure distributors used for application of the diluted asphalt emulsion tack coat shall be self-propelled, equipped with pneumatic tires, and capable of uniformly applying 0.05 to 0.15 gal/yd² of the diluted emulsion over the required width of application. Distributors shall be equipped with tachometers, pressure gages, and volume-measuring devices. The tack coat shall be applied at least 2 hours before the slurry seal but within the same day.

626-4.3 EQUIPMENT CALIBRATION. Each slurry mixing unit to be used on the project shall be calibrated in the presence of the Engineer prior to construction. Previous calibration documentation covering the exact materials to be used may be accepted by the Engineer provided they were made during the calendar year. The documentation shall include an individual calibration of each material at various settings, which can be related to the machine's metering devices. No machine will be allowed to

work on the project until either the calibration has been completed or a previous calibration is accepted by the Engineer.

626-4.4 PREPARATION OF EXISTING SURFACE. Clean pavement surface immediately prior to placing the tack coat and slurry seal coat by sweeping, flushing well with water leaving no standing water, or a combination of both, so that the pavement surface is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film. Remove oil or grease that has not penetrated the asphalt pavement by scraping or by scrubbing with a detergent, then wash thoroughly with clean water. Water flushing will not be permitted in areas where considerable cracks are present in the pavement surface. After cleaning, treat these areas with an oil spot primer.

All painted stripes or markings on the surface to be treated, shall be removed according to Subsection P-620-3.3. Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new asphalt pavement similar to that of the existing pavement. Materials and methods of construction shall comply with the applicable sections of these specifications. Remove all vegetation and debris from cracks to a minimum depth of 1-inch. If extensive vegetation exists, treat the specific area with a concentrated solution of a water-based herbicide approved by the Engineer. Fill all cracks greater than 1/4-inch (wide) with a crack sealant meeting ASTM D6690, Type IV. The crack sealant, preparation, and application shall be compatible with the surface treatment/overlay to be used. To minimize contamination of the asphalt with the crack sealant, underfill the crack sealant a minimum of 1/8-inch, not to exceed 1/4-inch. Any excess joint or crack sealant shall be removed from the pavement surface.

626-4.5 APPLICATION OF SLURRY SEAL COAT. Charge the mixture in the following order:

- **a.** Water
- **b.** Aggregate
- **c.** Asphalt Emulsion

No violent mixing will be permitted. Maintain temperature range at the mixer between 90 and 120 °F. Mix until a uniform coating of the aggregate is obtained. Continue mixing until the mixture is discharged into the spreader box. Discard the entire batch if there is evidence that the emulsion has broken.

The surface shall be pre-wet by fogging ahead of the slurry spreader box. Water used in pre-wetting the surface shall be applied at such a rate that the entire surface is damp with no apparent flowing water in front of the slurry spreader box. The slurry mixture shall be of the desired consistency when deposited on the surface, and no additional elements shall be added. Total time of mixing shall not exceed 2 minutes. A sufficient amount of slurry shall be carried in all parts of the spreader box at all times so that complete coverage of all surface voids and cracks is obtained. Care shall be taken not to overload the spreader box which shall be towed at a slow and uniform rate not to exceed 5 mph. No lumping, balling, or unmixed aggregate shall be permitted. No segregation of the emulsion and fines from the coarse aggregate will be permitted. If the coarse aggregate settles to the bottom of the mix, the slurry shall be removed from the pavement surface. A sufficient amount of slurry shall be fed into the box to keep a full supply against the full width of the spreader box. The mixture shall not be permitted to overflow the sides of the spreader box. No breaking of the emulsion will be allowed in the spreader box.

Apply the slurry seal to form a film with a maximum thickness of 3/8 inch. Isolated depressions and cracks may have a thickness greater than 3/8 inch in order to obtain a smooth surface.

The finished surface shall have no more than 4 tear or drag marks greater than 1/2 inch wide and 4 inches long in any 12 foot by 22 foot section. It shall have no tear or drag marks greater than 1 inch wide and 3 inches long.

The finished surface shall have no transverse ripples of 1/4 inch or more in depth, as measured with a 12-foot straight edge laid upon the surface.

Adjacent lanes shall be lapped at the edges a minimum of 2 inches with a maximum of 4 inches to provide complete sealing at the overlap. Construction longitudinal and transverse joints shall be neat and uniform without buildup, uncovered areas, or unsightly appearance. All joints shall have no more than 1/4 inch difference in elevation when measured across with a 12-foot straight edge.

After application of the slurry seal, the surface shall be rolled with a pneumatic-tired roller a minimum of 2 complete passes. The roller shall be operated at a tire pressure of approximately 50 psi.

The fresh slurry seal application shall be protected by barricades and markers and permitted to dry for 4 to 24 hours, depending on weather conditions. Any damage to uncured slurry shall be repaired at the expense of the Contractor.

In areas where the spreader box cannot be used, the slurry shall be applied by means of a hand squeegee. Upon completion of the work, the seal coat shall have no holes, bare spots, or cracks through which liquids or foreign matter could penetrate to the underlying pavement. The finished surface shall present a uniform and skid resistant texture satisfactory to the Engineer. All wasted and unused material and all debris shall be removed from the site prior to final acceptance.

Upon completion of the project, the Contractor shall sweep the finished surface with a conventional power rotary broom, to remove any potential loose material from the surface. The material removed by sweeping shall be disposed of in a manner satisfactory to the Engineer.

626-4.6 CERTIFICATION. Samples of the emulsion that the Contractor proposes to use, together with a statement as to its source, shall be submitted, and approval shall be obtained before using such material. The Contractor shall submit to the Engineer a manufacturer's certified report for each consignment of the emulsion. The manufacturer's certified report shall not be interpreted as a basis for final acceptance. All such reports shall be subject to verification by testing samples of the emulsion as received for use on the project.

METHOD OF MEASUREMENT

626-5.1 The emulsified asphalt for slurry coat will be measured by the square yard.

626-5.2 Aggregate will be measured by the ton of dry aggregate.

626-5.3 Tack coat will be measured by the ton.

626-5.4 Emulsified Asphalt Slurry Seal Surface Treatment will be measured according to Section 90 by the square yard, all preparation, materials, and application, completed and accepted. Liquid asphalt material, aggregate, blotter material, water used for emulsion and preparation, sweeping and dust control are subsidiary to the work. Any areas of emulsified asphalt slurry seal surface treatment found unacceptable by the Engineer shall be removed and reconstructed at the Contractor’s expense. The pay unit/payment is for all layers/full depth of slurry seal surface treatment.

BASIS OF PAYMENT

626-6.1 Payment will be made at the contract unit price per square yard for the slurry coat and at the contract price per ton for aggregate and tack coat.

Payment will be made under:

Item P626.010.0000	Emulsified Asphalt for Slurry Coat - per square yard
Item P626.020.0000	Aggregate - per ton
Item P626.030.0000	Emulsified Asphalt for Tack Coat - per ton
Item P626.040.0000	Emulsified Asphalt Slurry Seal Surface Treatment – per square yard

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 313	Degradation Value of Aggregates
ISSA TB-100	Wet Track Abrasion of Slurry Surfacing Systems
ISSA TB-106	Measurement of Slurry Seal Consistency
ISSA TB-115	Determination of Slurry System Compatibility
ASTM C1602	Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D6690	Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ATM 301	WAQTC FOP for AASHTO T 2 Sampling of Aggregates
ATM 304	WAQTC FOP for AASHTO T 27/T 11 Sieve Analysis of Fine and Coarse Aggregates
ATM 307	WAQTC FOP for AASHTO T 176 Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
ATM 313	Degradation Value of Aggregates

MATERIAL REQUIREMENTS

AASHTO M 17	Mineral Filler for Bituminous Paving Mixtures
AASHTO R 5	Selection and Use of Emulsified Asphalts

TURFING ITEMS

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. Provide the seed mixture as specified in the Special Provisions. Provide seed collected or harvested within 2 years of the targeted seeding date. Provide all seed in pure live seed (PLS) unless otherwise directed.

Provide seed true of genus and species. Meet the applicable requirements of the State of Alaska Seed Regulations, 11 AAC 34, Articles 1 and 4, and the Federal Seed Act, 7 CFR Part 201.

The Engineer will review requests for species or cultivar substitution(s); genus substitution is not allowed. Substitution requests need to be submitted a minimum of 60 calendar days in advance of delivery.

a. Prohibited and Restricted Noxious Weeds and Quarantined Pests. Provide seed and appliances certified to be free of prohibited noxious weeds or quarantined pests, and certified to contain no more than the maximum allowable tolerances for restricted noxious weeds, according to Alaska Administrative Code, Title 11, Chapter 34 (11 AAC 34).

1. Seed or appliances found to contain prohibited noxious weeds or quarantined pests will be rejected, according to 11 AAC 34.020(a) and 11 AAC 105-180, respectively.

2. Seed or appliances found to contain restricted noxious weed seed in excess of the maximum allowable tolerance per pound will be rejected, according to 11 AAC 34.020(b).

Prohibited and restricted noxious weeds are listed in 11 AAC 34.020, and can be viewed at the following URL: http://plants.alaska.gov/invasives/noxious-weeds.htm.

b. Labeling. Ensure each bag or container of individual seed species is labeled to meet requirements of 11 AAC 34.010. Do not remove labels from bags or containers.

c. Certification. Certify seed is free of prohibited noxious weeds and restricted noxious weeds are within allowable tolerances. Provide to the Engineer no later than 10 days prior to seeding 4 signed copies of a statement signed by the vendor identifying the lot number or lot numbers, certifying each lot of seed has been tested within the preceding nine months, by a recognized seed testing laboratory, a member of the Association of Official Seed Certifying Agency (AOSCA), or the Alaska Plant Materials Center.

Include the following in each certification:

(1) name and address of laboratory

(2) date of test

(3) lot number

(4) seed name

(5) percent pure seed

(6) percent germination

(7) percent weed content

(8) percent inert matter

Seed will be rejected if:

d. Contains prohibited noxious weeds;

e. Contains restricted noxious weeds above maximum allowable tolerances;

f. Not certified as tested within the preceding nine months;

g. Wet, moldy, or otherwise damaged in transit or storage; or

h. Containers do not have labels or the labels have been removed.

Seed may be rejected for:

i. Discrepancies in the lot numbers listed on the statement to the lot numbers indicated on the labels of the seed containers.

The Contractor shall immediately remove rejected seed from the project premises. If seed is rejected for containing prohibited noxious weeds or for exceeding maximum allowable tolerances of restricted noxious weeds, dispose of rejected seed according to 11 AAC 34.075(g).

901-2.2 FERTILIZER. Provide 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 in the Special Provisions. Use either of the following methods:

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. 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.

901-3.5 FINAL ACCEPTANCE. 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 acre. By the area of ground surface acceptably seeded, fertilized, and maintained. Required reseeding is subsidiary.

b. Seeding by the pound. By the weight of seed acceptably placed. Fertilizer is subsidiary. Any other work required will be measured separately.

c. Water for maintenance. By the M-gal (1,000 gallons) acceptably placed. Use a conversion factor of 8.34 pounds per gallon, if measured by weight. Use a conversion factor of 7.48 gallons per cubic foot, if measured by volume.

BASIS OF PAYMENT

901-5.1 Soil preparation, fertilizer, and water required for hydraulic method are subsidiary. Mulching will be measured and paid for under Item T-908.

a. Seeding by the Acre. Payment is for established vegetative mat.

b. Seeding by the Pound. Payment is for established vegetative mat.

c. Water for Seeding. Water applied for growth of vegetative mat.

Payment will be made under:

Item T901.010.0000	Seeding – per acre
Item T901.020.0000	Seeding – per pound
Item T901.030.0000	Water for Maintenance – per Mgal
Item T901.040.0000	Application of Bird Repellent – per contingent sum

ITEM T-903 SPRIGGING

DESCRIPTION

903-1.1 This item shall consist of planting sprigs of living grass plants at the locations shown on the plans or as directed by the Engineer in accordance with these Specifications.

MATERIALS

903-2.1 SPRIGS. Sprigs shall be healthy living stems (stolons or rhizomes), of native beach wildrye (Leymus mollis), harvested from areas within the airport property as shown on the plans or as directed by the Engineer. The presence of weeds or other material which might be detrimental to the proposed planting will be cause for rejection of sprigs.

903-2.2 NOT USED.

903-2.3 FERTILIZER. Provide 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.

903-2.4 WATER. All water used shall be sufficiently free from oil, acid, alkali, salt, or other harmful materials that would inhibit the growth of grass. Brackish water shall not be used at any time. It shall be subject to the approval of the Engineer prior to use.

CONSTRUCTION METHODS

903-3.1 GENERAL. Sprigging shall be done in accordance with the recommendations contained in the booklet, "Beach Wildrye Planting Guide for Alaska", 1994 by Stoney Wright with the Alaska Plant Materials Center located in Palmer, Ph. (907) 745-4469. This booklet can be downloaded at: http://plants.alaska.gov/reveg/coastal_06_beach-wildrye.php.

903-3.2 ADVANCE PREPARATION AND CLEANUP. After grading of areas has been completed and before applying fertilizer, areas to be sprigged shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris which might interfere with sprigging, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after grading of areas and before beginning the application of fertilizer, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

903-3.3 APPLYING FERTILIZER. Following advance preparation and cleanup, fertilizer shall be uniformly spread at a rate which will provide not less than the minimum quantity of each fertilizer ingredient as stated in the special provisions. Apply fertilizer at the rate of 550 pounds per acre. Apply fertilizer with power sprayers, blower equipment, or other approved methods.

903-3.4 HARVESTING SPRIGS. Harvesting may be performed by any method acceptable to the Engineer, including crisscross cultivation, shallow plowing, or other acceptable methods to thoroughly loosen the sprigs from the soil and to bring them to the surface. After loosening the sprigs from the soil, they shall be gathered in small piles or windrows, watered, and kept moist until planted. Stockpile sprigs in designated or approved areas.

Sprigs that have heated in stockpiles, have become frozen, permitted to dry out, or otherwise seriously damaged during harvesting or delivery shall be rejected and shall be disposed of as directed by the Engineer.

903-3.5 PLANTING SPRIGS. Accomplish planting and fertilizing after June 1 and before September 1. Sprigging shall not be done during windy weather, or when the ground is dry, excessively wet, frozen, or otherwise untillable. If the soil is not moist when the sprigs are being set, water shall be applied until the soil is moist and in a workable condition.

Furrows shall be opened along the approximate contour of slopes at 3 foot spacings and 5 inches in depth. Sprigs shall be placed without delay in the open furrow at 3 foot on center spacing, and the roots of each sprig shall be covered immediately with soil by employing the “drop and stomp” planting method. Provide sprig spacing uniformity of plus-minus 6 inches. Provide depth uniformity of plus-minus 1 inch.

903-3.6 NOT USED.

903-3.7 ESTABLISHING TURF. The Contractor shall be responsible for the proper care of the sprigged areas during the period when the plants are becoming established and he shall protect the sprigged areas against traffic by warning signs or barricades approved by the Engineer. Surfaces gullied or otherwise damaged following sprigging shall be repaired by regrading and resprigging as directed. The Contractor shall water as directed, and otherwise maintain sprigged areas in a satisfactory condition until final inspection and acceptance of the work.

METHOD OF MEASUREMENT

903-4.1 Sprigging shall be measured by area, measured on the ground surface, completed and accepted.

BASIS OF PAYMENT

903-5.1 Payment will be made at the contract unit price. This price shall be full compensation for providing and placing all material including fertilizing and watering of sprigged areas, and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item T903.010.0000	Sprigging – per acre
Item T903.020.0000	Sprigging – per square yard

ITEM T-905 TOPSOIL

DESCRIPTION

905-1.1 This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

MATERIALS

905-2.1 TOPSOIL. Provide 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.

The gradation shall conform to selected Class in Table 1 when tested according to ATM 304 If no class is indicated, meet the grading requirements in Table 1 for Class A topsoil.

TABLE 1
TOPSOIL GRADING

Sieve Designation	Percent Passing By Weight	
	CLASS A	CLASS B
3 in	-	100
1/2 in.	100	-
No. 4	95-100	75-100
No. 16	64-90	50-95
No. 200	30-60	20-80
Organic Matter	10-40	5 min.

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.

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 GCP Subsection 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 T905.010.0010	Topsoiling, Class A – per square yard
Item T905.020.0010	Topsoiling, Class A – per lump sum
Item T905.030.0000	Organic Material – per cubic yard
Item T905.040.0000	Organic/Silt Material – per cubic yard

TESTING REQUIREMENTS

ATM 304	WAQTC FOP for AASHTO T 27/T 11 Sieve Analysis of Fine and Coarse Aggregates

ITEM T-908 MULCHING

DESCRIPTION

908-1.1 This work consists of providing, placing, and maintaining soil stabilization material where shown on the Plans.

MATERIALS

908-2.1 MULCH. Virgin/recycled wood fiber, recycled paper (wood cellulose), or an acceptable blend containing up to 50% recycled paper, with the following characteristics:

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. Provide 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 METHODS

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 at the rate specified in the Special Provisions. If seeding is specified, complete the application of mulch or matting within 24 hours after seed is placed. When matting is shown on the plans, 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 GCP Subsection 90-02, acceptably placed.

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. Water, maintenance, and repair are subsidiary.

Payment will be made under:

Item T908.010.0000	Mulching – per square yard
Item T908.020.0000	Mulch – Straw – per square yard
Item T908.030.0000	Mulch - Shredded Bark Mulch – per square yard
Item T908.040.0000	Mulch - Hydraulic Erosion Control Products – per square yard

ITEM T-920 VEGETATIVE MAT

DESCRIPTION

920-1.1 Establish living vegetative cover by transplanting vegetative mats at the locations shown on the plans or as directed by the Engineer. Maintain the transplanted vegetative cover for the term of the contract. Comply with Fish Habitat Permit *[specify permit #]*.

MATERIALS

920-2.1 VEGETATIVE MAT. Use the vegetative mat from the portion of the existing slough impacted by construction.

920-2.2 FERTILIZER. If needed, use fertilizer that conforms to the requirements of 901-2.2 Fertilizer, using the same application rate specified in 901-3.3 Application. Fertilizers should generally not be necessary for transplanting vegetative mats, but may be required for soil repairs in 920-2.4.

920-2.3 WATER. Ensure that the water is sufficiently free from oil, acid, alkali, salt, or other harmful materials that would inhibit the growth of grass.

920-2.4 SOIL FOR REPAIRS. Use native soils similar to those found at the source of the relocated vegetative mats for fill of areas to be repaired.

CONSTRUCTION METHODS

920-3.1 GENERAL. Prepare the areas to be revegetated with mats by removing rocks larger than 2 inches in any diameter, logs, wood, and other debris. Dispose of debris below grade in areas to be restored or in other approved disposal areas. Grade subsoil so top surface of relocated vegetative mat will be at finish grade.

920-3.2 OBTAINING AND STORING VEGETATIVE MAT. Remove the vegetative mat from the slough or designated source using a backhoe and measure in size according to the size of the backhoe bucket. Dig a test hole to determine the depth of the vegetative mat which will be the depth where most of the roots/rhizome matter is retained. Stockpile the vegetative mat on heavy-duty impervious construction plastic. Staple the sides of the plastic together to create a wall effect to trap moisture. Keep the vegetative mat moist. Do not cover the vegetative mat during stockpiling, except when it is transported (rolling the plastic will facilitate the transportation of the vegetative mat in one piece; in case the vegetative mat breaks apart, then the individual broken pieces can be independently planted). Stockpile the vegetative mat for a minimal amount of time within the construction area for up to six months, or as directed by the Engineer.

920-3.3 LAYING VEGETATIVE MAT. Scarify or add soil as necessary to the plant site to promote root growth, then add vegetative mat. Tap down the mat so that it is in direct contact with the soil, and water the mat thoroughly.

920-3.4 WATERING. Ensure that adequate water and watering equipment is on hand before relocating vegetative mat. Keep vegetative mat moist until it has become established and continued growth is assured. Water in a manner that will avoid erosion from the application of excessive quantities and avoid damage to the finished surface.

920-3.5 REPAIRING. When the surface has become bullied or otherwise damaged during the period covered by this contract, repair the affected areas to re-establish the grade and the condition of the soil, as directed by the Engineer.

METHOD OF MEASUREMENT

920-4.1 GCP Section 90 by the unit area of surface covered with vegetative mat in final position as accepted by the Engineer.

BASIS OF PAYMENT

920-5.1 This item will be paid for on the basis of the contract unit price per square yard for relocated vegetative mat in final position as full compensation for all labor, equipment, material, staking, and incidentals necessary to satisfactorily complete the items as specified. Water for maintenance is subsidiary except when it is listed in the bid schedule.

Payment will be made under:

Item T920.010.0000	Relocate Vegetative Mat – per square yard
Item T920.020.0000	Water for Maintenance – per Mgal

APPENDIX

(Designer to add Appendix Items here and list them in Table of Contents)