

CASCADE POINT
FERRY TERMINAL STAGE 1 DESIGN BUILD

Project No. HSHWY00015

REQUEST FOR PROPOSALS

PART II – CONTRACT REQUIREMENTS

May 23, 2025

**Alaska Department of Transportation and Public Facilities
Southcoast Region
6860 Glacier Highway
Juneau, AK 99801**

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PART II CONTRACT REQUIREMENTS

DIVISION 100 – GENERAL PROVISIONS

SECTION 101

DEFINITIONS AND TERMS

101-1.01 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.

Cited publications refer to the most recent issue, including interim publications, in effect on the date of the Request for Proposals, 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.

Beginning in Division 200 we use imperative mood and 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.

Beginning in Division 200 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."

101-1.02 ACRONYMS. Acronyms used in the Contract include the following (publications and plans are italicized):

AAC	<i>Alaska Administrative Code</i>
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AITC	American Institute of Timber Construction
ANSI	American National Standards Institute
AKOSH	Alaska Occupational Safety and Health
AS	<i>Alaska Statute</i>
ASDS	<i>Alaska Sign Design Specifications</i>
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing & Materials
ATM	Alaska Test Method (see <i>Alaska Test Methods Manual</i>)
ATSSA	American Traffic Safety Services Association
AWPA	American Wood Preservers Association
AWG	American Wire Gage
AWS	American Welding Society

AWWA	American Water Works Association
CFR	<i>Code of Federal Regulations</i>
CRSI	Concrete Reinforcing Steel Institute
DOLWD	Alaska Department of Labor and Workforce Development
DOT&PF	Alaska Department of Transportation and Public Facilities
EI	Edison Electrical Institute
EIA	Electronic Industries Association
FHWA	Federal Highway Administration
FOP	Field Operating Procedure (see <i>Alaska Test Methods Manual</i>)
FSS	Federal Specifications and Standards, General Services Administration
IMSA	International Municipal Signal Association
ICEA	Insulated Cable Engineers Association
ITE	Institute of Transportation Engineers
MRP	<i>Mining and Reclamation Plan</i>
MUTCD	<i>Manual on Uniform Traffic Control Devices</i>
NEC	<i>National Electrical Code</i>
NESC	<i>National Electrical Safety Code</i>
NEMA	National Electrical Manufacturers Association
SAE	Society of Automotive Engineers
SSHC	<i>DOT&PF Standard Specifications for Highway Construction</i>
SSPC	Steel Structures Painting Council
SWPPP	<i>Storm Water Pollution Prevention Plan</i>
UL	Underwriters Laboratory
WAQTC	Western Alliance for Quality in Transportation Construction (see <i>ATM Manual</i>)

101-1.03 DEFINITIONS.

ACCEPTANCE. The Contracting Agency's action in accepting the Work as conforming to the Contract requirements.

ACCEPTANCE TESTING or TESTING FOR ACCEPTANCE. An activity that is carried out by the IQF and consists of a series of material tests of the work in accordance with the Specifications, the materials testing frequency schedule, and the Construction Quality Management Plan. Passing tests will be used to document Project compliance with the Specifications. Failing tests will be cause for rework to achieve a passing test result in accordance with the Construction Quality Management Plan.

ALASKA BIDDER. A Proposer who is eligible for a 5 percent preference in procurement scoring of the Price Proposal according to AAC 12.260(d) and meets the requirements of AS 36.30.170(b).

ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES (DOT&PF). The Contracting Agency, also referred to as the Department.

ALASKA OFFEROR. A Proposer who is eligible for a 10 percent preference in procurement scoring of the Technical Proposal according to AAC 12.260(e) and meets the requirements of AS 36.30.170(b).

ALTERNATIVE TECHNICAL CONCEPT (ATC). A technical solution proposed by a Prequalified Proposer during the RFP phase of the Selection Process. An ATC is any proposed change to the Conceptual Design Plan and/or requirements which provides the same or better level of service, quality, and value as the Conceptual Design Plan. ATCs are proposed by the Prequalified Proposers in a pre-Proposal acceptance process, as required in the Instruction to Proposers, during the RFP phase of the Selection Process. The Contracting Agency reserves the sole right to accept and approve or reject a pre-Proposal submittal of an ATC for inclusion with a Proposer's Proposal. The Design-Builder shall be responsible for all costs associated with the investigation, preparation, submittal, and final implementation of an ATC; this includes but is not limited to design, changes to environmental documents, environmental compliance, and permitting, utilities relocation, ROW acquisition, construction, and warranty.

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.

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.

ALASKA TEST METHODS MANUAL. The materials testing manual used by the Department. 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.

AS-BUILT PLAN. Plans that show the final configuration of the work in the field after all approvals by the Department.

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.

BEST AND FINAL OFFER (BAFO). A revised Technical and Price Proposal, which may be requested by the Contracting Agency after submittal of the Technical and Price Proposals. The BAFO is optional at the sole discretion of the Contracting Agency.

BETTERMENT. The construction of an additional facility for a utility owner or other third party, or upgrading of a facility being relocated or rearranged for the Project, which is not attributable to construction of the Project or is made solely for the benefit of and at the election of the third party requesting the same.

BID. Equivalent to Proposal.

BID BOND. A type of bid guaranty.

BIDDER. Equivalent to Proposer.

BID DOCUMENTS. Equivalent to Proposal.

BID GUARANTY. Equivalent to Proposal Guaranty.

BRIDGE. A structure, including supports, erected over a depression or an obstruction, such as water, highway, or railway; and having a track or passageway for carrying traffic or other moving loads and a length measured along the roadway center of more than 20 feet between undercopings of abutments or spring lines of arches or extreme ends of openings of multiple boxes. The length of a bridge structure is the overall length measured along the line of survey stationing between backs of abutment backwalls or between ends of the bridge floor.

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.

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

CONCEPTUAL DESIGN PLAN (CDP). A Plan that has been developed by the Contracting Agency; is presented in the RFP; and has been used by the Contracting Agency to identify the ROW corridor, slope limits, and environmental impacts. The CDP represents the minimum acceptable requirements. Technical Proposals may modify the CDP to the extent that the modifications exceed the requirements of the CDP.

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 QUALITY ASSURANCE (CQA). The Independent Construction Quality Firm's program of planned policies, procedures, detailed responsibilities, and systematic actions necessary to provide confidence that the quality management and results meet the Contract requirements related to the final construction elements; includes construction inspection, testing, and audits of the Design-Builder's Construction Quality Management Plan.

CONSTRUCTION QUALITY CONTROL (CQC). The actions of the Design-Builder in examining, inspecting, checking, and testing in-process work to ensure conformity to Project construction requirements.

CONSTRUCTION QUALITY MANAGEMENT PLAN (CQMP). The Design-Builder's plan, developed and executed by the IQF, for ensuring construction quality of the Project as further defined in RFP Part III, Scope of Work.

CONTRACT DOCUMENTS. The Contract, including all documents listed in Subsection 105-1.04, Coordination of Contract Documents, as well as all amendments and attachments to the foregoing and all Change Orders issued.

CONTRACTING AGENCY. DOT&PF, also referred to as the Department.

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 and the COAR are identified in RFP Part I, Instructions to Proposers.

CONTRACTING OFFICER'S AUTHORIZED REPRESENTATIVE (COAR) – The single point of contact designated to receive communications from Prequalified Proposers during the procurement process and from the Design-Builder during execution of the Contract. The COAR is identified in the ITP but may be changed by written notice from the Contracting Agency. The COAR is the authorized representative of the Contracting Officer and is responsible for administration of the Contract.

CONTRACTOR. Equivalent to the Design-Builder.

CONTRACT PRICE. The lump sum price shown on Form PP-1, as adjusted by Change Order(s), and price adjustments made under the terms of the Contract.

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 Request for Proposals, Bid Form, Standard Specifications, Standard Modifications, 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 Request for Proposals.

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. Contract time may be specified either in calendar days or by completion date.

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.

CRITICAL PATH. Each critical path on the Project schedule that ends on a completion deadline (that is, the term shall apply only following consumption of all available float). The lowercase term “critical path” shall mean the activities and durations associated with the longest path(s) through the Project schedule.

CULVERT. Any structure not classified as a bridge 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.

DEPARTMENT-CAUSED DELAYS. Unavoidable delays, to the extent that they affect a Critical Path, arising solely from the following matters:

A suspension order

Department-Directed Changes

Failure or inability of the Department to provide responses to proposed schedules, Plans, design documents, and other submittals and matters for which response by the Department is required, within the time periods indicated in the Contract Documents

Any lawsuit seeking to restrain, enjoin, challenge, or delay construction of the Project or the granting or renewal of any governmental approval of the Project, except to the extent that the lawsuit is based on improper action by the Design-Builder and except for any lawsuits for which the Design-Builder has accepted the risk under Contract

Uncovering, removing, and restoring work to the extent provided in Subsection 105-1.10, Inspection of Work

Any improper action by the Department’s designated representative with binding authority, as specified in Subsection 107-1.13, Responsibility for Damage Claims, or the Department’s

improper failure to act within a reasonable time after delivery of notice by the Design-Builder to the Department requesting such action

DEPARTMENT-DIRECTED CHANGES. Any changes in the work which the Department has directed the Design-Builder to perform in accordance with Subsection 104-1.02, Changes, including changes in the Department standards applicable to the work. Direction by the Department to stop work pending provision of evidence of compliance with applicable requirements of the Contract Documents will not be considered a Department-Directed Change. Direction to modify construction means and methods will not be considered a Department-Directed Change, provided that such direction is an appropriate means of ensuring compliance with applicable requirements of the Contract Documents. The fact that a Directive was issued by the Department shall not be considered evidence that, in fact, a Department-Directed Change occurred.

DESIGN-BUILDER. The individual, firm, corporation, joint venture, or any acceptable combination of individuals and entities contracting with the Department for performance of the Contract; also referred to as the Contractor.

DESIGN-BUILD TEAM. Equivalent to Project Team.

DESIGN QUALITY ASSURANCE (DQA). The Independent Design Quality Firm's program of planned policies, procedures, detailed responsibilities, and systematic actions necessary to provide confidence that the quality management and results meet the Contract requirements related to the final design elements; includes calculation checking, Plan review, and audits of the Design-Builder's Design Quality Management Plan.

DESIGN QUALITY CONTROL (DQC). The actions of the Design-Builder in examining, verifying, and checking in-process design elements and calculations to determine the correctness and accuracy of the Project design.

DESIGN QUALITY MANAGEMENT PLAN (DQMP). The Design-Builder's plan for ensuring design quality of the Project, as further defined in RFP Part II, Scope of Work.

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.

ENGINEER. The authorized representative of the Department's Contracting Officer, also referred to as the COAR.

ENTITY. Either the Prospective Proposer or a Major Participant.

ENVIRONMENTAL CLEARANCE. A permit or other clearance that is specific to the Project and is issued by a government, State, or local authority.

ENVIRONMENTAL COMPLIANCE MANAGER (ECM). The individual who ensures that the Project is designed, constructed, and managed with the proper regard to the environmental requirements of the Project. The Design-Builder shall provide an ECM, who shall be an integral part of the Design-Builder's Quality Program. This person shall have functions that are distinct from other management functions and shall be available on site within one hour notice. The Design-Builder shall not relieve the ECM of any of his or her duties without the express written consent of the Contracting Agency. The ECM's primary function is to ensure incorporation of environmental commitments into the Project and to monitor, document, and report environmental compliance. This includes, but is not limited to, management, design, and construction with respect to the environmental requirements and commitments.

ENVIRONMENTAL LAWS. All governmental rules now or hereafter in effect relating to the environment or to emissions, discharges, releases, or threatened releases of hazardous substances into the environment,

including into the air, surface water or groundwater, or onto land; or relating to the manufacture, processing, distribution, use, treatment, storage, disposal, transport, or handling of hazardous substances; or otherwise relating to the protection of public health, public welfare, or the natural environmental (including protection of nonhuman forms of life, land, surface water, groundwater, and air), including the statutes listed in the definition of Hazardous Substances; NEPA, as amended, 42 U.S.C. §§ 4321 et seq.; the Occupational Safety and Health Act, as amended, 29 U.S.C. §§ 651 et seq.; the Hazardous Materials Transportation Act, as amended, 49 App. U.S.C. §§ 1801; the Endangered Species Act, as amended, 16 U.S.C. §§ 1531 et seq.; the Migratory Bird Treaty Act, 16 U.S.C. §§ 703 et seq.; the Eagle Protection Act, 16 U.S.C. § 668; and applicable State statutes.

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.

ESCROW PROPOSAL DOCUMENT (EPD). The meaning set forth in Subsection 103-1.11, Escrow Proposal Documents.

EVALUATION CRITERIA RESPONSE. The narrative response that is provided in the Proposer's Technical Proposal.

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.

FINAL INSPECTION. The date when the Project construction is complete. All punch list items are complete.

FINAL WARRANTY ACCEPTANCE. The date that defines the completion of the warranty period, and the date upon which the warranty bond shall be released by the Department. Acceptance will occur as soon as the Department has determined that the Contract requirements have been met for the warranted work.

FOOTPRINT. The maximum area of ground disturbance as shown in the CDP. This Footprint may be modified at the sole cost and risk of the Design-Builder.

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.

HOLIDAYS. State of Alaska legal holidays are:

1. New Year's Day - January 1
2. Martin Luther King, Jr. Day - Third Monday in January
3. Presidents' Day - Third Monday in February
4. Seward's Day - Last Monday in March
5. Memorial Day - Last Monday in May
6. Independence Day - July 4
7. Labor Day - First Monday in September
8. Alaska Day - October 18
9. Veteran's Day - November 11
10. Thanksgiving Day - Fourth Thursday in November
11. Christmas Day - December 25
12. Every Sunday
13. 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, 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, Sunday and the following Monday are both legal holidays (See AS 44.12).

INDEPENDENT CONSTRUCTION QUALITY FIRM (ICQF). The Entity that is responsible for developing the Construction Quality Management Program and implementing Construction Quality Control by documenting and reporting on construction quality on the Project, and is responsible for signing quality certifications of construction quality based on observations, reviews, and tests.

INDEPENDENT DESIGN QUALITY FIRM (IDQF). The Entity that is responsible for implementing the Design Quality Management Program by documenting and reporting on design quality on the Project, and is responsible for signing quality certifications of designs based on reviews, analyses, and calculations.

INDEPENDENT QUALITY FIRM (IQF). Either the ICQF or the IDQF, as appropriate.

INSPECTOR. The ICQF's or the Contracting Agency's representative who is authorized to make detailed inspections of Contract performance and materials.

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.

REQUEST FOR PROPOSALS. The advertisement for bids for all work or materials on which bids are required.

KEY PERSONNEL. The persons assigned to the Project, the loss of whom would, in the judgment of the Contracting Agency, likely have a significant impact on the cost, timeliness, or conformity of the work. The list of persons designated as Key Personnel appears in RFP Part I, Instructions to Proposers.

MAJOR CONTRACT ITEM. A Contract item with a total value of 5 percent or more of the Contract award amount.

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). A list of materials for which certifications must be submitted 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.

MEDIAN. The portion of a divided highway separating the traveled ways.

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

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.

OWNER. Equivalent to the Alaska Department of Transportation and Public Facilities.

PATHWAY. A paved path for multiple uses.

PAVEMENT STRUCTURE. The combination of subbase, base course, and surface course placed on a subgrade to support the traffic load and distribute the traffic load to the roadbed.

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. Drawings, profiles, typical cross sections, Standard Drawings, working drawings, shop drawings, and supplemental drawings or reproductions showing the location, character, dimensions, and details of the work as stated in RFP Part II, Subsection 105-1.02, Plans. When used to control the Work, the Plans shall be released for construction by the Department.

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

PREQUALIFIED PROPOSER. An individual, firm, partnership, corporation, joint venture, or combination thereof that submits an SOQ Proposal and is invited to submit a Proposal in response to the RFP. The Prequalified Proposer shall propose to be the Design-Builder for the Project and shall, if its Proposal is selected, execute the Contract.

PREVAILING TIME. The time on the Contracting Agency's receiving clerk's time stamp.

PRICE PROPOSAL. The firm fixed Project price developed by the Prequalified Proposer in response to the RFP and submitted with the Technical Proposal.

PROFILE. The vertical elevation of the surface of the layer at the location indicated. On a roadbed it is typically indicated at the longitudinal centerline of the top layer of pavement. On a material or fabrication it may be used to indicate a thickness of material or thickness of a coating.

PROJECT. The Cascade Point Ferry Terminal Stage 1 Design Build project.

PROJECT TEAM. The members of the Prequalified Proposer's or Major Participant's organizations who have been assigned roles to perform on the Project.

PROPOSAL. A Proposer's response to the RFP in conformance with RFP Part I, Instructions to Proposers. The Proposal consists of a Technical Proposal and a Price Proposal, including properly completed Proposal forms and all required supporting documentation.

PROPOSAL GUARANTY. The security furnished with a Proposal to guarantee that the Proposer will enter into a Contract if the Contracting Agency accepts the Proposal.

PROPOSAL DEADLINE. The date and time, as listed in RFP Part I, Section 1.6, Proposal Submittal Deadline and Location, by which the Proposals must be submitted to the Contracting Agency.

PROPOSER. An individual, firm, partnership, corporation, joint venture, or combination thereof that prepares and submits a Proposal in response to the RFP. Proposers are those who were notified in writing by the Department that they are eligible to receive the RFP by virtue of the Department's short

listing of their SOQ Proposal submitted in response to the RFQ issued by the Department. The Proposer will propose to be the Design-Builder for the Project and will, if its Proposal is selected, execute the Contract.

QUALIFIED PRODUCTS LIST. A list of companies and products that the Department has found conforms to the SSHC.

QUALITY CHECKPOINT (QCP). A point in time when construction has proceeded to a defined stage at which representatives of the Design-Builder and the IQF, together with the Department's oversight representative, determine the progress to date by reviewing appropriate construction documentation for the portions of the Work under review. The parties then judge whether to accept or reject the completed work. No additional work shall take place past the QCP until all parties mutually agree that the work up to that point is acceptable.

QUALITY PROGRAM. The documentation, standards, written Plans, and activities that constitute the design and construction quality efforts on the Project or comparable projects.

RELEASE FOR CONSTRUCTION PLANS. A set of Plans that describes and controls a portion of the Work, and that (a) conforms to the Contract requirements, (b) has been subjected to Quality Control the Design-Builder, (c) has been certified by the IDQF as meeting the Contract requirements and as having been subjected to the proper QA/QC checks, (d) has been duly submitted to the Contracting Agency with the required certification, and (e) has been released for construction by the Contracting Agency in a written transmittal signed by the COAR.

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. Determined solely by the Department to conform in all material respects with the requirements of the RFQ and the RFP.

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.

ROADBED. Graded portion of a highway within top and side slopes, prepared as a foundation for the pavement structure and shoulders.

ROADSIDE. A general term denoting the area adjoining the outer edge of the roadway. Extensive areas between the roadways of a divided highway may also be considered roadside.

ROADWAY. Portion of a highway including shoulders, for vehicular use.

SCHEDULE OF VALUES. A price breakdown of the lump sum price submitted in the Proposer's Price Proposal prepared by Design-Builder and acceptable to Owner indicating that portion of the Contract Price to be paid for each major component of the Work.

SELECTION PROCESS. The two-step procurement process used to select a Design-Builder. The Selection Process consists of Step 1, determining the Short List, and Step 2, selecting the Design-Builder. Step 1 has been completed. Step 2 is described in RFP Part I, Section 6, Selection Process.

SHORT LIST. The list of Proposers who have been prequalified by the Department and invited to prepare a Proposal. The Department published the Short List at the end of Step 1 of the Selection Process.

SHOULDER. Portion of the roadway adjacent to the traveled way for accommodation of stopped vehicles for emergency use, and for lateral support of base and surface courses.

SIDEWALK. Portion of the project constructed for the exclusive use of pedestrians.

SPECIAL PROVISION. Addition or revision that amends or supersedes the Standard Specifications or Standard Modifications, 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 DRAWING. Drawing approved by the Department for repetitive use, showing details to be used where appropriate.

STANDARD MODIFICATION. Addition or revision that amends or supersedes the Standard Specification, and is approved by the Department for general application and repetitive use.

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.

STATEMENT OF QUALIFICATIONS (SOQ) PROPOSAL. A Prospective Proposer's proposal submitted in response to the RFQ in Step 1 of the Selection Process.

STATION. A distance of 100 feet measured horizontally, usually along centerline.

STIPEND. Payment to the unsuccessful Proposers under the terms described in RFP Part II, Subsection 103-1.12, Stipend.

STRUCTURE. Bridge, culvert, catch basin, drop inlet, retaining wall, cribbing, manhole, endwall, building, sewer, service pipe, underdrain, foundation drain, or other similar feature that may be encountered in the work.

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, safety appurtenance, utilities, lighting and all bridge deck and parapet work is complete.

For projects that will not be opened to the traveling public or are being built in phases, the work is substantially complete when it is ready for the subsequent project.

SUBSTRUCTURE. All portions of a bridge below the bearings of simple and continuous spans, skewbacks of arches and tops of footings of rigid frames, including backwalls, wingwalls, and wing protection railings.

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

SUPERSTRUCTURE. The entire bridge structure above the substructure.

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.

TECHNICAL PROPOSAL. A submittal that is part of the Proposer's response to the RFP. The required format and contents of the Technical Proposal are described in RFP Part I, Section 7, Proposal Format and Contents.

TRAFFIC CONTROL PLAN (TCP). One or more project-specific plans detailing the routing of vehicular or pedestrian traffic through or around a construction area including the location of all traffic control devices.

TRAIL. An unpaved path for multiple uses.

TRAVELED WAY. Portion of the roadway designed for vehicle use, excluding shoulders.

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 a utility company, inclusive of any subsidiary.

WARRANTY WORK. Corrective action taken to bring the warranted Work into compliance with the Contract for release of the warranty bond.

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, night work lighting plans, or any other supplementary plans or similar data which the Contractor is required to submit to the Engineer for approval.

SECTION 102

BIDDING REQUIREMENTS AND CONDITIONS

102-1.01 QUALIFICATION OF PROPOSERS. All firms desiring to participate in DOT&PF construction projects must register annually by submitting a completed Bidder Registration (Form 25D-6).

102-1.02 CONTENTS OF REQUEST FOR PROPOSALS PACKAGE. The contents of the RFP package are as stated in RFP Part I, Section 1.1, Introduction. The Standard Specifications, permits, forms, reference standards, Standard Plans, and other documents listed in the RFP are considered part of the RFP, whether included or not.

102-1.03 QUANTITIES. The quantities of Work required to produce a complete Project are not defined. The Proposer is required to make its own estimate of quantities based on the Proposer's own investigations, interpretations, and judgments. The Contractor shall be required to furnish a complete Project in accordance with the requirements, for the lump sum Contract price regardless of the exact quantities necessary to complete the Project, and no relief or equitable adjustment will be made for any claim of increased quantities.

102-1.04 EXAMINATION OF RFP DOCUMENTS AND SITE VISIT. Proposers shall examine the work site and all Contract documents before preparing a Proposal. Submitting a Proposal is a binding representation that the Proposer has examined the work site, is aware of the conditions to be encountered, and has examined and understands all of the Contract documents.

The records of geotechnical investigations including boring logs, test results, geology data reports, soil reports, material site reports, and geotechnical reports included in a proposal bid package or made accessible to bidders or contractors, are for information purposes only. These records are not part of the Contract. These records indicate subsurface conditions only at specific locations and times, and only to the depths penetrated. They do not necessarily reflect variations in soil, rock or groundwater conditions that may exist between or outside such locations. Actual conditions may differ from what is shown in the records. Material sources referenced in these records may not contain materials of sufficient quantity or quality to meet project requirements. The accessibility of these records does not constitute approval, nor guarantee suitability of soils or sources, or the rights to use sources for this project, except as specifically provided in Subsections 106-1.02.4.b, Mandatory Sources, and 106-1.02.4.c, Designated Sources. The records shall not substitute for independent investigation, interpretation, or judgment of the bidder or Contractor. The Department is not responsible for any interpretation or conclusion drawn from its records by the bidder or Contractor.

Contractors shall examine Subsection 106-1.02 Material Sources for further information about material source development.

Any questions about Proposal procedures, site conditions, or Contract requirements must be submitted in writing to the COAR designated in RFP Part I, Instructions to Proposers. Questions must be submitted in sufficient time to get a reply before submission of Proposals. 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 Proposers.

102-1.05 PREPARATION OF PROPOSAL. Prepare Proposals in accordance with Part I, Instructions to Proposers, and the Contract requirements contained in the RFP.

Forms that are required to be submitted as part of the Proposal shall only be submitted on the forms furnished by the Department or legible copies of the Department's forms. All entries shall be legible and in ink or type. Proposers shall enter the lump sum price required on the Form in figures in accordance with the instructions on the Form

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 necessary copies of the technical and price proposals and forms must be signed in ink by the person or persons authorized to sign the Contract for the Proposer. If a Proposer is a corporation, the bid must be signed by a corporate officer with authority to bind the corporation, or agent. If a Proposer is a partnership, a partner must sign. If the Proposer is a joint venture, each principal member must sign. If a Proposer is a sole proprietorship, the owner must sign. Each person signing the bid must initial any changes made to entries on the forms.

102-1.06 NONRESPONSIVE PROPOSALS.

1. A bid shall be rejected as nonresponsive if it:
 - a. Is not properly signed by an authorized representative of the bidder in ink and in a legally binding manner;
 - b. Contains unauthorized additions, conditional or alternative bids, or other irregularities that make the bid incomplete, indefinite, or ambiguous;
 - c. 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 102-1.05;
 - d. Fails to include an acceptable bid guaranty with the bid;
 - e. Is materially unbalanced; or
 - f. Fails to meet any other material requirement of the Request for Proposals.
2. A bid may be rejected as nonresponsive, in the Department's discretion, if it:
 - a. Is not typed or completed in ink;
 - b. Fails to include an acknowledgement of receipt of each addendum by assigned number and date of issue; or
 - c. Is missing a bid price for any pay item, except when alternate pay items are authorized.

102-1.07 PROPOSAL GUARANTY. Proposals shall be accompanied by a Proposal guaranty in the amount specified in RFP Part I, Instructions to Proposers. The guaranty shall be unconditionally payable to the State of Alaska and shall be in the form of an acceptable Proposal Bond (Form 25D-14), or a certified check, cashier's check, or money order.

The surety of a Proposal 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 Proposal Bond.

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

102-1.08 DELIVERY OF PROPOSALS. Delivery of Proposals shall be in accordance with RFP Part I, Instructions to Proposers.

102-1.09 WITHDRAWAL OR REVISION OF PROPOSALS. 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 Request for Proposals. 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 Request for Proposals. Written withdrawal requests must be signed and submitted by the bidder's duly appointed representative who is legally authorized to bind the bidder.

Revisions to the Technical Proposal shall be as stated in RFP Part I, Instructions to Proposers.

Revisions to the Price Proposal shall include the modification of the lump sum price but shall not reveal the amount of the total original or revised lump sum price.

102-1.10 PROTEST OF REQUEST FOR PROPOSALS. An interested party, as defined in AS 36.30.699, may protest an Request for Proposals before the bid opening in accordance with AS 36.30.560 and AS 36.30.565. Submit a protest to the Contracting Officer.

102-1.11 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 mail, courier, fax, or may post the addenda on its web site. Unless picked up in person or included with the bid documents, addenda or notice that an addenda has been issued will be addressed to the individual or company to whom bidding documents were issued and sent to the 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 Request for Proposals. Bidders must acknowledge all addenda received, either on the Bid Form or by fax prior to the scheduled time of bid opening. If a bidder received no addenda, the bidder shall enter "None" on the Bid Form.

102-1.12 RECEIPT AND OPENING OF PROPOSALS. Receipt and opening of Proposals shall be in accordance with RFP Part I, Instructions to Proposers.

102-1.13 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:

1. Evidence of bid rigging or collusion;
2. Fraud or dishonesty in the performance of previous contracts;
3. More than one bid for the same work from an individual, firm, or corporation under the same or different name;
4. Unsatisfactory performance on previous or current contracts;
5. Failure to pay, or satisfactorily settle, all bills due for labor and material on previous contracts;
6. Uncompleted work that, in the judgment of the Department, might hinder or prevent the bidder's prompt completion of additional work, if awarded;
7. Failure to reimburse the state for monies owed on any previous contracts;
8. Default under previous contracts;
9. Failure to submit evidence of registration and licensing;
10. Failure to comply with any qualification requirements of the Department;
11. 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;
12. Failure to satisfy the responsibility standards set out in state regulations;
13. Lack of skill, ability, financial resources, or equipment required to perform the contract; or
14. Lack of legal capacity to contract.

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

SECTION 103

AWARD AND EXECUTION OF CONTRACT

103-1.01 CONSIDERATION OF PROPOSALS. Consideration of Proposals will be in accordance with RFP Part I, Instructions to Proposers.

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.

103-1.02 This section is left blank.

103-1.03 AWARD OF CONTRACT. The Department will award the Contract to the best value, responsible, and responsive Proposer in accordance with RFP Part I, Instructions to Proposers, unless it rejects all Proposals. The Department will notify all Proposers in writing of its intent to award.

The Department will notify the apparent successful Proposer in writing of its intent to award the Contract, and will request all required documents to be executed and submitted within the time specified. The apparent successful Proposer'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 Proposal security.

If an award is made, it will be made as soon as practicable and usually within 40 days after the determination of best value. Award may be delayed due to protest or irregularities in the proposals, or if the award date is extended by mutual consent. Proposals shall be valid for 120 days after submittal, and may be extended by mutual consent.

103-1.04 RETURN OF PROPOSAL GUARANTY. Return of Proposal Guaranty shall be in accordance with RFP Part I, Instructions to Proposers.

103-1.05 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 each 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:

1. 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.
2. Irrevocable letters of credit, with a financial institution approved by the Contracting Officer.
3. Cashier's 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 107-1.19.

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:

1. Becomes insolvent or is declared bankrupt;
2. Loses its right to do business in any state affecting the work;
3. Ceases to meet Contract requirements;
4. Fails to furnish reports of financial condition upon request; or
5. Otherwise becomes unacceptable to the Department.

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

1. An individual surety with a corporate surety; or
2. 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.

103-1.06 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 AS 21 and (ii) have a financial rating acceptable to the Department. The Contractor shall notify the Engineer, in writing, at least 30 days before cancellation of any coverage or reduction in any limits of liability.

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 107-1.13. 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:

1. 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:
 - a. Waiver of subrogation against the state;
 - b. Employer's Liability Protection at \$500,000 each accident/each employee and \$500,000 policy limit;
 - c. "Other States" endorsement if the Contractor directly utilizes labor outside of the State of Alaska;
 - d. United States Longshore and Harbor Workers' Act Endorsement, whenever the work involves activity over or about navigable water; and
 - e. 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.
2. Commercial General Liability: on an occurrence policy form covering all operations with combined single limits not less than:
 - a. \$1,000,000 Each Occurrence;
 - b. \$1,000,000 Personal Injury;
 - c. \$2,000,000 General Aggregate; and
 - d. \$2,000,000 Products-Completed Operations Aggregate.

3. Automobile Liability: covering all vehicles used in Contract work, with combined single limits not less than \$1,000,000 each occurrence.
4. 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 liability 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.
5. Insurance – Professional and Technical Errors and Omissions and/or Miscellaneous Liability:
 - a. Provide policy coverage for all claims that the Design-Builder will become legally obligated to pay resulting from any actual or alleged negligent act, error, or omission related to the Design- Builder's professional services required under this Contract. On request, the Design-Builder must submit a financial statement that is signed by a certified public accountant and provides evidence that the Design-Builder has adequate assets to cover any deductible amount that applies to this policy.
 - b. The Design-Builder's professional and technical errors and omissions insurance minimum limits will be as follows:
 - (1) \$1,000,000 per claim
 - (2) \$1,000,000 annual aggregate
 - c. Professional liability policy(s) may be provided by the individual professionals as a subcontractor to the General Contractor. Such Professional Liability policy shall provide for an aggregate limit of not less than \$1,000,000. The Department shall be listed as the Certificate Holder for this policy whether provided by the Design-Builder or Subcontractor. If a project-specific policy is provided, at the conclusion of the work, and as part of the Certificate of Substantial Completion, the Design-Builder shall transmit to the Owner a certificate of insurance indicating that the policy has been prepaid for 12 months from the date of Substantial Completion.

The State of Alaska shall be named as an additional insured on policies required by paragraphs 2 through 5 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:

1. Denote the type, amount, and class of operations covered;
2. Show the effective (and retroactive) dates of the policy;
3. Show the expiration date of the policy;
4. Include all required endorsements;
5. Be executed by the carrier's representative; and
6. If a certificate of insurance, include the following statement:

"This is to certify that the policies described herein comply with all aspects of the insurance requirements of (Project Name and Number). The insurance carrier agrees that it shall notify the Engineer, in writing, at least 30 days before cancellation of any coverage or reduction in any limits of liability."

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.

103-1.07 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.

103-1.08 FAILURE TO EXECUTE CONTRACT. If the successful bidder fails to 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 Proposal Guaranty. The Department will then, in its discretion, consider the next highest scoring Proposer for Award of the Contract, cancel the Project or readvertise the Project.

103-1.09 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.

103-1.10 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.

103-1.11 ESCROW PROPOSAL DOCUMENTS. Furnish a legible copy of the Proposal documentation and an affidavit, as instructed in writing by the Contracting Officer. Proposal documentation consists of written documentation of preliminary engineering sketches and calculations, preliminary sizing of structural members or other discrete Project elements, quantity estimates and takeoffs, construction schedules on which the Proposal is based, cost estimates, rates of production and progress, assumptions, calculations, quotes from subcontractors and suppliers, and any other information used to prepare the Proposal for the Project.

Obtain and furnish the same level of Proposal documentation, for each major participant, subcontractor, supplier or fabricator with a subcontract or agreement exceeding \$200,000, regardless of tier. Seal each Entity's documentation in separate envelopes, labeled with the Entity's name and address, submission date, and Project name and number. Include a cover letter or quote signed by a responsible party.

Meet the following requirements:

1. Submitting Proposal Documentation. Place the Proposal documentation in a sealed container clearly marked "Escrow Proposal Documents" and labeled with the Proposer's name and address, the submission date, and the Project name and number. Deliver the sealed container to the address indicated in RFP, Part I, Instructions to Proposers, for safekeeping.
2. Affidavit. Submit directly to the Contracts Office at the time the Escrow Documents are delivered, a signed and certified affidavit attesting that:
 - a. the affiant has examined the Proposal documentation, and it includes all documents used to prepare the Proposal,
 - b. the sealed container contains all Proposal documentation submitted,
 - c. the escrow materials were relied on to prepare the Proposal, and
 - d. should a dispute arise, the Contractor's rights to use Proposal preparation documentation other than those in escrow are waived.

3. Access and Use of Escrow Documents. The Proposal documentation will remain in escrow, without access by either party, except as otherwise provided herein. In the event the Contractor (1) provides notice of intent to claim, (2) provides a claim, (3) provides a Contract Change Order, or (4) initiates Contract-related litigation, the Department may obtain copies of the Proposal documentation as provided herein.

Both parties will submit to the depository and copy to each other a list of personnel that are authorized to access the escrow documents. Use forms provided by the depository.

Upon request, the depository will set the time and place for access to escrow documents, will monitor the escrow documents review, and will arrange for a method of copying escrow documents. Access to escrow documents shall require at least 5 days' advance written notice so that the other party has the opportunity to witness the escrow review, examination, and use. There is no requirement that both parties witness the escrow document review, but if one party is absent, then the review must occur in the presence of a neutral third-party observer to be designated by the depository.

Notwithstanding paragraph five below, the Department will be allowed: to make copies of escrow documentation (whether hard copy, electronic, or otherwise); to use and to provide review copies to consultants directly involved in the subject dispute.

Distribution is not authorized except as related to resolution of a dispute. The Department will be allowed to incorporate pertinent copies as supporting documentation in significant Contract Change Orders, contractual disputes, and the settlement of disputed claims.

The Department is not liable for any Contractor costs associated with escrow review and use.

4. Failure to Provide Proposal Documentation. Refusal or failure to provide Proposal documentation or affidavit renders the Proposal not responsive. Failure or refusal to provide subcontractor Proposal documentation will result in subcontract disapproval.
5. Confidentiality of Proposal Documentation. Materials held in escrow are the Contractor's property. Except as otherwise provided herein, the escrow materials cannot be released without the Contractor's approval.
6. Cost and Escrow Instruction. The Department pays to store escrowed materials and instructs the depository regarding escrow.
7. Payment. The Contractor shall include within the overall Contract price the cost to comply with this subsection.
8. Return of Escrow Documentation. The original escrow documents of unsuccessful Proposers shall be returned within 30 days of either Contract award or cancellation of the Project. The original escrow documents will be returned to the Contractor after Final Completion and after the Department receives an executed Contractor's Release (Form 25D-117) with no exceptions listed.

SECTION 104

SCOPE OF WORK

104-1.01 INTENT OF CONTRACT. The intent of the Contract is to provide for the design, construction, and completion of every detail of the Work described and all activities necessary for satisfactory completion of the Project. The Contractor shall furnish all design, labor, material, supervision, equipment, tools, transportation, supplies, and other resources required to complete the work in the time specified and in accordance with the Contract. The Contractor is responsible for the means, methods, techniques, sequence, or procedures of construction, safety, quality control, and to perform or furnish the work in accordance with the Contract documents.

RFP Part III, Scope of Work, describes in detail the performance and prescriptive requirements for the elements required to complete the Project.

104-1.02 CHANGES.

1. 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.
 - a. 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 109-1.04.
 - b. 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:
 - (1) 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;
 - (2) 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 109-1.05, and the Engineer issues a change order for the work. The Contractor shall keep complete daily records of the cost of such work; or
 - (3) 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.
 - c. If the Engineer eliminates a Contract item, the Contractor shall accept compensation under Subsection 109-1.09.
2. Outside Contract Scope. Changes determined to be outside the general scope of the Contract shall be made only by Supplemental Agreement issued in accordance with AS 36.30 and the State's procurement regulations. Additional bonding or insurance may be required.
3. Cost and Pricing Data. Before a Change Order or Supplemental Agreement covering work for which there is no established Contract price will be approved, 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.

4. Changes to the Proposed Design. The Technical Proposal is a part of the Contract, and the concepts contained therein shall not be materially changed unless specifically authorized by the Department. Design documents presented to the Department for approval shall modify the concepts presented in the Proposal as necessary to meet the contract requirements or correct deficiencies as determined by the Department. Plans previously approved by the Department and released for construction for any Project element shall not be modified except at the sole discretion of the Department. The Department will normally only allow such changes if there is shown to be a benefit to the Department and not for the convenience of the Contractor. No time or cost adjustment will be allowed for any design changes or field changes required to meet the Contract requirements.

104-1.03 DIFFERING SITE CONDITIONS. The Contractor shall immediately notify the Engineer in writing and specifically describe the alleged differing site condition if the Contractor discovers:

1. 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
2. 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.

Failure to give the Engineer immediate 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.

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.

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 105-1.17.

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.

104-1.04 USE OF MATERIALS FOUND ON THE WORK. The Design-Builder may use on the Project, with the Engineer's approval, such stone, gravel, sand, or other material determined suitable by the Engineer, as may be found in the excavation. The Contractor shall not excavate or remove any material that is within the right-of-way but outside the slope and grade lines described in the Project permits 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.

104-1.05 CLEANUP. The Contractor shall remove all rubbish, temporary structures, excess materials, and equipment from the project site, from state owned materials sources, and from all work areas before project completion.

104-1.06 ALTERNATIVE TECHNICAL CONCEPT PROPOSALS BY CONTRACTOR. The Contractor may propose Alternative Technical Concepts in accordance with the RFP Part I, Instructions to Proposers, prior to submission of Proposals only.

SECTION 105

CONTROL OF WORK

105-1.01 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 being performed improperly. The Engineer has authority to accept completed work, issue Directives, issue Interim Work Authorizations, issue Change Orders, and recommend Contract payments.

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

The Engineer has authority to suspend work for reasons listed under Subsection 108-1.06. If the suspension is to protect workers or the 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. 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:

1. Suspend the work until it is corrected; and
2. 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 104-1.02.

Whenever submittals, Plans, mix designs, samples, filings, certificates, or other notifications are indicated as to be made to the Engineer, the Contractor shall submit these items to the Engineer through the Independent Qualify Firm, which shall submit them to the Engineer as part of its program of Project compliance documentation. Time limits for review of submittals or other action begin when the Engineer has received an acceptable complete submittal from the IQF accompanied by the IQF's statement that the submittal (or proposed activity, if appropriate) meets Contract requirements. Nothing in this statement shall be construed to weaken the authority of the Engineer, or to limit the Engineer's ability to request and receive any requested Project documentation directly from the Contractor.

Wherever it is indicated that items are to be located, materials delivered, articles for salvage identified, waste areas or stockpiles located, location of samples determined, samples taken, test methods selected, etc. as directed, designated, or selected by the Engineer, the location and/or extent of such activity will be preliminarily designated by the IQF in writing. This information will be submitted to the Engineer and will be subject to approval or acceptance by the Engineer prior to the activity taking place. Nothing in this statement shall be construed to weaken the authority of the Engineer, or to limit the Engineer's ability to direct the Contractor within the provisions of the Contract.

Wherever the Contractor is required to obtain the Engineer's approval or acceptance before undertaking or proceeding with a portion of the Work, the IQF shall render his approval and/or acceptance in writing precedent to the Engineer making his determination as to whether approval is to be granted. Nothing in this statement shall be construed to weaken the authority of the Engineer, or limit his ability to request and receive any information about the Project directly from the contractor, that he so requests, nor shall this statement limit the ability of the Engineer to make his own tests or inspections of the Work.

Wherever it is indicated that the Engineer may reject Work, and for all other Project acceptance requirements, the IQF is to inspect and make a determination of the quality and conformance of the Work. If such work is determined to be defective, the IQF shall issue a nonconformance report to both the Contractor and the Engineer, and the work shall be required to be brought into conformance with the Contract (see RFP Part III, Section 16 Quality Program, for requirements). Nothing in this statement shall be construed to weaken the authority of the Engineer, or limit his ability to inspect any Work and to reject Work that does not conform to the Contract requirements.

Wherever it is indicated that the Engineer is to test or accept a portion of the Work, the IQF shall perform such tests and shall certify in writing that the Work conforms to the Contract precedent to the Engineer approving or accepting any portion of the Work. The Department retains the sole authority for acceptance of the Work. Nothing in this statement shall be construed to weaken the authority of the Engineer, or limit his ability to inspect, test and approve Work that conforms to the Contract requirements.

105-1.02 PLANS. The Contractor shall be required to develop Plans to control the work for all Project elements. The Contractor's Plans shall show lines, grades, typical cross sections, details, location, and design of all structures as well as a summary of items included within the Schedule of Values. The Contractor's structure Plans shall include all details that may be required to adequately control the work, including, but not limited to, bar lists, connection details, and details showing placement of reinforcement.

The Plans shall be prepared in conformance with the Contractor's approved Design Quality Management Plan, and shall be submitted for approval. The Contractor shall not perform work or order materials until the Plans for such Work, or for changes, are released for construction by the Engineer.

The Engineer will not release Plans for construction unless the Plans:

- (a) conform to the Contract requirements,
- (b) have been QC'ed by the Design-Builder,
- (c) have been certified by the Independent Design Quality Firm as meeting the Contract Requirements and been subject to the proper quality control and quality assurance checks,
- (d) have been duly submitted to the Contracting Agency with the required certification, and

The Contractor shall submit to the Engineer, through the IDQF, three sets of all Plans for all Project elements. 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 use D-size (22-inch by 34-inch) white paper with dark blue or black lines on all Plans. For each submittal on D-size plans the Contractor shall also submit three ½ size (11 inch by 17 inch) copies. In some instances electronic copies shall be submitted as directed by the Engineer. Where called for or when requested, the Contractor shall also furnish calculations. Calculations including computer print outs, shall be in form and format and content requested by the Engineer, and shall be submitted in triplicate on 8-1/2 inch by 11 inch paper, printed on one side.

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

The Contractor is responsible for the accuracy of dimensions and details and for conformity of the Plans with the Contract requirements. The Engineer may order the Contractor to comply with the Contract requirements at the Contractor's sole expense if the approved Plans or working drawings deviate from the Contract requirements.

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

1. Sufficient additional copies to provide eight approved sets of prints, which shall be exact photo-replicas of the approved Plans and shall be so certified by the IDQF prior to transmittal to the Engineer;

One set of reproducible transparencies (polyester film); and

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

The Contractor shall include in the Contract price the cost of designing the Project and furnishing all Plans.

105-1.03 CONFORMITY WITH PLANS AND SPECIFICATIONS. Work performed and materials furnished shall conform to the Plans and 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 and Specifications 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.

105-1.04 COORDINATION OF CONTRACT DOCUMENTS. These Specifications which include the Standard Specifications and the modifications contained herein, the Plans, the RFP, the Proposal, 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.

Should discrepancies appear between any of the following parts of the Contract, a listed part shall take precedence over all those listed below it:

1. Change Orders
2. The Design-Builder's Proposal Documents only to the extent that they exceed the requirements of the RFP, as determined solely by the Contracting Agency (see Note below)
3. Contract Requirements (RFP Part II)
4. The Scope of Work (RFP Part III)
5. Appendices to the RFP (Part IV)
6. Standard Drawings
7. Other Referenced Standards

Note: The Contractor's Proposal shall take precedence over the RFP only to the extent that it exceeds the requirements of the RFP. (In other words, if the Proposal Documents include statements that can reasonably be interpreted as offers to provide higher-quality items than otherwise required by the Contract Documents or to perform services in addition to those otherwise required, or otherwise contains terms which are more advantageous to the Department than the requirements of the other Contract Documents, the Contractor's obligations in the Contract shall include compliance with all such statements, offers, and terms.) The determination as to whether a portion of the Proposal exceeds the requirements of the RFP will be made at the sole discretion of the Department.

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.

105-1.05 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.

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 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.

105-1.06 UTILITIES.

1. Bid Considerations. Bidders shall include in their bid the cost of:
 - a. All utility work that is specified in the Contract as work to be performed by the Contractor;
 - b. Working around or through all permanent and temporary utilities shown on the Plans, in both their present and adjusted positions;
 - c. Accommodating the removal, adjustment, or relocation of utilities shown on the Plans by entities other than the Contractor;
 - d. Construction and removal of temporary utilities, to provide temporary utility service during the construction or repair of a permanent utility; and
 - e. Other utility work not specifically identified as compensable in Subparagraph 4 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 in accordance with Subparagraph 4 Compensation.

When an entity other than the Contractor is to remove, adjust, or relocate any utility, the applicable completion dates or specific calendar days to complete the removal, adjustment, or relocation 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.

2. 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.

3. Utility Work. The Contractor shall:
 - a. Make all necessary arrangements with utility owners to locate all utilities that may be within an area of work before excavation in that area, in accordance with AS 42.30.400;
 - b. Provide right-of-way staking and construction staking with lines and grades before excavation in that area;
 - c. Prevent damage to utilities or utility property within or adjacent to the project;
 - d. Carefully uncover utilities where they intersect the work;
 - e. 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;
 - f. Promptly notify the utility owner and the Engineer in the event of accidental interruption of utility service, and cooperate with the utility owner and the Engineer until service is restored;
 - g. Take all precautions necessary to protect the safety of workers and the public when performing work involving utilities;
 - h. Follow an approved traffic control plan;
 - i. Keep the length of open trench excavation to a minimum, backfill trenches as work is completed;
 - j. Cover open trenches with metal plates capable of bearing traffic where traffic will cross trenches;
 - k. Maintain continuous utility service and install temporary utility systems where needed;
 - l. Ensure all excavation conforms to AS 42.30.400 – 42.30.490;
 - m. 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);
 - n. 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;
 - o. 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;
 - p. When required by the utility owner, provide for a cable watch of overhead power, underground power, telephone, and gas;
 - q. Obtain plan approval from the local fire authority, and provide for the continued service of fire hydrants, before working around fire hydrants;
 - r. Do all pressure testing or camera testing required to verify utility acceptance in a timely manner; and
 - s. Coordinate the Storm Water Pollution Prevention Plan (SWPPP) (Section 641) with their work and the utility companies' work.
4. Compensation.
 - a. Except as otherwise specifically provided in this Subparagraph 4, no equitable adjustment will be paid by the Department:
 - (1) Due to any variations in location, elevation, and nature of utilities shown on the Plans, or the operation of removing, adjusting, or relocating them;
 - (2) 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
 - (3) For any adjustments or relocations of utilities requested for the Contractor's convenience.
 - b. Except as otherwise specifically provided in this Subparagraph 4, the Engineer will issue a Change Order with equitable adjustment if:
 - (1) Utilities owned by Utility Companies not listed in RFP Part III, Section 10, Utilities, require removal, adjustment, or relocation; or
 - (2) Conflicts occur between utilities owned by Utility Companies not listed in RFP Part III, Section 10, Utilities, and other necessary work
 - d. 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:

- (1) No equitable adjustment will be paid by the Department, and the Contractor shall be solely responsible for repair costs and expenses, when:
 - (a) The Contractor failed to obtain field locates before performing the work that resulted in the damage;
 - (b) 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;
 - (c) The plan profile supplied by the utility company or the field locate does not indicate or inaccurately indicates the elevation of a buried utility;
 - (d) The utility is visible in the field; or
 - (e) The Contractor could otherwise reasonably have been aware of the utility.
 - (2) The Engineer will issue a Change Order with an equitable adjustment for the cost of repairing damage if:
 - (a) 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;
 - (b) The utility is owned by a Utility Company not listed in RFP Part III, Section 10, Utilities, or other Contract documents, and the Contractor could not reasonably have been expected to be aware of the utility's existence; or
 - (c) The Contractor made a written request for a field locate in accordance with AS 42.30.400, the utility owner did not locate the utility in accordance with AS 42.30.410, and the Contractor could not reasonably have been expected to be aware of the utility's existence or location.
- e. 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:
- (1) By dates stated in the Special Provisions, and the utility work is not completed by the dates stated; or
 - (2) 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 and the utility owner.
- f. 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.

Request locates from all the utilities having facilities in the area. **Utilities Relocated by Others.** Utilities may be relocated by others concurrently with construction of this project. For utilities being relocated, the Contractor will:

- a. include utility work on the Construction Phasing Plan and Progress Schedule;
- b. provide erosion, sediment, and pollution control including the stabilization of areas disturbed during utility work. Identify all utility companies performing ground disturbing activity in the Storm Water pollution Prevention Plan (SWPPP). Refer to Section 641 for further information;
- c. clear and grub;
- d. provide traffic control and flagging;
- e. provide Construction Surveying before utility relocation, including:
 - Control for utility relocation - either ROW or Centerline staking with Station information.
 - Slope staking.

- Proposed structures, not including utilities to be relocated by others.

The utility shall give the Contractor, through the Engineer, 15 calendar days advance written notice for required staking.

The Contractor shall coordinate his efforts and access with utility work taking place within the project area.

105-1.07 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.

105-1.08 SURVEY CONTROL. The Department will provide sufficient horizontal and vertical control data to establish the planned lines, grades, shapes, and structures. The Contractor shall provide all additional survey work to maintain control during the project.

105-1.09 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.

105-1.10 INSPECTION OF WORK. All materials and each part and detail of the work shall be subject to inspection by the Independent Construction Quality Firm and the Department. The Contractor shall allow safe access to all parts of the work and shall provide information and assistance to the ICQF and the Engineer to ensure a complete and detailed inspection.

Any work done or materials used without inspection by an authorized ICQF or 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 in accordance with 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 in accordance with the Contract.

105-1.11 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 105–1.03. 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.

105-1.12 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 under Subsection 643-1.03. 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.

105-1.13 MAINTENANCE DURING CONSTRUCTION. The Contractor shall maintain the entire highway and related highway facilities located within the project (between the beginning of project and end of project shown on the Plans) from the date construction begins until the Contractor receives a letter of substantial 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.

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

1. Following partial acceptance (Subsection 105-1.14).

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

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 107-1.15.

All costs of maintenance work during construction and before the project is accepted as substantially complete 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:

1. Suspend the work until corrective maintenance is completed;
2. Assess a traffic price adjustment against the Contract Amount when an adjustment rate is specified in the Contract; and
3. Employ others for corrective maintenance and deduct the cost from the Contract amount.

105-1.14 PARTIAL ACCEPTANCE. The Contractor may submit a written request for partial acceptance of a geographically separate unit of the project. The Engineer will accept the unit in writing before project completion if the Engineer inspects the unit and finds that the unit is substantially complete to Contract requirements, and acceptance is in the best interest of the State.

The Contractor may submit a written request for partial acceptance of a completed portion of the project, when the completed portion is longer than five miles. The Engineer will accept the portion in writing before project completion if the Engineer performs an inspection of the portion and finds that the portion is substantially complete to Contract requirements, and acceptance is in the best interest of the State.

Partial acceptance of the unit or portion neither voids nor alters any Contract terms. Partial acceptance of a unit or portion of the Work does not establish a separate warranty date for that unit or portion of the Work

105-1.15 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 except as listed under Subsections 618-3.06 and 621-3.04, Period of Establishment. 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, except for work specified under RFP Part III, Warranties, a letter of Project completion will be issued by the Engineer. Project completion will relieve the Contractor from further maintenance responsibilities and will stop the count of Contract time but will not relieve the Contractor of any other obligations under the Contract.

105-1.16 FINAL ACCEPTANCE AND RECORD RETENTION. The Department will issue the letter of Final Acceptance after all of the following:

1. Project completion;
2. Receipt of all certificates, as-builts, warranties, and other required documents;
3. Receipt of the Contractor's Release, with no exceptions;
4. Certification of payment of payroll and revenue taxes by DOLWD and State Department of Revenue; and
5. Final payment under the Contract.

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

1. Specified under Subsection 107-1.19;
2. Required by law or regulation; or
3. 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.

105-1.17 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 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 an Intent to Claim in writing to the Engineer.

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.

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. The Contracting Officer will issue written acknowledgement of the 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.

1. The written Claim must include all of the following:
 - a. The act, event, or condition giving rise to the claim;
 - b. The Contract provisions that apply to the claim and that provide for the requested relief;
 - c. The item or items of Contract work affected and how they were affected;
 - d. The specific relief requested, including Contract time if applicable, and the basis upon which it was calculated;
 - e. Revised progress schedules under Subsection 108–1.03; and
 - f. A certification signed by the Contractor that the claim is made in good faith, that the supporting cost and pricing data are accurate and complete to the best of the Contractor's knowledge and belief, and that the amount requested accurately reflects the Contract adjustment that the Contractor believes is due.
2. The claim, in order to be considered, must show:
 - a. That the Contractor suffered damages or delay;
 - b. The damages or delay were caused by the act, event, or condition listed in the claim; and
 - c. 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 in accordance with 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 in accordance with 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 106

CONTROL OF MATERIAL

106-1.01 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.

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 list of proposed material sources and materials to be purchased from suppliers shall be duly submitted to the Engineer in accordance with the Construction Quality Management Plan (CQMP).

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 105-1.11 if they do not conform to Contract requirements. Inspectors are authorized to reject materials that do not conform to specifications. The ICQF's inspectors shall inspect all materials. The ICQF's inspectors shall report their actions to the ICQF. Reports of material inspections shall be duly submitted or made available to the Engineer in accordance with the CQMP.

The Contractor shall submit to the ICQF 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, duly submitted by the ICQF in accordance with the CQMP (see Subsection 106-1.05). 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 105-1.11.

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 105-1.11. The list of proposed products and materials to be purchased from the Approved Products List shall be duly submitted to the Engineer in accordance with the CQMP.

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

1. Conformance to the specified performance, testing, quality or dimensional requirements; and
2. 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 105-1.11.

Pursuant to AS 36.15.050 and AS 36.30.322, agricultural/wood products harvested in Alaska shall be used in state funded projects 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.

Maintain records that establish the type and extent of agricultural/wood products utilized. When such products are not utilized, 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. 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 according to the last paragraph of Subsection 105-1.03, Conformity With Plans and Specifications.

106-1.02 MATERIAL SOURCES.

1. General. The Contractor shall:
 - a. Utilize Useable Excavation according to Subsection 104-1.04 before using material sources listed in Subsection 106-1.02.4. 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;
 - b. Produce a sufficient quantity of materials meeting the specifications to complete the project;
 - c. 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;
 - d. Determine the type of equipment and methods to be used;
 - e. Expect variations in material quality within the deposits, and procure material only from acceptable portions of the deposit, regardless of source ownership; and
 - f. Prevent erosion, sedimentation, and pollution within a materials source.

The Contractor agrees that:

- g. The costs to explore and develop material sources, including all production effort, are subsidiary to the cost of providing the specified material;
 - h. 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.
 - i. 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.
2. Inspection and Acceptance. The Contractor shall perform sampling and testing during materials processing and placement in accordance with its Quality Control Plan (Subsection 106-1.03, Testing and Acceptance) and shall obtain acceptable material samples from locations designated within the source.

The ICQF will sample and test materials to determine the quality of the source, at its expense, as part of its Acceptance Testing (106-1.03.2). 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.

3. 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 in accordance with the operator's written training plan approved by the Mine Safety and Health Administration, covering the following items:

- a. Site-specific health and safety risks;
- b. Recognition and avoidance of hazards;
- c. Restricted areas;
- d. Warning and evacuation signals;
- e. Evacuation and emergency procedures;
- f. Other special safety procedures; and
- g. 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.

4. Type of Sources. The Contractor shall utilize Useable Excavation according to Subsection 104-1.04 before using material sources listed in this Subsection. When there is insufficient Useable Excavation, the Contractor shall 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.

When there is insufficient Useable Excavation, the Contractor shall supply additional required material from the following sources:

- a. Contractor-Furnished Sources. For a material source that is a commercial plant as defined in Subsection 108-1.01.3.a the Contractor shall:
 - (1) Acquire the necessary rights and permits to obtain material from a commercial plant;
 - (2) Pay as subsidiary costs all related costs to obtain and use material from the source; and
 - (3) Be solely responsible for the quality and quantity of materials.

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

- (4) Acquire the necessary rights and permits to take materials from the sources including state-owned sources that are not under the Department's control;
- (5) Pay as subsidiary costs all related costs to obtain, develop, and use the sources, including but not limited to permit costs and mineral royalties;
- (6) Be solely responsible for quality and quantity of materials; and
- (7) Obtain all necessary rights, permits, and plan approvals before clearing or disturbing the ground in the material source.

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

- (8) Chooses to change material sources for any reason;
- (9) Is unable to produce a sufficient quantity or quality of materials from Contractor-Furnished sources; or
- (10) Encounters unexpected, unforeseen, or unusual conditions within Contractor-Furnished sources.

- b. 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 that estimates quality and quantity of material 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 it is subsequently found that the quality or quantity of material producible from a Mandatory Source is not as represented by the materials report, and a change of source is necessary for that reason alone, a Change Order with equitable adjustment will be made.

- c. 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 that estimates quality and quantity of material 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 subsequently found that the quality and quantity of material producible from that source is not as represented by the materials report, 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.

- d. 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 Contractor's satisfaction.

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

- (1) 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;
- (2) Whether boring logs, test results or data reliably represent current existing subsurface conditions;
- (3) Whether interpretations of the boring logs, test results, or other data are correct;
- (4) Whether moisture conditions and indicated water tables vary from those found at the time borings were made;
- (5) Whether the ground at the location of the borings was physically disturbed or altered after the boring was made; and
- (6) 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.

- e. Excluded Material Sources. Some material sources may not be considered acceptable regardless of location or ownership. The bid documents may identify some material sources excluded from use. The Department reserves the right to exclude any material source or any portion of a material source, at any time after Contract award, that is determined by material testing to be unsuitable for use on the project.
5. 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 107-1.02. For each material site the Contractor shall:
- a. Acquire approval for a Mining and Reclamation Plan (MRP) or receive an exemption, in accordance with AS 27.19. The MRP shall include:
 - (1) Plan and cross-sectional views of the site;
 - (2) Applicable boundaries or property lines;
 - (3) Areas and depths to be developed;
 - (4) Locations of access roads, stripping, sorting, and waste piles, crushing and plant sites, stockpile sites, drainage features, erosion and pollution control features; and
 - (5) Condition the Contractor will leave the site after the materials extraction is completed, including reseeded.
 - b. Submit a SWPPP as required by Section 641.

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

106-1.03 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 105-1.11.

1. **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. Quality control is subsidiary to the applicable items. The Contractor shall perform quality control as follows:
 - a. Submit a Quality Control Plan no less than five working days before the preconstruction conference. Include, for each item being produced, the methods to be used for sampling and testing, the proposed testing frequency, personnel qualifications, and equipment descriptions. Include the use of control charts, chart update frequency, chart posting location, and criteria for corrective action. The Quality Control Plan will become part of the CQMP.
 - b. Sample materials during manufacturing or processing and perform quality control tests, as needed, to ensure materials produced conform to the Contract Specifications. Document quality control tests and make them available to the Engineer on a daily basis.
 - c. Sample and test according to test methods required in the Specifications.
2. **ACCEPTANCE TESTING.** The Department has the exclusive right and responsibility for determining the acceptability of the design, construction, and incorporated materials. The Contractor shall provide and pay for the services of an ICQF and an IDQF, as required by RFP Part III, Section

16, Quality Program. The ICQF is responsible to conduct Acceptance Testing using Department procedures, practices, and approved test methods, in accordance with the CQMP.

The Contractor shall not rely on the Acceptance Testing for its Quality Control. The Acceptance Testing is not a substitute for the Contractor's QC. The Engineer or ICQF may retest materials that have failed the initial acceptance test, but neither is required to do so.

3. **QUALITY LEVEL ANALYSIS (QLA).** The basis of payment for production lots of selected Contract items is adjusted through QLA using acceptance test results. Price adjustments are determined by using the method specified under the QLA section of the bid item specification and Tables 106-1 and 106-2. As an incentive to produce quality material, a pay factor greater than 1.00 may be obtained. The maximum pay factor obtainable is 1.05.

QLA is a statistical procedure for estimating the percent compliance to a specification and is affected by shifts in the arithmetic mean (\bar{x}) and by the sample standard deviation (s). Analysis of test results will be based on an Accepted Quality Level (AQL) of 95 percent and Contractor's risk of 5 percent. AQL is the lowest percentage within the specification limits of a material that is acceptable as a process average and receives 100 percent pay. The risk is the probability that when the Contractor is producing material at exactly the AQL, the Contractor will receive less than a 1.00 pay factor.

Table 106-1 gives the Percent within Upper or Lower Specification Limits (P_U or P_L) for a given number of samples (n), and a given Upper or Lower Quality Index (Q_U or Q_L). For negative values of Q_U or Q_L , use absolute values of Q_U or Q_L . Then P_U or P_L is equal to 100 minus the table value of P_U or P_L .

The Upper and Lower Quality Indexes (Q_U and Q_L) are determined from the QLA section of the bid item specification.

Table 106-2 gives the Pay Factor (PF) for a given number of samples (n) and a given Quality Level. Quality Level = $(P_U + P_L) - 100$.

P _U or P _L	n = 3	n = 4	n = 5	n = 6	n = 7
	Upper or Lower Quality Index (Q _U or Q _L)				
100	1.16-50.0	1.48-50.0	1.68-50.0	1.81-50.0	1.90-50.0
99	-	1.45-1.47	1.61-1.67	1.71-1.80	1.77-1.89
98	1.15	1.42-1.44	1.55-1.60	1.63-1.70	1.68-1.76
97	-	1.39-1.41	1.50-1.54	1.56-1.62	1.60-1.67
96	1.14	1.36-1.38	1.45-1.49	1.50-1.55	1.53-1.59
95	-	1.33-1.35	1.40-1.44	1.44-1.49	1.47-1.52
94	1.13	1.30-1.32	1.36-1.39	1.39-1.43	1.41-1.46
93	-	1.27-1.29	1.32-1.35	1.34-1.38	1.36-1.40
92	1.12	1.24-1.26	1.28-1.31	1.30-1.33	1.31-1.35
91	1.11	1.21-1.23	1.24-1.27	1.25-1.29	1.26-1.30
90	1.10	1.18-1.20	1.20-1.23	1.21-1.24	1.21-1.25
89	1.08-1.09	1.15-1.17	1.16-1.19	1.17-1.20	1.17-1.20
88	1.07	1.12-1.14	1.13-1.15	1.13-1.16	1.13-1.16
87	1.05-1.06	1.09-1.11	1.09-1.12	1.09-1.12	1.09-1.12
86	1.04	1.06-1.08	1.06-1.08	1.05-1.08	1.05-1.08
85	1.02-1.03	1.03-1.05	1.02-1.05	1.02-1.04	1.01-1.04
84	1.01	1.00-1.02	0.99-1.01	0.98-1.01	0.98-1.00
83	←--- 0.98-1.00	0.97-0.99	0.96-0.98	0.95-0.97	0.94-0.97
82	0.97	0.94-0.96	0.92-0.95	0.91-0.94	0.91-0.93
81	0.94-0.96	0.91-0.93	0.89-0.91	0.88-0.90	0.87-0.90
80	0.92-0.93	0.88-0.90	0.86-0.88	0.85-0.87	0.84-0.86
79	0.90-0.91	0.85-0.87	0.83-0.85	0.81-0.84	0.81-0.83
78	0.88-0.89	0.82-0.84	0.79-0.82	0.78-0.80	0.77-0.80
77	0.85-0.87	0.79-0.81	0.76-0.78	0.75-0.77	0.74-0.76
76	0.83-0.84	0.76-0.78	0.73-0.75	0.72-0.74	0.71-0.73
75	0.80-0.82	0.73-0.75	0.70-0.72	0.69-0.71	0.68-0.70
74	0.77-0.79	0.70-0.72	0.67-0.69	0.66-0.68	0.65-0.67
73	0.75-0.76	0.67-0.69	0.64-0.66	0.63-0.65	0.62-0.64
72	0.72-0.74	0.64-0.66	0.61-0.63	0.60-0.62	0.59-0.61
71	0.69-0.71	0.61-0.63	0.58-0.60	0.57-0.59	0.56-0.58
70	0.66-0.68	0.58-0.60	0.55-0.57	0.54-0.56	0.53-0.55
69	0.63-0.65	0.55-0.57	0.52-0.54	0.51-0.53	0.50-0.52
68	0.60-0.62	0.52-0.54	0.48-0.51	0.48-0.50	0.47-0.49
67	0.57-0.59	0.49-0.51	0.46-0.47	0.45-0.47	0.45-0.46
66	0.53-0.56	0.46-0.48	0.44-0.45	0.42-0.44	0.42-0.44
65	0.50-0.52	0.43-0.45	0.41-0.43	0.40-0.41	0.39-0.41
64	0.47-0.49	0.40-0.42	0.38-0.40	0.37-0.39	0.36-0.38
63	0.44-0.46	0.37-0.39	0.35-0.37	0.34-0.36	0.33-0.35
62	0.40-0.43	0.34-0.36	0.32-0.34	0.31-0.33	0.31-0.32
61	0.37-0.39	0.31-0.33	0.29-0.31	0.28-0.30	0.28-0.30
60	0.33-0.36	0.28-0.30	0.26-0.28	0.26-0.27	0.25-0.27
59	0.30-0.32	0.25-0.27	0.24-0.25	0.23-0.25	0.22-0.24
58	0.26-0.29	0.22-0.24	0.21-0.23	0.20-0.22	0.20-0.21
57	0.23-0.25	0.19-0.21	0.18-0.20	0.17-0.19	0.17-0.19
56	0.19-0.22	0.16-0.18	0.15-0.17	0.15-0.16	0.14-0.16
55	0.15-0.18	0.13-0.15	0.12-0.14	0.12-0.14	0.12-0.13
54	0.12-0.14	0.10-0.12	0.09-0.11	0.09-0.11	0.09-0.11
53	0.08-0.11	0.07-0.09	0.07-0.08	0.06-0.08	0.06-0.08
52	0.05-0.07	0.04-0.06	0.04-0.06	0.04-0.05	0.04-0.05
51	0.01-0.04	0.01-0.03	0.01-0.03	0.01-0.03	0.01-0.03
50	0.00	0.00	0.00	0.00	0.00

P _U or P _L	n = 8	n = 9	n = 10 to 11	n = 12 to 14	n = 15 to 18
	Upper or Lower Quality Index (Q _U or Q _L)				
100	1.96-50.0	2.01-50.0	2.05-50.0	2.10-50.0	2.15-50.0
99	1.82-1.95	1.85-2.00	1.87-2.04	1.92-2.09	1.94-2.14
98	1.71-1.81	1.73-1.84	1.75-1.86	1.78-1.91	1.80-1.93
97	1.62-1.70	1.64-1.72	1.66-1.74	1.68-1.77	1.69-1.79
96	1.55-1.61	1.56-1.63	1.57-1.65	1.59-1.67	1.60-1.68
95	1.48-1.54	1.49-1.55	1.50-1.56	1.51-1.58	1.52-1.59
94	1.42-1.47	1.43-1.48	1.44-1.49	1.45-1.50	1.45-1.51
93	1.37-1.41	1.37-1.42	1.38-1.43	1.38-1.44	1.39-1.44
92	1.31-1.36	1.32-1.36	1.32-1.37	1.33-1.37	1.33-1.38
91	1.26-1.30	1.27-1.31	1.27-1.31	1.27-1.32	1.28-1.32
90	1.22-1.25	1.22-1.26	1.22-1.26	1.22-1.26	1.23-1.27
89	1.17-1.21	1.17-1.21	1.18-1.21	1.18-1.21	1.18-1.22
88	1.13-1.16	1.13-1.16	1.13-1.17	1.13-1.17	1.13-1.17
87	1.09-1.12	1.09-1.12	1.09-1.12	1.09-1.12	1.09-1.12
86	1.05-1.08	1.05-1.08	1.05-1.08	1.05-1.08	1.05-1.08
85	1.01-1.04	1.01-1.04	1.01-1.04	1.01-1.04	1.01-1.04
84	0.97-1.00	0.97-1.00	0.97-1.00	0.97-1.00	0.97-1.00
83	0.94-0.96	0.94-0.96	0.93-0.96	0.93-0.96	0.93-0.96
82	0.90-0.93	0.90-0.93	0.90-0.92	0.90-0.92	0.89-0.92
81	0.87-0.89	0.87-0.89	0.86-0.89	0.86-0.89	0.86-0.88
80	0.83-0.86	0.83-0.86	0.83-0.85	0.83-0.85	0.82-0.85
79	0.80-0.82	0.80-0.82	0.80-0.82	0.79-0.82	0.79-0.81
78	0.77-0.79	0.77-0.79	0.76-0.79	0.76-0.78	0.76-0.78
77	0.74-0.76	0.73-0.76	0.73-0.75	0.73-0.75	0.72-0.75
76	0.71-0.73	0.70-0.72	0.70-0.72	0.70-0.72	0.69-0.71
75	0.67-0.70	0.67-0.69	0.67-0.69	0.67-0.69	0.66-0.68
74	0.64-0.66	0.64-0.66	0.64-0.66	0.63-0.66	0.63-0.65
73	0.61-0.63	0.61-0.63	0.61-0.63	0.60-0.62	0.60-0.62
72	0.58-0.60	0.58-0.60	0.58-0.60	0.58-0.59	0.57-0.59
71	0.56-0.57	0.55-0.57	0.55-0.57	0.55-0.57	0.54-0.56
70	0.53-0.55	0.52-0.54	0.52-0.54	0.52-0.54	0.51-0.53
69	0.50-0.52	0.49-0.51	0.49-0.51	0.49-0.51	0.49-0.50
68	0.47-0.49	0.47-0.48	0.46-0.48	0.46-0.48	0.46-0.48
67	0.44-0.46	0.44-0.46	0.44-0.45	0.43-0.45	0.43-0.45
66	0.41-0.43	0.41-0.43	0.41-0.43	0.41-0.42	0.40-0.42
65	0.39-0.40	0.38-0.40	0.38-0.40	0.38-0.40	0.38-0.39
64	0.36-0.38	0.36-0.37	0.35-0.37	0.35-0.37	0.35-0.37
63	0.33-0.35	0.33-0.35	0.33-0.34	0.32-0.34	0.32-0.34
62	0.30-0.32	0.30-0.32	0.30-0.32	0.30-0.31	0.30-0.31
61	0.28-0.29	0.27-0.29	0.27-0.29	0.27-0.29	0.27-0.29
60	0.25-0.27	0.25-0.26	0.25-0.26	0.24-0.26	0.24-0.26
59	0.22-0.24	0.22-0.24	0.22-0.24	0.22-0.23	0.22-0.23
58	0.20-0.21	0.19-0.21	0.19-0.21	0.19-0.21	0.19-0.21
57	0.17-0.19	0.17-0.18	0.17-0.18	0.17-0.18	0.16-0.18
56	0.14-0.16	0.14-0.16	0.14-0.16	0.14-0.16	0.14-0.15
55	0.12-0.13	0.11-0.13	0.11-0.13	0.11-0.13	0.11-0.13
54	0.09-0.11	0.09-0.10	0.09-0.10	0.09-0.10	0.09-0.10
53	0.06-0.08	0.06-0.08	0.06-0.08	0.06-0.08	0.06-0.08
52	0.04-0.05	0.04-0.05	0.04-0.05	0.04-0.05	0.04-0.05
51	0.01-0.03	0.01-0.03	0.01-0.03	0.01-0.03	0.01-0.03
50	0.00	0.00	0.00	0.00	0.00

**TABLE 106-2
DETERMINATION OF PAY FACTOR (PF)**

Pay Factor	n = 3	n = 4	n = 5	n = 6	n = 7	n = 8	n = 9	n = 10 to n = 11	n = 12 to n = 14	n = 15 to n = 18
	Quality Level (P _U + P _L) - 100									
1.05	100	100	100	100	100	100	100	100	100	100
1.04	90-99	91-99	92-99	93-99	93-99	93-99	94-99	94-99	95-99	95-99
1.03	80-89	85-90	87-91	88-92	89-92	90-92	91-93	91-93	92-94	93-94
1.02	75-79	80-84	83-86	85-87	86-88	87-89	88-90	88-90	89-91	90-92
1.01	71-74	77-79	80-82	82-84	84-85	85-86	85-87	86-87	87-88	88-89
1.00	68-70	74-76	78-79	80-81	81-83	82-84	83-84	84-85	85-86	86-87
0.99	66-67	72-73	75-77	77-79	79-80	80-81	81-82	82-83	83-84	85
0.98	64-65	70-71	73-74	75-76	77-78	78-79	79-80	80-81	81-82	83-84
0.97	62-63	68-69	71-72	74	75-76	77	78	78-79	80	81-82
0.96	60-61	66-67	69-70	72-73	73-74	75-76	76-77	77	78-79	80
0.95	59	64-65	68	70-71	72	73-74	74-75	75-76	77	78-79
0.94	57-58	63	66-67	68-69	70-71	72	73	74	75-76	77
0.93	56	61-62	65	67	69	70-71	71-72	72-73	74	75-76
0.92	55	60	63-64	65-66	67-68	69	70	71	72-73	74
0.91	53-54	58-59	62	64	66	67-68	68-69	69-70	71	73
0.90	52	57	60-61	63	64-65	66	67	68	70	71-72
0.89	51	55-56	59	61-62	63	64-65	66	67	68-69	70
0.88	50	54	57-58	60	62	63	64-65	65-66	67	69
0.87	48-49	53	56	58-59	60-61	62	63	64	66	67-68
0.86	47	51-52	55	57	59	60-61	62	63	64-65	66
0.85	46	50	53-54	56	58	59	60-61	61-62	63	65
0.84	45	49	52	55	56-57	58	59	60	62	64
0.83	44	48	51	53-54	55	57	58	59	61	63
0.82	42-43	46-47	50	52	54	55-56	57	58	60	61-62
0.81	41	45	48-49	51	53	54	56	57	58-59	60
0.80	40	44	47	50	52	53	54-55	55-56	57	59
0.79	38-39	43	46	48-49	50-51	52	53	54	56	58
0.78	37	41-42	45	47	49	51	52	53	55	57
0.77	36	40	43-44	46	48	50	51	52	54	56
0.76	34-35	39	42	45	47	48-49	50	51	53	55
0.75	33	38	41	44	46	47	49	50	51-52	53-54
0	0-32	0-37	0-40	0-43	0-45	0-46	0-48	0-49	0-50	0-52

106-1.04 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:

1. 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;
2. Give the inspector full and safe access to all parts of the plant used to manufacture or produce materials; and
3. 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 105-1.11. 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 105-1.11.

106-1.05 CERTIFICATES OF COMPLIANCE. The Engineer may authorize the use of certain materials or assemblies based on a manufacturer's certificate of compliance. The certificate must state that the material or assembly fully complies with Contract requirements, include the project name and number, and be signed by the manufacturer. The certificate must accompany each lot of the materials or assemblies delivered to the project and must clearly identify the lot.

The Contractor shall submit a manufacturer's certificate of compliance, as required, for each item listed on the Materials Certification List (MCL) included in the Contract documents. The Contractor shall submit additional manufacturer's certificates of compliance if required by the Contract or by the Engineer.

Materials or assemblies 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 meet Contract specifications, they may be rejected and ordered removed under Subsection 105-1.11. The Engineer may refuse permission to incorporate materials or products into the project based on a manufacturer's certificate of compliance that does not meet specifications.

106-1.06 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:

1. Use only approved portions of the project site for storage of materials and equipment or plant operations;
2. Provide any additional space needed for such purposes without extra compensation;
3. Restore Department-owned or controlled storage and plant sites to their original condition without extra compensation;
4. 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
5. 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.

106-1.07 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.

106-1.08 SUBMITTAL PROCEDURE. The Contractor shall complete a Submittal Register, and shall submit it to the Engineer on forms provided by the Department. 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, Construction Phasing Plan, Traffic Control Plan, Storm Water Pollution Prevention Plan, 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 Materials Certification List and the Contract.

The number of copies required for submittals may be included in the specifications for individual bid items. If the number of copies of a submittal is not otherwise specified, three copies shall be required. On each sheet submitted to the Department, including working drawings, catalog cuts, manufacturer's certifications, etc., space shall be provided for Contractor and Department review stamps.

Each copy of each submittal shall include a Submittal Summary sheet. The Contractor may use forms provided by the Department or a similar form of the Contractor's choice as approved by the Department. The Contractor shall sign submittals and submit them to the Engineer. The Department will review submittals within 30 days after they are received. 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 will review resubmittals within 30 days after they are received.

The Contractor shall not order material or use working drawings that have not been approved by the Department. The Contractor shall be responsible for timely submittals. Failure by the Department to review submittals within the time given 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, company and location of invoice (bill, certificate); project name and number where material will be incorporated; manufacturer, product number, quantity and cost.

SECTION 107

LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

107-1.01 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, regulations or decrees 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, or regulation.

107-1.02 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.

The Department will:

1. The Department has secured some permits and licenses required for the construction of the proposed Project. A list of permits secured, or to be secured by the Department is located in RFP Part III, Section 12, Environmental Compliance.
2. Modify Department-acquired permits during the performance of the contract, if deemed necessary by the Engineer.

The Contractor shall:

1. Acquire any permits and licenses required to complete the project that are not acquired by the Department;
2. Provide qualified professionals to collect data or perform studies necessary to acquire permits for the use of sites not previously permitted;
3. Give all notices required for the prosecution of the work;
4. Abide by all permits and licenses whether acquired by the Department or by the Contractor;
5. 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;
6. Obtain modifications to permits acquired by the Contractor;
7. Pay all charges, fees and taxes; and
8. Provide proof of payment of all taxes before the Department makes final payment.

In addition, before using an area not previously permitted for use by the Contract, the Contractor shall:

1. Contact all government agencies having possible or apparent permit authority over that area;
2. Obtain all required permits and licenses from those agencies;
3. Obtain permission from any property owners or lessees with an interest in the property; and
4. Provide all of the following to the Engineer:
 - a. All permits or clearances necessary to use the site for its intended purpose(s);
 - b. A written statement that all permits or clearances necessary have been obtained;
 - c. 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
 - d. 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.

107-1.03 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.

107-1.04 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.

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.

107-1.06 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:

1. A worksite hazard analysis;
2. A hazard prevention and control plan including personal protective equipment and safe work procedures required for specific tasks;
3. New employee training and periodic worker training regarding safety and health;
4. Regular safety meetings with written documentation of attendance, safety topics discussed, worker safety complaints, and corrective actions taken; and
5. 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 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.

107-1.07 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:

1. Immediately cease operations at the site of the find;
2. Immediately notify the Engineer of the find; and
3. 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.

107-1.09 CONSTRUCTION OVER OR ADJACENT TO WATERS. The Contractor shall fully comply with all laws, regulations and permits issued by agencies of the United States and the State of Alaska when working in, over or adjacent to wetlands, tidelands, anadromous fish streams, eagle nests, navigable waters, or coastal waters.

The Contractor shall ensure that all work in, over or adjacent to navigable waters is conducted so that free navigation of the waterways is not obstructed and that existing navigable depths are not impaired, except as allowed by the U.S. Coast Guard and the U.S. Army Corps of Engineers.

107-1.10 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 notice to the Federal Aviation Administration when required by law. 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 is liable for all property damage, injury, or death resulting from the use of explosives on the project. The Contractor 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.

107-1.11 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE.

1. 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, the condition of each area and haul route will be compared to the earlier photographs. Prior to demobilization 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.
2. 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 dumping 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 dumping. 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.
3. Property marks. The Contractor shall:
 - a. 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
 - b. Not move such monuments or marks without the Engineer's approval.
4. Damage to property. The Contractor shall:
 - a. 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;

- b. 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
- c. 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.

5. Protection of natural resources. The Contractor shall:

- a. Conduct work in a manner that minimizes disturbance to and protects natural resources in compliance with all federal, state, and local laws and regulations;
- b. When working near designated wetlands, as defined by the Corps of Engineers, place no fill, nor operate equipment outside the permitted area;
- c. When working in or near designated anadromous fish streams, as defined by AS 41.14.840 and .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; and
- d. Not refuel and service equipment within 100 feet of wetlands and/or other water bodies.
- e. If water from a non-municipal water source is required for construction purposes, obtain a Temporary Water Use Permit from the Water Resource Manager, and provide a copy to the Engineer. The Water Resource Manager is with the Department of Natural Resources in Anchorage and may be contacted at (907) 269-8624.
- f. Bald Eagles are protected under the Bald Eagle Protection Act (16 U.S.C. 668-668c) which prohibits “takes” of bald eagles, their eggs, nests, or any part of the bird. The Act defines “taking” as “to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb.”

Maintain a Primary Zone of a minimum 330 feet as an undisturbed habitat buffer around nesting bald eagles. If topography or vegetation does not provide an adequate screen or separation, extend this buffer to 0.25 miles, or a sufficient distance to screen the nest from human activities. The actual distance will depend on site conditions and the individual eagle’s tolerance for human activity. Within the Secondary Zone, between 330 feet and 660 feet from eagles nest tree no obtrusive facilities or major habitat modifications shall occur. If nesting occurs in sparse stands of trees, treeless areas, or where activities would occur within line-of-site of the nest, this buffer shall extend up to 0.5 miles. No blasting, logging and other noisy, disturbing activities should occur during the nesting period (March 1 – August 31) within the primary or secondary zones.

Extremely noisy activities such as road construction or other activities that occur within the Secondary Zone shall be conducted outside the nesting period to avoid disturbance to eagles. If activities occur in proximity to a nest site, employ an individual qualified to observe and assess the impact of such activities on nesting eagles. Behavior generally associated with disturbed eagles includes alarm calls, birds flushed from their nest or perch, and aggressiveness.

If nest trees are discovered within the vicinity of the project site, the U.S. Fish and Wildlife Service must be notified immediately by calling (907) 786-3503 or (907) 271 – 2772, before starting construction activities, for further site evaluation. This is an advisory. Do what is required to keep from disturbing a nesting eagle.

6. 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:
- a. Not excavate, nor use for fill, any material at any site suspected of or found to contain hazardous materials or petroleum fuels;
 - b. Not raze and remove, or dispose of structures that contain asbestos or lead-based paints;
 - c. Not stockpile, nor dispose of, any material at any site suspected of or found to contain hazardous materials or petroleum;

- d. 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;
 - e. Report any containment, cleanup, or restoration activities anticipated or performed as a result of such release or discovery;
 - f. Handle and dispose of hazardous material with properly trained and licensed personnel who follow an approved Hazardous Material Control Plan as per Section 641.
7. **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 107-1.02.
8. **Solid waste.** The Contractor shall remove all debris, trash, and other solid waste from the project site as soon as possible and in accordance with the Alaska Department of Environmental Conservation Solid Waste Program.

107-1.12 FOREST PROTECTION. The Contractor shall:

- 1. 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;
- 2. Keep forest areas in an orderly condition;
- 3. 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 in accordance with the requirements of the supervising authorities;
- 4. Take all reasonable precautions to prevent and suppress forest fires;
- 5. 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
- 6. Make every possible effort to notify the appropriate forestry agency at the earliest moment of the location and extent of any forest fire.

107-1.13 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.

107-1.15 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 643-3.07.

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.

107-1.16 RESERVED.

107-1.17 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.

107-1.18 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.

107-1.19 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.

107-1.20 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.

SECTION 108

PROSECUTION AND PROGRESS

108-1.01 SUBCONTRACTING OF CONTRACT. The Contractor shall submit a Contractor Self Certification for Subcontractors and Lower Tier Subcontractors, Form 25D-042, 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 the approved Schedule of Values 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.

1. The Contractor shall ensure that for all subcontracts (agreements):
 - a. The Department is furnished with one completed Contractor Self Certification, Form 25D-042, for each subcontract;
 - b. The subcontractors have submitted a Bidder Registration, Form 25D-6;
 - c. The required prompt payment provisions of AS 36.90.210 are included in all subcontracts;
 - d. 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;
 - e. 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;
 - f. 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;
 - g. A clause is included requiring the Contractor to pay interest on retainage, according to AS 36.90.250 and AS 45.45.101(a);
 - h. Other required items listed in Form 25D-042 are included in the subcontracts;
 - i. The subcontractors pay current prevailing rate of wages as per Subsection 107-1.04 and file certified payrolls with the Engineer and DOLWD for all work performed on the project; and
 - j. Upon receipt of a request for more information regarding subcontracts, the requested information is provided to the Department within 5 calendar days.
2. The Contractor shall ensure that for all lower tier subcontracts (agreements between subcontractors and lower tier subcontractors):
 - a. The required prompt payment provisions of AS 36.90.210 are included in all lower tier subcontracts;
 - b. 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;
 - c. 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;

- d. 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;
 - e. 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);
 - f. Other required items listed in Form 25D-042 are included in the lower tier subcontracts;
 - g. The lower tier subcontractors pay current prevailing rate of wages as per Subsection 107-1.04 and file certified payrolls with the Engineer and DOLWD for all work performed on the project; and
 - h. Upon receipt of a request for more information regarding subcontracts, the requested information is provided to the Department within 5 calendar days.
3. The following will be considered as subcontracting, unless performed by the Contractor:
- a. **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.
 - b. **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.
 - c. **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.
 - d. **Other Contractors.** All other contractors working on the project site under contract with the Contractor are considered subcontractors unless specifically excluded in this subsection.
4. The following will not be considered as subcontracting, but the Contractor shall comply with the prompt payment provisions of AS 36.90:
- a. **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.
 - b. **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.
 - c. **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.
5. **Owner-Operators.** Hauling of materials for the project by bona fide truck owner-operators who are listed as such on the 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:

- a. Alaska Driver's License with appropriate CDL class and endorsements;
- b. Business license for trucking with supporting documents that list the driver as the business owner or corporate officer;
- c. Documents showing the driver's ownership interest in the truck, including copies of:

- (1) Truck registration; and
- (2) 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:

- a. The owner-operator's right to control the manner in which the work is to be performed;
- b. The owner-operator's opportunity for profit or loss depending upon their managerial skill;
- c. The owner-operator's investment in equipment or materials required for their task, or the employment of helpers;
- d. Whether the service rendered requires a special skill;
- e. The degree of permanence of the working relationship; and
- f. 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.

108-1.02 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 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.

108-1.03 PROSECUTION AND PROGRESS. The Contractor shall meet with the Engineer at the regional construction office for a preconstruction conference before beginning construction. Submit the following at the Preconstruction Conference:

1. A Critical Path Method (CPM) Schedule is required, in a format acceptable to the Engineer, showing the order the work will be carried out and the contemplated dates the Contractor and subcontractors will start and finish each of the salient features of the work, including scheduled periods of shutdown. Indicate anticipated periods of multiple shift work in the CPM Schedule. Revise to the proposed CPM Schedule promptly. Promptly submit a revised CPM Schedule if there are substantial changes to the schedule, or upon request of the Engineer.
2. 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 Subsection 105-1.02 and for other events such as inspection of structural steel fabrication.
3. A list showing all proposed subcontractors and material suppliers.
4. A Construction Phasing plan.

5. A Storm Water Pollution Prevention Plan, Erosion and Sediment Control Plan, and a Hazardous Material Control Plan, with the line of authority and designated field representatives, as required under Section 641.
6. A letter designating the Contractor's Project Superintendent, defining that person's responsibility and authority, and providing a specimen signature.
7. A letter designating the Environmental Compliance Officer, and designating that person's responsibilities and authority
8. A letter designating an Equal Employment Opportunity Officer and a Disadvantaged Business Enterprise Officer, and designating those person's responsibilities and authority.
9. A Design Quality Management Plan, Construction Quality Management Plan, and a Quality Control Plan, as required under Subsection 106-1.03, Testing and Acceptance, and Part III, Section 16, Quality Program.
10. A letter designating a Safety Officer, and designating that person's responsibilities and authority.
11. A letter designating the Environmental Compliance Officer, and designating that person's responsibilities and authority.
12. A proposed Schedule of Values submitted on a state contract form for approval. The Contractor shall break down all Contract work into measurable work items, in sufficient detail to serve as a basis of progress payments. Any stockpiled materials for which interim payment is proposed shall be included. The Schedule of Values must indicate a quantity and unit cost including overhead and profit for each work item, the total cost for each work item, and the total cost for all work items. The total cost for all work items must equal the total Contract price.

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 in accordance with Subsection 105-1.17.

108-1.04 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.

108-1.05 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, perform the work in an unskilled manner, who are intemperate or disorderly, or who jeopardize the safety of the public, other workers or Engineer's personnel. 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.

108-1.06 CONTRACT TIME, EXTENSION OF CONTRACT TIME AND SUSPENSION OF WORK. Contract time will be by specific Completion Date.

1. 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.

2. Reasons for Suspension of Work and Extension of Contract Time. The Department may order a suspension of work for any reason listed in Items 3a through 3p.

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:

- a. Acts of God;
- b. Acts of the public enemy;
- c. Fires;
- d. Floods;
- e. Epidemics;
- f. Quarantine restrictions;
- g. Strikes;
- h. Freight embargoes;
- i. Unusually severe weather;
- j. In accordance with Subsection 105-1.06.4.d, delays by utility owners beyond completion dates specified in the RFP Part III, Section 10, Utilities for relocating or adjusting utilities and related facilities; or
- k. 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 3, Items a through j.

No additional Contract time or additional compensation will be allowed due to delays caused by or suspensions ordered due to:

- l. Failure to correct unsafe conditions for the workers or the public;
- m. Adverse weather that is not unusually severe;
- n. Failure to carry out Contract provisions;
- o. Failure to carry out orders given by the Engineer; or
- p. 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 105-1.17.

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 on a basis commensurate with the amount and difficulty of the extra work, provided that the extra work is for a controlling item.

4. 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.
- a. 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.
 - b. 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:
 - (1) 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

- (2) 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.
- c. 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:
 - (1) The Department is not responsible under the Contract, including the Contractor's fault or negligence; or
 - (2) An equitable adjustment is either provided for or excluded under any other section of this Contract.
- d. Claims for equitable adjustments under this section shall be filed under Subsection 105-1.17 except that:
 - (1) 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; and
 - (2) 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.

108-1.07 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 108-1 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 108-1 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 108-1
DAILY CHARGE FOR LIQUIDATED DAMAGES
FOR EACH CALENDAR DAY OF DELAY**

Original Contract Amount		Daily Charge
From More Than	To and Including	
\$ 0	1,000,000	\$1,500
1,000,000	5,000,000	2,900
5,000,000	25,000,000	5,500
25,000,000	-----	6,900

Permitting the Contractor to continue work 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.

108-1.08 DEFAULT OF CONTRACT. The Contracting Officer will give a written Notice of Default to the Contractor and the Surety if the Contractor:

1. Fails to begin work under the Contract within the time specified;
2. Fails to perform the work with sufficient workers, equipment, or materials to ensure the prompt completion of the work;
3. Performs the work unsuitably or neglects or refuses to remove materials or to replace rejected work;
4. Discontinues the prosecution of the work;
5. Fails to resume work that has been discontinued within a reasonable time after notice to do so;
6. Becomes insolvent except that if the Contractor declares bankruptcy, termination shall be in accordance with 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;
7. Allows any final judgment to stand against the Contractor unsatisfied for a period of 60 days;
8. Makes an assignment for the benefit of creditors, without the consent of the Engineer;
9. Fails to comply with applicable minimum wage or civil rights requirements;
10. Is a party to fraud, deceit, misrepresentation, or malfeasance in connection with the Contract; or
11. 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 of 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 108-1.09, Termination for Convenience.

108-1.09 TERMINATION FOR CONVENIENCE.

1. Notice. The Contracting Officer may terminate the Contract in whole or in part due to:

- a. 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.
- b. 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.
- c. 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.

2. Required Actions. Unless otherwise directed by the Contracting Officer, upon receipt of a Notice of Termination the Contractor shall immediately:

- a. Stop work as directed in the Notice.
- b. Place no further orders or subcontracts for materials, services, or facilities except as approved to complete work not terminated.
- c. Terminate all orders and subcontracts for the terminated work.
- d. Accomplish either (1) or (2) below as directed by the Contracting Officer:
 - (1) 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.
 - (2) Settle any outstanding liabilities and claims arising from termination of orders and subcontracts. Settlements must be limited to costs allowed under this Section.
- e. 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 108-1.09.2.f., below.
- f. 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 (1) or (2) below:
 - (1) 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.
 - (2) 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:

- (1) applied to reduce any payments to be made by the Department under the Contract,
 - (2) credited to the cost of the work, or
 - (3) paid in any other manner as directed.
- g. Deliver to the Department completed or partially completed plans, drawings, information, and other property required to be furnished under the Contract.

- h. Take all necessary actions and comply with all directives to protect contract-related property in which the Department has or may acquire an interest.
- i. 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.

- 3. 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.
 - a. Without duplication of any amount paid for under Subsection 108-1.09.2., the claim may be for the total of:
 - (1) 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 Subsection 108-1.09.3.b. regarding reimbursement of equipment costs and Subsection 108-1.09.3.c. regarding unallowable items.
 - (2) payments approved by the Contracting Officer under Subsection 108-1.09.2.d.(2) to settle the termination claims of suppliers and subcontractors to the extent not covered under Subsection 108-1.09.3.a.(1).
 - (3) reasonably incurred costs for:
 - (a) 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 Subsection 108-1.09.8.
 - (b) settling subcontractor and supplier claims, excluding the amounts of those settlements paid under Subsection 108-1.09.3.a.(2).
 - (4) reasonable profit on the costs included in Subsection 108-1.09.3.a(1) 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 108-1.09.4. The Department will not pay profit on costs included in Subsections 108-1.09.3.a.(2) and 108-1.09.3.a.(3).
 - b. Equipment claims will be reimbursed as follows:
 - (1) 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.
 - (2) 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.
 - (3) 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,

unless the affiliate, division, subsidiary or other organization has an established practice of leasing to unaffiliated lessees.

- c. The following costs are not payable under a termination settlement agreement or Contracting Officer's determination of the termination claim, or on appeal:
 - (1) Loss of anticipated profits or consequential or compensatory damages
 - (2) Unabsorbed home office overhead (also termed "General & Administrative Expense") related to ongoing business operations
 - (3) Bidding and project investigative costs
 - (4) Direct costs of repairing equipment to render it operable for use on the terminated work
4. 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:
 - a. The amount due for termination claim costs under Subsection 108-1.09.3.a.(3); plus
 - b. The remainder of the total allowable claim amount due reduced by multiplying the remainder by the ratio of (1) the total contract price to (2) the remainder plus the estimated cost to complete the entire Contract; minus
 - c. all disposal and other credits, all advance and progress payments and all other amounts previously paid under the Contract.
5. Deductions. In arriving at the amount due under this Subsection, the Department will deduct:
 - a. All previous payments made before termination;
 - b. Any claim which the Department may have against the Contractor;
 - c. 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;
 - d. All partial payments made under this Section; and
 - e. Any adjustment for loss determined under Subsection 108-1.09.4.
6. 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 108-1.09.3, that includes a profit under Subsection 108-1.09.3.a.(4) or, where appropriate, a loss adjustment under Subsection 108-1.09.4, and that takes into account the Contractor's reasonable business judgment in performing the work.

The total settlement, whether determined under this Subsection 108-1.09.6 or under Subsection 108-1.09.7, exclusive of the costs listed in Subsection 108-1.09.3.a.(3), may not exceed the total contract price as reduced by previous payments made and the value of the work not terminated, as determined from the approved Schedule of Values.

If an agreement is reached in whole or in part, the Department will amend the contract and will pay the agreed amount.

7. 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 108-1.09 on the basis of information available to the Department.

8. Right of Appeal. The Contractor may appeal a Contracting Officer's Decision within the time and in the manner specified in Subsection 105-1.17.
9. 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.
10. 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 107-1.19 or elsewhere in the Contract.
11. 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.
12. Definitions. In this Subsection 108-1.09, 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.
13. 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 highway 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 109

MEASUREMENT AND PAYMENT

109-1.01 GENERAL. The lump sum price indicated on Form PP-1 of RFP Part I, Instructions to Proposers, Section 9, RFP Proposal Forms (which is known as the Contract Price), shall be full compensation for design, construction, and warranty of the Project in its entirety. No adjustment of the Contract Price will be made except in the case of:

1. Adjustments for incentives or disincentives, or other reductions described in the Contract.
2. Owner directed changes in the Work in accordance with Subsection 104-1.02, Changes.
3. Differing Site Conditions in accordance with Section 104-1.03, Differing Site Conditions

All requirements specified or necessary for a complete Project are to be furnished for the Contract Price indicated in the Design-Builder's Proposal in accordance with the accepted Release for Construction Plans, regardless of the presence or absence of any statements that any Work is to be paid for as extra work, or of the presence or absence of any statements that any Work is subsidiary to another item.

The above statement does not nullify Specifications that refer to price adjustments for quality of materials and/or workmanship, such as for asphalt cement concrete, Portland cement concrete, traffic price, schedule submittal adjustments or similar price adjustments, which shall remain in full force and effect.

109-1.02 MEASUREMENT OF QUANTITIES. The Contractor shall determine the quantities of work completed during each Contract pay period. The Contractor shall maintain current records of measurements, invoices, estimates, and computations for each pay request and make them available to the Engineer for inspection through Final Acceptance.

When the Contract specifies Quality Control and/or Acceptance testing frequencies, the Contractor shall provide timely measurements of material production and application rates to the Engineer to allow proper sampling and testing.

109-1.03 SCOPE OF PAYMENT. The Contractor shall accept the Contract Price as full payment for furnishing all resources necessary to complete all work under the Contract in a complete and acceptable manner. The Contractor shall assume all liability for risk, loss, damage, or expense resulting from the work, subject to Subsection 107-1.18.

109-1.04 COMPENSATION FOR ALTERED QUANTITIES. No allowance shall be made to the Contractor for any increased expenses, loss of expected reimbursement or loss of anticipated profits suffered or claimed, from alterations in quantities.

109-1.05 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:

1. Labor. Based on the sum of a. through f.
 - a. 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.
 - b. Overtime hours worked times the difference between the overtime rate and the straight time rate. No markup is allowed.

- c. 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.
 - d. Workers' Compensation Insurance at 8 percent of a. 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.
 - e. 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.
 - f. Markup at 35 percent of the sum of a., c., d., and e. 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.
 - g. Compensation for extra design work and administration will be computed by multiplying all direct labor costs by 2.60.
2. 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.
3. 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.
- a. Hourly Rental Rate. Based on rental rates in the current edition and appropriate volume of the *Rental Rate Blue Book for Construction Equipment*, published by PRIMEDIA Information, Inc., 1735 Technology Drive, Suite 410, San Jose, CA 95110-1313.
- 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 for Alaska – South Region. 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.
- b. 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.

- c. 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.
- d. 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 Blue Book or prevailing commercial rates. No markup is allowed.
- e. 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 3.a., b., and c. (above) with no markup, except that the adjusted monthly rate is the monthly rate determined directly from the submitted rental or lease agreement.

- f. 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:

- (1) If by common carrier: paid freight bill or invoice.
 - (2) If hauled with the Contractor's own resources: hourly rental rate for hauling unit plus operator wages.
 - (3) If equipment must be moved under its own power: half of the normal hourly rental rate plus operator's wages.
- 4. Work by a Subcontractor or Owner-Operator. For time and materials work performed by an approved subcontractor or owner-operator under items 1 through 3 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.
 - 5. 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.
 - 6. 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.
 - 7. 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.

109-1.06 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 109-1.07. At the Departments discretion, a progress payment may be made twice monthly if the value of the estimate exceeds \$10,000 and the Contractor makes the request.

The Contractor shall submit an estimate of work completed based on the approved Schedule of Values. The Contractor shall include supporting documentation as required by the Engineer.

The Contractor shall submit Progress payment requests to the ICQF, which shall review each progress payment request. The ICQF shall verify that the acceptable quality documentation is on file for all items for which progress payment is requested and that the following information is correct:

1. Percent complete of all payment items
2. Quality-based price adjustments
3. Value of materials on hand (in accordance with Subsection 109-1.07, Payment for Material on Hand)

The payment items are the items listed in the Design-Builder-provided and Department-approved Schedule of Values. The Contractor shall submit a proposed Schedule of Values at the Preconstruction Conference for approval. Once approved, the Schedule of Values shall be used as the basis for progress estimates. After the ICQF has reviewed the progress payment request and verified that it is correct, the ICQF shall so certify, and shall submit the progress payment request with the accompanying certification to the Engineer for payment. The progress payment requests shall not include any payment for work documented as deficient by the IQF.

Contractor's failure to pay subcontractors, or subcontractor's failure to pay lower tier subcontractors, according to prompt payment provisions required under Subsection 108-1.01 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 108-1.01 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 108-1.01, 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).

109-1.08 FINAL PAYMENT. When the project has been completed as provided in Subsection 105-1.15, 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 1 through 4 in the first paragraph of Subsection 105-1.16.

If the Contractor approves 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 approves the final estimate and executes the Contractor's Release form, final payment will be processed.

The Contractor may reserve any unresolved claims that were timely filed in accordance with Subsection 105-1.17 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.

DIVISION 200 – EARTHWORK

SECTION 201

CLEARING AND GRUBBING

201-1.01 DESCRIPTION. Clear, grub, remove, and dispose of all vegetation and debris within designated areas of the project, except such objects as are designated to remain or are to be removed under other sections of these Specifications. Preserve from injury or defacement all vegetation and objects designated to remain.

201-2.01 MATERIALS. None.

CONSTRUCTION REQUIREMENTS

201-3.01 GENERAL. The limits of work and all trees, shrubs, plants and other things to remain shall be shown on the plans. Preserve all things designated to remain. Keep erosion potential to a minimum. Preserve survey stakes, boundary markers, bench marks, and tie points until such time as their usefulness has ceased and the work has been accepted.

Cut timber, with a 5 inch diameter or larger at breast height, into 8 foot lengths, de-limbed, and stacked to a height no greater than 6 feet at locations readily available for removal by the property owner.. Provide at least two weeks for the property owner to access the site where timber is made available. Dispose of the remaining timber left after the access time period.

Clearing and grubbing is not permitted within the migratory bird window of May 1 to July 15; except as permitted by Federal, State and local laws approved by the Engineer.

201-3.02 CLEARING. Cut and dispose of all trees, down timber, stubs, brush, bushes and debris from all areas designated.

Fell trees toward the center of the area to be cleared, in order to minimize damage to the trees that are to be left standing. Remove and dispose of trees unavoidably falling outside the specified limits. Cut trees and brush to a height of not more than 6 inches above the surrounding ground.

201-3.03 GRUBBING. Remove and dispose of all stumps, roots, moss, grass, turf, debris or other objectionable material within excavation limits, and within fill limits where the embankments are to be made to a depth less than 4 feet below subgrade. Grub any other areas designated on the Plans or in the Special Provisions.

Except in areas to be excavated, backfill stump holes and other holes with suitable materials and compact according to the Specifications.

201-3.04 HAND CLEARING. Cut and dispose of all trees, down timber, stubs, brush, bushes and debris from all areas designated, with minimal disturbance to grass and/or moss cover. Do not use equipment on wheels or tracks in areas designated as hand clearing, except as stated below.

Cut stumps flush with the ground. In areas to be covered by least 4 feet of subgrade material, stumps may extend up to 12 inches above natural ground, except where geotextile is specified.

201-3.05 SELECTIVE TREE REMOVAL. Remove and dispose of selected trees, as designated by the Engineer, and which are located outside the normal clearing and grubbing limits. The Engineer may designate the trees to be removed under this item at any time during the Contract life, subject to conditions in Subsection 201-3.04, Hand Clearing. Cut off designated trees no more than 12 inches above the ground surface.

201-3.06 DISPOSAL. Dispose of all vegetation, debris and timber less than 5 inch in diameter at breast height removed by clearing or grubbing using approved methods at approved off-site locations.

Obtain the property owner's written permission to dispose of vegetation and debris at locations outside the right-of-way limits and a waiver of all claims against the State for any damage to such land which may result. Obtain all permits required by law for such disposal. Furnish a copy of such permission, waiver of claims, and permits to the Engineer before commencing work.

Burning will only be allowed with permission of the Department. Do not burn when prevailing winds would produce a smoke hazard to traffic or disturb local communities. Place piles for burning in open spaces within the Project, or in other spaces shown on the Plans where no damage to trees, other vegetation or embankment stability will occur.

SECTION 202

REMOVAL OF STRUCTURES AND OBSTRUCTIONS

202-1.01 DESCRIPTION. Remove and dispose or salvage all buildings, fences, guardrail, structures, old pavements, abandoned utilities and any other obstructions which are not designated or permitted to remain, except for the obstructions to be removed and disposed of under other items in the Contract. Backfill the resulting trenches, holes and pits. When the bid does not include pay items for removal of structures and obstructions as set out in this Section, perform such work under Section 203 or as specified. Remove and reset mailboxes and newspaper delivery tubes and the preserve from injury and defacement all vegetation and objects not scheduled to be removed.

202-2.01 MATERIALS. Use materials that conform to the following:

Timber	AASHTO M 168 (Hemlock, Douglas fir, Western Pine, or Sitka Spruce). Pressure treated per AASHTO M 133.
Steel Pipe	Standard Weight Steel Pipe, 2-inch (max.) diameter. Galvanized per AASHTO M 111.
Steel Fasteners	ASTM A 307, Grade A. Galvanized per AASHTO M 232.
Reflectors	Yellow acrylic prismatic type meeting AASHTO M 290 or reflective sheeting meeting AASHTO M 268, Type III, IV, or V.

CONSTRUCTION REQUIREMENTS

202-3.01 GENERAL. Raze, remove, and dispose of, or salvage all buildings and foundations, structures, fences, and other obstructions, any portions of which are within the right-of-way, except utilities and those for which other provisions have been made for removal.

Fill basements, or cavities left by structure removal, to the level of the surrounding ground and, if within the prism of construction, compact backfill as specified under Section 203.

Stockpile all materials which are designated for use on the project at approved locations.

Burn or otherwise dispose of combustible debris as approved.

Non-combustible debris or materials may be:

1. placed in embankments under the provisions of Subsection 203-3.03 for placing rock in embankments (No metal pipes, wires, or cables may be placed in any embankment),
2. buried on the project, outside the embankment at approved locations, under a minimum covering of 2 feet of earth, or
3. disposed of outside the right-of-way limits, provided that before dumping such materials or debris on private or public lands, obtain from the owner of such land written permission for such dumping and a waiver of all claims against the State for any damage to such land which may result, together with all permits required by law for such dumping. Furnish a copy of such permission, waiver of claims, and permits to the Engineer before commencing work. Grade waste areas to drain.

Remove septic or fuel tanks according to the Department of Environmental Conservation (DEC) regulation. Remove or abandon wells according to DEC regulations.

202-3.02 MAIL BOXES. Remove existing mail boxes and newspaper delivery tubes within the project limits and temporarily reset them at approved locations. Install the boxes and tubes in such a position that their usefulness will not be impaired.

After construction has been completed, install mail boxes and tubes to meet Standard Drawings M-20 and M-23. Repair or replace any posts, boxes, tubes or other material broken or damaged by the Contractor.

202-3.03 REMOVAL OF BRIDGES, CULVERTS, AND OTHER DRAINAGE STRUCTURES. Do not remove bridges, culverts and other drainage structures in use by traffic until satisfactory arrangements have been made to accommodate traffic.

Do not remove manholes, inlets, valves or any other portion or portions of the sewer or water systems until the new systems are in operation or suitable arrangements have been made for the diversion, interruption, or a temporary system has been installed.

When flexible pipe is designated on the Plans to be abandoned in place, crush and flatten the ends before covering. Securely plug other conduits by an approved method.

Remove the substructures of existing structures down to the natural stream bottom and remove those parts outside of the stream down 12 inches below natural ground surface. Where such existing structures lie wholly or in part within the limits for a new structure, remove such portions as necessary to accommodate the new structure.

Upon removal of existing bridges, dress all slopes or embankments according to the plan details. Dress slopes not designated in the Plans to conform to the natural ground surface or blend as directed. Fill all excavations and depressions.

Complete blasting or other operations necessary for the removal of an existing structure or obstruction, which may damage new construction, prior to placing the new work.

202-3.04 REMOVAL OF PIPE. Any pipe required to be removed to construct the work becomes the Design-Builder's property.

202-3.05 REMOVAL OF PAVEMENT, SIDEWALKS, AND CURBS. Dispose of all concrete pavement, base course, sidewalks, curbs, gutters, etc., designated for removal, in an acceptable manner.

In removing pavements, curbs, walks, driveways and similar structures, make all cuts clean, vertical, and true to designated lines where an abutting structure or a part of a structure is to be left in place.

SECTION 203

EXCAVATION AND EMBANKMENT

203-1.01 DESCRIPTION. Excavate, haul, place, and compact or dispose of specified materials necessary to construct the project. Conform to the lines, grades, depths and typical cross sections shown on the Plans or as established. The Plans will designate material to be removed within the excavation limits as classified or unclassified excavation.

203-2.01 MATERIALS.

1. Unclassified Excavation. All materials of whatever character encountered in the work. May include rock, common, or muck.
2. Classified Excavation.
 - a. Common Excavation. Silt, sand, gravel, and granular material other than rock or muck.
 - b. Rock Excavation. Rock that cannot be excavated without blasting or ripping.
 - c. Muck Excavation. Soils, organic matter, and other material not suitable for foundation material regardless of moisture content.
3. Borrow. Approved material required for embankments or for other portions of the work, and obtained from sources outside the right-of-way limits for the project.
4. Rock Stabilization Materials. As specified on the Plans or Special Provisions.
5. Rockfall Mitigation Materials. As specified on the Plans or Special Provisions.
6. Crushed Glass. May be combined with soil-aggregate material to be used in embankment construction. Meet 703-2.15 requirements.

CONSTRUCTION REQUIREMENTS

203-3.01 GENERAL. Perform all necessary clearing and grubbing prior to beginning excavation, grading, and embankment operations in any area.

Keep excavation and embankment areas free draining at all times as the work progresses. Finish the excavation and embankments to reasonably smooth and uniform surfaces.

Excavate and embank material only within the limits on the Plans or as directed. Prevent disturbing material and vegetation outside of the slope limits.

The Engineer may designate excavated soils, that cannot be properly compacted in embankments, as unsuitable.

When unsuitable material is encountered at the required depth of excavation, remove the unsuitable material to the depth specified or directed. Allow for measurements to be taken before backfill is placed.

Dispose of unsuitable material or excess usable material at approved locations.

Obtain the property owner's written permission to dispose of unsuitable material or excess usable material at locations outside the right-of-way limits and a waiver of all claims against the State for any damage to such land which may result. Obtain all permits required by law for such disposal. Furnish a copy of such permission, waiver of claims, and permits to the Engineer before commencing work.

Ensure that all waste areas are properly graded and drained. Blend the outer limits of waste into surrounding grounds with no noticeable break or variation readily discernible. When existing roadway embankment slopes are used as disposal sites for waste or surplus material, finish the slopes with a motor grader or other approved method.

When the volume of suitable excavation is not sufficient for constructing the fill to the grades indicated, furnish the necessary borrow from approved sources. Borrow may be necessary even though not shown on the Plans. The source and acceptability of the borrow is subject to approval.

Do not place borrow material until after the usable roadway excavation has been placed in the fill. If you place more borrow than is required, resulting in or as a result of the unnecessary wasting of usable excavation, the amount of such waste will be deducted from the borrow quantity.

Obliteration of Roadways includes all grading operations necessary to incorporate the existing roadway into the new roadway and surroundings in order to provide a pleasing appearance from the new roadway. Fill ditches not required for drainage and grade to the approximate original ground contour.

Do not place soil-aggregate containing glass cullet:

1. Within four feet from the face of any embankment slope,
2. Within 150 feet from any surface water body,
3. In embankment areas where culvert placement is required,
4. In contact with any geosynthetic material.

203-3.02 ROCK EXCAVATION. Excavate rock by blasting, ripping, or both.

Unless Subgrade Blasting is specified, excavate material which would classify as rock within the limits of the roadbed to a minimum depth of 6 inches below subgrade.

1. Blasting.

- a. Blasting Plan. Prior to commencement of drilling, submit a Blasting Plan prepared by a qualified Blaster. Include the details of test blasting, controlled blasting and production blasting. Include station limits, date and time of each blast, layout details of each blast, trade names, types and sizes of explosives and accessories, delay sequences of the blast holes, and powder factors. Submit a revised Blasting Plan any time there is a change in the drilling or blasting methods.
- b. Blaster. Use a qualified blaster licensed or otherwise authorized under all applicable federal, state and local laws or regulations to possess, transport, store and use explosives of the type used on the Project. Provide the Blaster's resume and copies of all applicable licenses to the Engineer with the Blasting Plan. Have the Blaster on site during all loading and blasting operations. Require the Blaster to take responsible charge for safety procedures as set forth below and to maintain a detailed record for each day of blasting work.
- c. Pre-Blast Conference. Hold a pre-blasting meeting at the jobsite prior to commencement of any drilling and blasting operations with the Contractor, the Blaster and representatives of the Engineer. Discuss the Blasting Plan and visit such specific sites as are necessary to familiarize the participants with the details of the blasting operations.
- d. Safety. Submit a Safety Plan that includes descriptions of road closures, warning signals, and plans for notification of affected local, state, and federal agencies. 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. Hold a safety meeting prior to commencement of blasting operations to address safety issues.

- e. Controlled Blasting. Controlled blasting holes are closely spaced, lightly loaded holes drilled along the plane of the final design slope. Controlled blasting is either preshear blasting with holes detonated before the production blasting or cushion (trim) blasting with holes detonated after the production blasting. Drill holes parallel to each other and within 12 inches of the staked slope plane. Use controlled blasting techniques for all rock slopes higher than 10 feet to produce a stable cut face sheared along the designed neat excavation line. If at any time during the progress of the work, the approved methods of blasting and drilling fail to produce the desired result of a smooth, stable backslope, modify the blasting method to achieve the desired result. Do not construct benches in finished rock back slopes unless approved by the Engineer. The Engineer may permit an offset for drilling equipment clearances. Do not use ANFO in controlled blasting holes.
 - f. Production Blasting. Use materials and methods as necessary to fragment and loosen the rock inside the design excavation limits, while leaving a smooth, stable back slope using the controlled blasting methods set forth above. Use appropriately designed delay sequences and charge weights per delay to minimize ground vibrations and prevent damage to buildings, structures, utilities, sensitive fish or wildlife habitat and other facilities. Prior to blasting, remove all loose objects, and render safe all dangerous conditions, in or near the cut slope area. Detonate production hole charges in a delay sequence toward the free face. Remove and dispose of loose material from rock slope failures or slides at the contract price for unclassified excavation if the Engineer determines the failure did not occur as a result of the Contractor's methods. The Engineer will determine the amount of loose material at the time of removal.
 - g. Scaling. Remove all loose, hanging, or potentially dangerous rock from newly excavated slopes and from surrounding existing slopes as the excavation progresses to ensure the rock slopes are stable. Do not commence work on subsequent lifts or shots until scaling is complete. Accomplish scaling with hand tools, hydraulic splitters, machine scaling with excavators or other equipment, high pressure water spray, light explosive charges, or other approved methods.
 - h. Ditch Line/Subgrade Blasting. Construct a free-draining fractured rock zone below the ditch line and the bottom of the structural section as shown on the Plans and Specifications or as directed. Blast or rip rock below the bottom profile of the ditch line and below the bottom of the structural section to depths as indicated or directed.
2. Stabilization. Stabilize excavated or existing rock surfaces with rock bolts, rock dowels, shotcrete, or other techniques, as indicated in the Plans and Specifications or as directed. The Engineer may increase or decrease the extent and type of stabilization methods depending on the geologic conditions encountered during the work. Obtain approval from the Engineer for rock bolts, dowels, shotcrete, resin grout, cement grout, mortar, and other stabilization accessories prior to ordering the items. Conduct performance testing as required by the Engineer to confirm the stabilization methods and equipment produce the required capacities and functions.
3. Rockfall Mitigation. Use rockfall mitigation methods such as rock catchment fences, wire mesh draping, flexible or rigid barriers, ditch width modification, and other techniques to intercept rockfall and control it before it reaches the roadway or other facilities. Construct according to the Plans and Specifications or as required by the Engineer. The Engineer may increase or decrease the extent and type of mitigation methods depending on the geologic conditions encountered during the work. Obtain approval from the Engineer for fence material, wire mesh, barrier design and accessories prior to ordering the items. Conduct performance testing as required by the Engineer to confirm the methods and equipment produce the required capacities and functions.
4. Drain Holes. Drill drain holes in rock slopes to relieve excess water pressure as specified or directed. The Engineer will determine the location and construction details of the drain holes, depending on the conditions encountered in each slope.

203-3.03 EMBANKMENT CONSTRUCTION. Prepare the areas upon which embankments are to be placed, construct dikes within or outside the right-of-way when required, place and compact approved

material within the roadway areas where unsuitable material has been removed, and place and compact embankment material in holes, pits, and other depressions within the roadway area. Use only approved materials in the construction of embankments and backfills. Embankment material will be approved for gradation following placement but prior to compaction.

Construct the embankment with selected material meeting the requirements of Subsection 703-2.07. Selected material may be obtained from unclassified excavation, rock excavation, common excavation or borrow.

Do not place rocks, broken concrete or other solid materials in embankment areas where piling is to be placed or driven, or where culvert placement is required.

Bench slopes that are steeper than 4:1, when measured at right angles to the roadway, when embankment is to be placed and compacted on hillsides, or when new embankment is to be compacted against existing embankments, or when embankment is built half-width at a time. Continuously bench over those areas as the work is brought up in layers. Make benches wide enough to permit placing and compacting operations. Begin each horizontal cut at the intersection of the original ground and the vertical side of the previous bench. Incorporate material cut out, and deemed suitable, into the new embankment and recompact along with the new material.

Scarify existing roadways, lying within 3 feet of subgrade, to a depth of 6 inches and recompact to meet Subsection 203-3.04 or 203-3.05.

When permanently frozen soils are encountered, place backfill or embankment materials in a timely manner, as directed, to minimize degradation of the foundation material. Do not place embankment over seasonally frozen ground unless authorized in writing.

Thaw and drain frozen material deemed acceptable for fill before placing in the embankment. Frozen cuts may require stage excavation: remove thawed material and allow the cut to thaw while work continues on some other portions of the project. After the material in the cut has thawed to a sufficient depth, remove the thawed material. Repeat this operation until all frozen material is removed or the cut is excavated to grade.

When excavation is performed when freezing weather is imminent, place the specified backfill promptly, following the excavation work, at least up to a level which will allow the surface to adequately drain. Make arrangements for the timely availability of such embankment or backfill materials prior to commencement of the stripping or excavation operations, when required.

If embankment can be deposited on one side only of abutments, wing walls, piers or culvert headwalls, prevent the overturning of or excessive pressure against the structure. Do not place the fill adjacent to the abutment of a bridge higher than the bottom of the backwall of the abutment until the superstructure is in place. When embankment is to be placed on both sides of a concrete wall or box type structure, keep the embankment at approximately the same elevation on both sides of the structure.

Place roadway embankment of earth materials in horizontal layers not to exceed 8 inches (uncompacted) for the full width of the embankment, except as required for traffic, and compact as specified before the next layer is placed. Use spreading equipment on each lift to obtain uniform thickness prior to compacting. Maintain uniform density, during compaction. Add or remove water, as necessary, to obtain the required density. Route compaction equipment uniformly over the entire surface of each layer.

Place rock embankment in lifts not thinner than the thickness of the largest rocks. Restrict maximum rock dimension to 3 feet. Distribute spalls and finer rock fragments to level and smooth each lift. Place succeeding lifts without damaging previously completed lifts. Dump rock on the lift being constructed and distribute by blading or dozing to fill voids and to form a dense, well-compacted embankment. Do not place rocks over 8 inches within 2 feet of finished subgrade.

Rock is considered usable material, regardless of size. Rocks too large to be embanked, as specified above, may either be reduced to a suitable size for incorporation into the embankment or disposed of in approved areas, at your option. Replace all wasted rock from excavation with borrow at no additional cost to the Department, unless such rock is excess to project embankment requirements.

Finish the subgrade surface so it will not vary more than 0.10 foot when tested using a 10-foot straightedge nor vary more than 0.10 ft from the established grade.

When embankment is to be placed over swampy or saturated ground, end dump an initial lift of material of sufficient depth to support hauling equipment, as directed.

Repair damage to embankment caused by hauling equipment.

Construct all embankments with moisture and density control unless the Engineer determines that such controls are not feasible.

Temporary surcharging consists of two methods:

1. Static Surcharge. Leave surcharge in place until the foundation material has reached stability or the required settlement has taken place.
2. Rolling Surcharge. Construct a surcharge on top of the embankment to the specified elevation and continually advance the surcharge as the embankment is constructed ahead.

Use material removed from the temporary surcharge in areas indicated on the Plans. Do not waste temporary surcharge material without written approval. Compaction is not required for material placed in a temporary surcharge.

203-3.04 COMPACTION WITH MOISTURE AND DENSITY CONTROL. The maximum density and optimum moisture will be determined by WAQTC FOP for AASHTO T 180 or ATM 212.

Adjust the moisture content of the embankment material to within 2% of the optimum moisture content and compact each layer to not less than 95% of the maximum density. Acceptance densities will be determined by WAQTC FOPs for AASHTO T 310 and T 224.

Compact embankment within 20 feet of a bridge abutment full width to not less than 100 percent of the maximum density. Material used within this zone shall be graded to pass the 3 inch sieve.

203-3.05 COMPACTION WITHOUT MOISTURE AND DENSITY CONTROL. Except for rock fills and the first layer of fills over swampy ground, deposit embankment materials in layers not exceeding 8 inches in thickness before compaction.

Compact by routing construction equipment and/or rollers uniformly over the entire surface of each layer before the next layer is placed. Compact until embankment does not rut under the loaded hauling equipment.

Keep dumping and rolling areas separate. Do not cover any lift by another until the required compaction has been completed.

SECTION 204

STRUCTURE EXCAVATION FOR CONDUITS AND MINOR STRUCTURES

204-1.01 DESCRIPTION. Excavate and backfill for pipe culverts, storm drains, manholes, inlets and other minor structures.

Perform all pumping, bailing, draining, sheeting, bracing, and incidentals required for proper execution of the work.

204-2.01 MATERIALS. Use selected material, Type A (Subsection 703-2.07) passing the 3-inch sieve for bedding material, and for backfill material to 12 inches above the pipe.

Use excavated native material for the remainder of the backfill if it meets the requirements of Selected Material, Type C.

Use bedding material, and backfill material within the roadbed structure, meeting the requirements for the applicable lift of material.

Use all suitable material from structure excavation for bedding and backfill prior to using material from another source.

204-3.01 CONSTRUCTION REQUIREMENTS. Remove and dispose of unsuitable foundation material below the designed elevation, as shown on the Plans or as necessary to obtain a firm, unyielding foundation. Replace with approved material.

Remove rock or other unyielding material, when encountered, to the depth shown on the Plans or as directed and replace with approved material.

Place bedding and backfill in uniform layers not more than 6 inches deep and compact to meet Subsection 203-3.04. Ponding or jetting is not permitted.

Excavation, bedding, backfill, and compaction for culverts outside the roadbed may be visually inspected and approved by the Engineer.

Native material may be utilized for electrical conduit backfill outside the pavement structure if it meets the minimum requirements of Selected Material, Type C, as specified in Subsection 703-2.07. Compaction may be as approved by the Engineer.

Do not place backfill against newly constructed masonry or concrete structures for a period of 14 days or until concrete achieves at least 80% of the design strength (f'c).

Support and protect existing conduits or utilities, which are not scheduled for removal or abandonment, when encountered in the excavation.

Remove all sheeting and bracing used in structure excavation upon completion of the work.

SECTION 205

EXCAVATION, BACKFILL, AND FOUNDATION FILL FOR MAJOR STRUCTURES

205-1.01 DESCRIPTION. Excavate and backfill for the foundations of bridges, retaining walls, concrete box culverts, and other major structures.

Furnish all resources to place and remove cribbing or cofferdams. Perform all required sheeting, bracing, bailing, pumping, draining, and grouting.

Replace unsuitable material encountered below the elevation of the bottom of footings.

205-2.01 MATERIALS. Use materials that conform to the following:

Backfill and Foundation Fill
Porous Backfill Material

Subsection 703-2.07, Selected Material, Type A
Subsection 703-2.10

CONSTRUCTION REQUIREMENTS

205-3.01 EXCAVATION.

1. General. Clear and grub prior to starting excavation.

Cut all rock or other hard foundation material to a firm surface, either level, stepped, or serrated, as directed, and remove all loose material.

Excavate to the bottom of footing prior to driving piles. Do not excavate below the footing elevation unless otherwise noted in the Contract.

When swell or subsidence results from driving piles, excavate the footing area or backfill with foundation fill material, to the grade of the bottom of the footing, as shown on the Plans. This work is subsidiary.

Do not disturb material below the bottom of footings.

Utilize all excavated material for backfill or embankment when approved as suitable and dispose of any unsuitable or surplus excavated material as directed.

Do not alter streambed channel and do not place excavated materials in natural stream channels, unless shown on the Plans or approved in writing.

Give the Engineer in writing no less than 15 days advance notice prior to beginning excavation for spread footings to allow for inspection of the excavated surface. With this notification, identify the location and specify a time period of no less than two days for the Department to inspect the excavated surface. Dewater and remove all debris from the surface prior to the Department's inspection. Obtain the Engineer's approval of the excavated surface prior to the placement of any formwork or foundation materials. Account for the time required by the Department to perform the inspection in the progress schedule submitted under Subsection 108-1.03. Suspension of work to allow for inspection is not a suspension of work per Subsection 108-1.06 and additional contract time will not be allowed.

2. Foundations on Bedrock. Excavate for footings founded on bedrock, to the neat lines of the footings. Fill overbreak areas outside the neat lines of footings, with Class A concrete, without extra compensation.

3. Cofferdams. Use suitable cofferdams as necessary wherever water-bearing strata are encountered above the elevation of the excavation. Construct foundation seals according to the requirements of Subsection 501-3.08.

Submit detailed working drawings showing proposed method of cofferdam construction, designed by a person proficient in cofferdam design. The working drawings must be stamped with the seal of, dated by, and signed by a Professional Engineer registered in the State of Alaska. The details and clearance of cofferdams, which affect the character of the finished work, is subject to approval but other details of the design are your responsibility. Submit drawings at least 3 weeks in advance of cofferdam construction.

Extend cofferdams to the required depth or to bedrock. Adequately brace cofferdams and make them as watertight as practical. Provide sufficient clearance inside cofferdams to permit construction of forms and permit pumping outside of the forms.

Right or enlarge cofferdams which are tilted or moved out of position by any cause during the sinking process, to provide the necessary clearance and proper pier location.

When no foundation seal is shown on the Plans and the cofferdam cannot be dewatered, place a seal if permitted in writing.

Foundation seals, when shown on the Plans, may be eliminated as directed if the cofferdams can be dewatered without the seals when the excavation has been carried to the elevation of the bottom of the footing, unless the Plans or Special Provisions specifically note that seals may not be eliminated.

Vent cofferdams at low water, if foundation seals are required, in order to prevent damage to green concrete from differential hydrostatic head.

No timber may extend into the completed substructure.

After substructure completion, remove sheet piling and other temporary structural materials in such a manner as to avoid disturbing the finished structure. Steel or concrete sheeting or bracing may be permitted to remain in the completed structure, subject to approval.

205-3.02 FOUNDATION FILL. Remove material that is unsuitable for foundations, to the depth below the bottom of the footing as shown on the Plans. Remove material that is unsuitable for approach slabs shown on the Plans.

Place Structural Fill in 8-inch layers, compacted to meet Subsection 203-3.04. Place Structural Fill as uniformly as possible on all sides of structural units as shown on the Plans. Avoid unbalanced loading of Structural Fill material which could damage the structure. When placed against concrete, place Structural Fill in accordance with Section 501.

Controlled Low-Strength Material may be used as an alternative source for Structural Fill if approved by the Engineer.

205-3.03 BACKFILL. Place backfill materials in 8-inch layers, compacted to meet Subsection 203-3.04. Bench slopes within the area to be filled.

Place underwater backfill in natural stream channels without compaction or layer requirements.

Place backfill as uniformly as possible on all sides of structural units. Avoid unbalanced loading of backfill which could damage the structure. When placed against green concrete or retaining type walls, prevent pressures which would damage the structure.

No ponding or jetting of backfill is allowed.

205-3.04 POROUS BACKFILL. Place porous backfill material continuously within a vertical plane 1 foot behind retaining walls and abutments, unless otherwise shown on the Plans.

Where weep holes are shown on the Plans or required by the Specifications, place not less than 1 cubic foot of Porous Backfill material in the fill at each hole, securely tied in a burlap bag, or wrapped with an acceptable geotextile fabric. Extend the wrapped Porous Backfill material at least 6 inches above the hole.

205-3.06 CONTROLLED LOW-STRENGTH MATERIAL. Provide Controlled Low-Strength Material (CLSM) that is self compacting, cementitious, flowable material requiring no subsequent vibration or tamping to achieve consolidation.

Design CLSM to have 28-day compressive strength between 100 psi minimum to 300 psi maximum as determined by ASTM D 4832 and a flowable consistency within a slump range of 3 to 10 inches as determined by WAQTC FOP for AASHTO T 119.

Calculate the water-cement ratio on the total weight of cementitious material. The following are considered cementitious materials: Portland cement, blended hydraulic cement, fly ash, and silica fume. Use admixtures in accordance with the manufacturer's recommendations. Do not use admixtures containing calcium chloride.

Mix and batch CLSM in accordance with Subsection 501-3.01 to Subsection 501-3.03.

Do not place CLSM on frozen ground, in standing water, or during wet weather conditions. Place CLSM only if the air temperature is 40 °F minimum and rising. Ensure the material temperature is at least 50 °F while being placed.

Do not apply loads to the CLSM until the compressive strength reaches 50 psi.

Acceptance will be based on a Certificate of Compliance. Provide a Certificate of Compliance for each batch of CLSM in accordance with Subsection 106-1.05.

SECTION 206

FILTER BLANKET

206-1.01 DESCRIPTION. Construct a layer of specified material in conformance to the plan dimensions and elevations.

206-2.01 MATERIALS. Use materials that conform to the following:

Filter Blanket Subsection 703-2.08

206-3.01 CONSTRUCTION REQUIREMENTS. Construct Filter Blanket in an even, homogeneous layer, avoiding contamination by the underlying material. Place the layer to full thickness in one application or end-dump and spread by tracked equipment.

DIVISION 300 – BASES

SECTION 304

SUBBASE

304-1.01 DESCRIPTION. Construct a subbase course on an approved foundation, as shown on the Plans.

304-2.01 MATERIALS. Use materials that conform to the following, for the grading specified:

Aggregate Subsection 703-2.09

Crushed glass may be combined with soil-aggregate material to be used in subbase construction. Meet 703-2.15 requirements.

304-3.01 CONSTRUCTION REQUIREMENTS. Place and compact subbase material to meet the requirements of Subsections 203-3.01, 203-3.03, and 203-3.04.

The material will be accepted for gradation based on random samples taken from the roadway after spreading but prior to compaction.

When subbase material is utilized as the finished wearing course, place and compact to meet Subsection 301-3.01 through 301-3.03.

Do not place subbase soil-aggregate containing glass cullet:

1. Within four feet from the face of any embankment slope,
2. Within 150 feet from any surface water body,
3. In embankment areas where culvert placement is required,
4. In contact with any geosynthetic material.

DIVISION 500 – STRUCTURES

SECTION 501

STRUCTURAL CONCRETE

501-1.01 DESCRIPTION. Furnish, place, finish, and cure Portland cement concrete for structure construction. Use the class of concrete noted on the Plans unless otherwise specified.

CLASSES OF CONCRETE

<u>Class A:</u>	General use concrete
<u>Class A-A:</u>	Concrete where improved strength and durability is required
<u>Class P:</u>	Concrete where strength in excess of 5000 psi is required
<u>Class DS:</u>	Concrete for drilled shaft foundations

501-1.02 DEFINITIONS.

ADMIXTURE. A material other than water, aggregate, hydraulic cement, pozzolan, and fiber reinforcement, added to the batch before or during mixing, used as an ingredient of a cementitious mixture to modify its freshly mixed, setting, or hardened properties.

AIR-ENTRAINING ADMIXTURE. An admixture causing the development of a system of microscopic air bubbles in concrete, mortar, or cementitious material paste during mixing, usually to improve its workability and resistance to damage by freezing and thawing.

SET-ACCELERATING ADMIXTURE. An admixture causing an increase in the rate of hydration of the hydraulic cement and shortens the time of setting, increases the rate of strength development, or both.

SET-RETARDING ADMIXTURE. An admixture causing a decrease in the rate of hydration of the hydraulic cement and lengthens the time of setting, decreases the rate of strength development, or both.

WATER-REDUCING ADMIXTURE. An admixture either increasing slump of freshly mixed mortar or concrete without increasing water content or maintaining slump with a reduced amount of water, due to factors other than air entrainment.

AGITATION. The process of providing motion in mixed concrete just sufficient to prevent segregation or loss of plasticity.

BLEED WATER. The autogenous flow of water emerging from newly placed concrete, and caused by the settlement of the solid materials within the mass. The relative quantity of mix water that will bleed can be estimated by AASHTO T 158.

CAMBER. For prestressed concrete members, camber is the net upward deflection of an eccentrically prestressed concrete member due to the combined loads, shrinkage, creep, and eccentricity of the prestress force. For non-prestressed members, camber is a deflection intentionally built into a structural element or form to improve appearance or to nullify the deflection of the element under the effects of loads, shrinkage, and creep.

CEMENT. A binding material that sets and hardens by hydration and is capable of doing so underwater, sometimes called hydraulic cements

CEMENTITIOUS MATERIAL. Hydraulic cements and pozzolans with cementing properties.

CHAMFER. A beveled edge or corner formed into finished concrete.

COMPRESSIVE STRENGTH, (f_c). The measured maximum resistance of a concrete or mortar specimen to axial compressive loading; expressed as force per unit cross-sectional area; or the specified resistance used in design calculations.

SPECIFIED COMPRESSIVE STRENGTH, (f'_c). The 28-day compressive strength used in structural design and specified in the Contract documents.

REQUIRED AVERAGE COMPRESSIVE STRENGTH, (f'_{cr}). The 28-day compressive strength, used as the basis for selection of concrete proportions in the mix design process, sufficiently greater than the Specified Compressive Strength to ensure the acceptance criteria are met.

COMPRESSIVE STRENGTH TEST. The average strength test of concrete, from at least two 6.0 x 12.0 inch or at least three 4.0 x 8.0 inch compressive strength test cylinders sampled according to AASHTO T 141, cured according to AASHTO R 39 or WAQTC FOP for AASHTO T 23, and tested according to AASHTO T 22 or sampled, cured, and tested to equivalent ASTM test methods. Unless otherwise noted, tested at an age of 28 days.

The average strength test of grout, from at least three specimens from a batch and tested according to WAQTC TM 12, AASHTO T 106, or ASTM C 109.

CONCRETE ANCHOR. Cast-in-place or post-installed fastening device installed in the concrete for the purpose of transferring loads to the concrete. See ASTM E 2265 for standard terminology.

CONSOLIDATION. The process of inducing a closer arrangement of the solid particles in freshly mixed concrete during placement by the reduction of voids, usually by vibration, rodding, tamping, or some combination of these actions.

CONSTRUCTION JOINT. The surface where two successive placements of concrete meet.

CURING. Action taken to maintain moisture and temperature conditions in a freshly placed cementitious mixture to allow hydraulic cement hydration and (if applicable) pozzolanic reactions to occur so the desired properties of the mixture develop.

CURING PERIOD. The length of time in which continuous curing operations are maintained thereby allowing the concrete to properly hydrate and develop its required strength and durability.

INITIAL CURING PERIOD. The time period between placement and implementation of final curing methods in which deliberate action is taken to reduce the loss of moisture from the surface of the concrete.

FINAL CURING PERIOD. The time period after the concrete achieves final set in which deliberate action is taken, without damaging or marring the concrete surface, to maintain satisfactory moisture content and temperature in concrete.

CURING COMPOUND. A liquid applied as a coating to the surface of newly placed concrete to retard the loss of water and, in the case of pigmented compounds, reflects heat to provide an opportunity for the concrete to develop its properties in a favorable temperature and moisture environment.

DURABILITY. The ability of concrete to resist weathering action, chemical attack, abrasion, and other conditions of service.

EVAPORATION RATE REDUCER. A material generating a continuous thin film when spread over water on the surface of fresh concrete to retard the evaporation of bleed water.

FIELD TEST RECORD. A record of compressive strength test results from concrete used on prior projects and produced by the concrete production facility.

INFORMATIONAL FIELD TEST. A compressive strength test, determined by the Engineer, from field test cylinders cured on the site under temperature and moisture conditions similar to the concrete in the structure; except, the compressive strength test may consist of one 6.0 x 12.0 inch or one 4.0 x 8.0 inch compressive strength test cylinder.

KEYWAY. A recess or groove in one lift or placement of concrete and filled with concrete of the next lift or grout, giving shear strength to the joint.

LAITANCE. A layer of weak material derived from cementitious material and aggregate fines either: 1) carried by bleeding to the surface or to internal cavities of freshly placed concrete; or 2) separated from the concrete and deposited on the concrete surface or internal cavities during placement of concrete underwater.

MORTAR. A mixture of cementitious material paste and fine aggregate occupying the space between particles of coarse aggregate.

RETEMPER. To add water and remix concrete or mortar to restore workability to a condition in which the mixture is placeable or usable.

ROCK POCKET. A porous, mortar-deficient portion of hardened concrete consisting primarily of coarse aggregate and open voids.

SCREED. To strike off concrete lying beyond the desired plane or shape. A tool for striking off the concrete surface, sometimes referred to as a strikeoff.

SET. The condition reached by a cementitious material paste, mortar, or concrete that has lost plasticity to a degree of stiffening generally stated as the time in hours and minutes required for cementitious material paste to stiffen sufficiently to resist the penetration of a weighted test needle as prescribed by AASHTO T 197,

INITIAL SET. The first stiffening of concrete.

FINAL SET. Attainment of significant rigidity in which rainfall, foot traffic, and curing materials contacting the concrete surface do not damage or mar the concrete surface and do not alter the properties of the finished surface.

TREMIE. A pipe or tube with a hopper for filling at its upper end through which concrete is deposited.

501-2.01 MATERIALS. Use materials conforming to the following:

1. Cementitious Materials

Portland Cement	Section 701
Blended Hydraulic Cement	Section 701
Fly Ash	Section 701
Ground Granulated Blast-Furnace Slag	Section 701
Silica Fume	Section 701

2. Aggregate Materials

Fine Aggregate	Subsection 703-2.01
Coarse Aggregate	Subsection 703-2.02
Aggregate for Abrasive Finish	Subsection 703-2.14

3. Water, Admixtures and Curing Materials

Curing Materials	Subsection 711-2.01
Chemical Admixtures	Subsection 711-2.02
Water and Ice	Subsection 712-2.01

4. Anchors and Inserts

Concrete Anchor Inserts and Bolts	Subsection 712-2.20
Utiliduct, HDPE	Subsection 706-2.08
Utiliduct, Steel	Section 716
Structural Steel	Section 716
Asphalt Felt	ASTM D 226, Type I (No. 15 Asphalt Felt)

5. Grout and Epoxy

Grout	Subsection 701-2.03
Epoxy Adhesive for Crack Sealing	AASHTO M 235, Type IV, Grade 3
Epoxy Adhesive for Crack Injection	AASHTO M 235, Type IV, Grade 1
Low-Viscosity Resin	Subsection 712-2.19
Epoxy Bonding Agents	AASHTO M 235, Type V

501-2.02 COMPOSITION OF MIXTURE - JOB MIX DESIGN. Provide a Job Mix Design, for each required class of concrete and Specified Compressive Strength (f_c), which meets the requirements of this Subsection and provides workability and consistency so the concrete can be worked readily into the forms and around reinforcement without segregation or bleeding. Determine proportions using the absolute volume method according to ACI 211.1.

1. Water-Cement Ratio and Cementitious Materials. Provide a Job Mix Design meeting the water-cement ratio requirements in Table 501-1.

Calculate the water-cement ratio based on the total weight of cementitious material. The following are considered cementitious materials: Portland cement, blended hydraulic cement, fly ash, ground granulated blast-furnace slag, and silica fume.

Fly ash, ground granulated blast-furnace slag, silica fume, and combinations of these materials may be used as a substitute for Type I and II Portland cement provided the quantity meets the limits of Table 501-2 and the total quantity of combined fly ash, ground granulated blast-furnace slag, and silica fume does not exceed 40 percent of the total cementitious material by weight. Do not use fly ash with Type III Portland cement.

**TABLE 501-1
WATER-CEMENT RATIO REQUIREMENTS**

Class of Concrete	Water-Cement Ratio, maximum
	lbs/lbs
A	0.45
A-A	0.40
P	0.35
DS	0.45

**TABLE 501-2
SUPPLEMENTARY CEMENTITIOUS MATERIAL LIMITS**

Cementitious Material	Percent of Total Cementitious Material by Weight ¹
	Maximum
Fly Ash	35%
Ground Granulated Blast-Furnace Slag	40%
Silica Fume	10%

¹ The maximum percent includes initial quantities in blended hydraulic cement plus additional supplementary cementations materials.

2. Aggregate Gradations. Provide a Job Mix Design meeting the fine aggregate gradation requirements in Subsection 703-2.01 and the coarse aggregate gradation requirements in Table 501-3.

**TABLE 501-3
COARSE AGGREGATE GRADATION REQUIREMENTS**

Class of Concrete	Coarse Aggregate Size Number
	AASHTO M 43
A	No. 57 or 67
A-A	No. 57 or 67
P	No. 67
DS	No. 7 or 8

3. Air Content. Provide a Job Mix Design with a total air content of 6.0 percent. The total air content for Class P concrete having a water/cement ratio less than 0.33 may be reduced 3.0 percent. Air-entrained concrete is required only for the deck portion of prestressed precast concrete members. Air-entrained concrete is not required for Class DS concrete.
4. Slump. Provide a Job Mix Design meeting the slump requirements in Table 501-4.

**TABLE 501-4
AIR CONTENT REQUIREMENTS**

Class of Concrete	Air Content
A	6.0% ±0.5%
A-A	6.0% ±0.5%
P	3.50% minimum ¹ and Super Air Meter (SAM) number ≤0.20 ¹
DS	Not required

¹Not required for web and bottom flange of precast, prestressed decked bulb-tee girders.

5. **Chloride Ion Content.** For Class A-A and P Concrete, provide a Job Mix Design with a total water soluble chloride ion content of the concrete that does not exceed 0.06 percent by weight of cementitious material for precast concrete members or 0.08 percent by weight of cementitious material for other concrete, tested according to ASTM C 1218.
6. **Required Averaged Compressive Strength.** Provide a Job Mix Design meeting a Required Average Compressive Strength (f_{cr}) established from either the Empirical Method or the Statistical Method.

If the Specified Compressive Strength (f_c) is not designated on the Plans, use a Specified Compressive Strength listed in Table 501-5.

**TABLE 501-5
COMPRESSIVE STRENGTH REQUIREMENTS**

Class of Concrete	Specified Compressive Strength (f_c) (psi)
A	4000
A-A	5000
P	8000
DS	4000

- a. **Empirical Method.** Establish the Required Average Compressive Strength from the following equations:

$$f_{cr} = f_c + 1200 \quad \text{for } f_c \leq 5000 \text{ psi}$$

$$f_{cr} = 1.1f_c + 700 \quad \text{for } f_c > 5000 \text{ psi}$$

Where: f_{cr} = Required Average Compressive Strength, psi
 f_c = Specified Compressive Strength, psi

- b. Statistical Method. If the production facility has field test records of compressive strength tests, establish the Required Average Compressive Strength based on the calculated standard deviation of the field test records and using the largest result of the following the equations:

$$f_{cr} = f_c + 1.34ks \quad \text{for all } f_c$$

or,

$$f_{cr} = f_c + 2.33ks - 500 \quad \text{for } f_c \leq 5000 \text{ psi,}$$

$$f_{cr} = 0.90f_c + 2.33ks \quad \text{for } f_c > 5000 \text{ psi,}$$

Where: f_{cr} = Required Average Compressive Strength, psi
 f_c = Specified Compressive Strength, psi
 k = 1.16 if 15 total tests are considered
 1.08 if 20 total tests are considered
 1.03 if 25 total tests are considered
 1.00 if 30 or more total tests are considered
 S = standard deviation, psi

Linear interpolation to determine k for intermediate number of tests is acceptable.

Use field test records performed within the past 12 months and spanning a period of more than 60 days for a class of concrete within 1000 psi of the Specified Compressive Strength. Use field test records from concrete produced at the production facility, which represent materials, quality-control procedures, and climatic conditions similar to those expected in the work. Do not use field test records from concrete in which acceptance requirements for materials or concrete proportions were more closely restricted than those in the proposed work. Use field test records meeting one of the following:

- (1) One Group of Field Test Records. Use field test records representing a group of at least 15 consecutive compressive strength tests in which all concrete was produced using the same mixture proportions. Calculate the standard deviation using the following equation:

$$s = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{(n-1)}}$$

Where: s = standard deviation, psi
 n = number of compressive strength test results considered
 X_i = individual compressive strength test result, psi
 \bar{X} = average of n compressive strength test results, psi

- (2) Two Groups of Field Test Records. Use field test records representing two groups of consecutive compressive strength tests totaling at least 30 tests. Ensure each group is comprised of at least 10 consecutive compressive strength tests, and all concrete in each group was produced using the same mixture proportions. Calculate the standard deviation using the following equation:

$$s = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{(n_1+n_2-2)}}$$

Where: s = standard deviation for the two groups combined, psi
s₁, s₂ = standard deviation for groups 1 and 2, respectively, calculated according to Subsection 501-2.02.6.b.(1), psi
n₁, n₂ = number of test results in groups 1 and 2, respectively

7. Job Mix Design Verification.

- a. Required Average Compressive Strength. Verify the Job Mix Design satisfies the Required Average Compressive Strength by meeting at least one of the following requirements:

- (1) Field Test Records. Use field test records that:

- (a) use materials of the same brand and type and from the same manufacturer as the materials used in the work;
- (b) were from concrete produced at the production facility;
- (c) use quality-control procedures, and had climatic conditions similar to those expected in the work; and
- (d) encompass a period of not less than 60 days.

Do not use field test records from concrete in which acceptance requirements for materials or concrete proportions were more closely restricted than those in the proposed work.

For a single group of at least 10 consecutive compressive strength tests for one mixture, verify the average of the compressive strength tests equals or exceeds the Required Average Compressive Strength.

For two groups, each having at least 10 consecutive compressive strength tests, for two mixtures representing classes of concrete within 1000 psi of the Specified Compressive Strength, plot the average strength of each group versus the water-cementitious material ratio of the corresponding mixture proportions and interpolate between them to determine the compressive strength corresponding to the water-cementitious material ratio of the Job Mix Design. Verify the interpolated compressive strength equals or exceeds the Required Average Compressive Strength.

- (2) Laboratory Trial Mixtures. Use materials and material combinations for trial mixtures of the same brand and type and from the same manufacturer as the materials used in the work.

Record the temperature of the freshly mixed concrete according to AASHTO T 309 and ensure the temperature is within 10°F of the intended maximum temperature of the concrete as mixed and delivered.

For each trial mixture, make and cure at least two 6.0 x 12.0 inch or at least three 4.0 x 8.0 inch compressive strength test cylinders for each test age according to AASHTO R 39. Test for compressive strength according to AASHTO T 22 at test ages of 7, 14 and 28 days.

For a single trial mixture, verify the compressive strength test equals or exceeds the Required Average Compressive Strength.

For a group of trial mixtures, make at least three trial mixtures with each mixture having a different cementitious material content. Select water-cement ratios producing a range of compressive strengths encompassing the Required Average Compressive Strength. From the results of the 28-day compressive strength tests, plot a curve showing the relationship between water-cement ratio and compressive strength. From the curve of water-cement ratio versus compressive strength, determine the compressive strength corresponding to the water-cementitious material ratio of the Job Mix Design. Verify the compressive strength equals or exceeds the Required Average Compressive Strength.

- b. Flowability Requirements for Class DS Concrete (Wet-Shaft Process). Verify the Job Mix Design satisfies the concrete flowability requirements of Subsection 501-3.05.6.a.1. Develop a slump loss table showing the slump at 1 hour intervals since batching until the concrete takes initial set.
 - c. Plasticity Requirements for Class DS Concrete (Dry-Shaft Process). Verify the Job Mix Design satisfies the concrete plasticity requirements of Subsection 501-3.05.6.b.1. Ensure initial set occurs after placement operations are complete.
8. Job Mix Design Submittal. Submit a written mix design, signed and sealed by a Professional Engineer registered in the State of Alaska, for each specified class of concrete and for each Specified Compressive Strength, to the Engineer at least 45 days prior to scheduled production. Submit the mix design on Form 25D-203. Include the following:
- a. Job Mix Design Proportions and Test Results. Submit concrete mixture proportions per cubic yard and test results for the proposed Job Mix Design. Include the following information:
 - (1) Weights of cementitious materials
 - (2) Weights of aggregates in saturated surface dry condition
 - (3) Volume or weight of each admixture.
 - (4) Weight of water
 - (5) Water-cement ratio
 - (6) Percentage of air by volume
 - (7) Total water soluble chloride ion content
 - (8) Wet unit weight
 - (9) Expected slump
 - (10) Expected 7, 14, and 28 day compressive strength
 - (11) Slump loss table for flowability requirements of Class DS concrete (if applicable)
 - (12) Time of initial set for plasticity requirements of Class DS concrete (if applicable)
 - b. Materials Documentation. Submit the following:
 - (1) For each cementitious material, include:
 - (a) Type/Class
 - (b) Brand
 - (c) Producer
 - (d) Plant location
 - (e) Certified test reports confirming the cementitious material meets these Specifications.

(2) For aggregates, include:

- (a) Pit or quarry location(s)
- (b) Bulk dry specific gravity, bulk saturated surface dry specific gravity, and apparent specific gravity
- (c) Absorption values
- (d) AASHTO size number for coarse aggregates
- (e) Gradations for aggregates

(3) For each admixture, include:

- (a) Type
- (b) Manufacturer
- (c) Manufacturer's product data sheet giving the procedure for admixture use and confirming the admixture meets these Specifications.
- (d) The batching process step and mixing instructions when each admixture is added.
- (e) When using two or more admixtures in the same Job Mix Design, provide manufacturer's certifications showing the admixtures are compatible and if they can be added simultaneously.

(4) Include the source of supply for water and ice.

c. Materials Samples. The Engineer may require samples of aggregate, cementitious materials, and admixtures to verify the mix design. If requested, furnish representative samples (330 pounds each) of both coarse and fine aggregates, 94 pounds of each cementitious material, and enough admixture to allow for Job Mix Design verification testing. Ensure the Department receives these samples at least 45 days before the mixture's scheduled production for the project.

d. Basis of Required Average Compressive Strength. If the Statistical Method is used, submit the following for each field test record:

- (1) Compressive strength test results of the tested concrete.
- (2) Standard test method used for determining compressive strength.
- (3) Date the compressive strength tests were performed
- (4) Aggregate source used for the tested concrete.
- (5) Specified strength of the tested concrete.
- (6) Batched weights of constituent materials for the concrete used for each compressive strength test.

e. Documentation of Required Average Compressive Strength. Submit documentation indicating the proposed concrete proportions will produce an average compressive strength equal to or greater than the Required Average Compressive Strength meeting one of the following requirements:

(1) Field Test Records. If field test records were used to verify the Required Average Compressive Strength, submit the following for each field test record:

- (a) Compressive strength test results of the tested concrete.
- (b) Standard test method used for determining compressive strength.
- (c) Date the compressive strength tests were performed
- (d) Aggregate source used for the tested concrete.
- (e) Specified strength of the tested concrete.
- (f) Batched weights of constituent materials for the concrete used for each compressive strength test.

- (2) Trial Mixtures. If a single or group of trial mixtures were used to verify the Required Average Compressive Strength, submit concrete mixture proportions per cubic yard and test results for each trial mixture. Include the following information:
- (a) Weights of cementitious materials
 - (b) Weight of aggregates in saturated surface dry condition
 - (c) Volume or weight of each admixture
 - (d) Weight of water
 - (e) Water-cement ratio
 - (f) 7-day, 14-day, and 28-day compressive strength test results
 - (g) Percentage of air by volume
 - (h) Wet unit weight
9. Changes. A change in the approved Job Mix Design proportions, materials, aggregate gradation, or aggregate quality requires a new Job Mix Design; except, a change in Type A, D, E, F, and G admixture proportions, or the addition of a Type A, D, E, F, and G admixture, does not require a new Job Mix Design.
10. Approval. Obtain the Engineer's approval of each mix design prior to use. Approval of the Job Mix Design does not constitute acceptance of produced concrete and will not obligate the Department to accept or pay for concrete that does not meet the mix acceptance requirements of Subsection 501-3.03.

CONSTRUCTION REQUIREMENTS

501-3.01 BATCHING. Batch concrete, in proportioned amounts, according to the approved Job Mix Design.

1. Certification and Calibration. Batch concrete using a certified batch plant. Obtain plant certification meeting the requirements in this Subsection. Use and maintain calibrated weighing and measuring devices for concrete batching equipment, including measuring devices for adding material on-site, meeting the requirements of this Subsection. Submit documentation required for plant certification and weighing and measuring device calibration meeting the requirements of this Subsection before commencing concrete work.
- a. Plant Certification by the National Ready Mix Concrete Association. Certification may be obtained from the National Ready Mix Concrete Association (NRMCA). Information concerning NRMCA certification may be obtained from the NRMCA at 900 Spring Street, Silver Springs, MD 20910 or online at www.nrmca.org. The NRMCA certification is valid for 2 years from the date of inspection.
 - b. Plant Certification by a Professional Engineer. Certification may be obtained by an independent inspection and evaluation by a Professional Engineer registered in the State of Alaska using and completing the NRMCA Plant Certification Check List. Correct deficiencies to the satisfaction of the Professional Engineer. The Professional Engineer must sign and seal the completed NRMCA Plant Certification Check List certifying all applicable items have been met. The certification by a Professional Engineer is valid for 2 years from the date of inspection.
 - c. Calibration of Weighing and Measuring Devices. Use weighing and measuring devices meeting the requirements of the National Institute of Standards and Technology Handbook 44: Specifications, Tolerances, and other Technical Requirements for Weighing and Measuring Devices, and are calibrated by a commercial scale service or certified by the DOT&PF Division of Measurement Standards & Commercial Vehicle Enforcement. Calibrate weighing and measuring devices using equipment traceable to the Alaska State Standards of Weight and Measure as adopted by AS 45.75.020.

Calibrate weighing and measuring devices:

- (1) no more than 12 months before commencing concrete work,
- (2) after each relocation,
- (3) at least once every 12 months until the work is completed, and
- (4) when, in the opinion of the Engineer, there is a question as to the accuracy or adequacy of the device.

- d. Certification and Calibration Submittals. If the Plant Certification is by the NRMCA, submit a copy of the NRMCA Certificate of Conformance. If the Plant Certification is by a Professional Engineer, submit a copy of the completed NRMCA Plant Certification Check List and associated Fleet Inspection Reporting Spreadsheet.

Submit copies of the calibration worksheets for weighing and measuring devices including the most recent date of inspection and the calibrated accuracy for each weighing and measuring device. Submit copies of updated calibration worksheets for each additional calibration required according to 501-3.01.1.c.

2. Measuring Materials.

- a. Cementitious Materials. Use cementitious materials of the same brand, type, and from the same plant of manufacture as the cementitious materials used to verify the approved Job Mix Design according to Subsection 501-2.02.7. Ensure the quantity of the Portland cement and the cumulative quantity of Portland cement plus other cementitious materials is proportioned in amounts required by the Job Mix Design and meets the mix acceptance requirements.

Measure cementitious materials by weight. When other cementitious materials, including fly ash, ground granulated blast-furnace slag, or silica fume, are specified in the concrete proportions, the material may be cumulatively weighed with the Portland cement. Weigh cementitious materials on a weighing device that is separate and distinct from those used for other materials. Weigh the Portland cement before other cementitious materials.

Portland cement is permitted to be measured in bags of standard weight (94 pounds). Do not use a fraction of a bag of cementitious materials unless its weight has been determined by calibrated weighing devices.

- b. Aggregates. Use aggregates from the same sources and having the same size ranges as the aggregates used in the trial mixtures or field test records used to verify the required average compressive strength. Ensure the quantity of the aggregates is proportioned in amounts required by the Job Mix Design.

Measure aggregates by weight. Establish batch weight measurements on dry materials and adjust the actual scaled weight for the required dry materials weight plus the total weight of moisture, both absorbed and surface, contained in the aggregate.

- c. Water. The total quantity of mixing water includes water added to the batch, ice added to the batch, and water occurring as surface moisture on the aggregates. Measure the added water by weight or volume. Measure added ice by weight. Discharge the flush water (wash water) prior to loading the next batch of concrete. Do not use flush water (wash water) as a portion of the mixing water.
- d. Admixtures. Use concrete admixtures according to the manufacturer's instructions and the approved Job Mix Design. Type A, D, E, F, and G admixtures not included in the approved Job Mix Design may be added according to Subsection 501-2.02.9.

Measure powdered admixtures by weight. Measure paste or liquid admixtures by weight or volume.

3. Materials Storage and Handling.

- a. Cementitious Materials. Keep cementitious materials dry and free from contaminants. Do not use cementitious materials which have become partially hydrated or which contain lumps of caked cementitious material.
- b. Aggregates. Do not allow segregation of the aggregates or contamination with foreign materials. Separate aggregate to prevent intermixing of specified gradations.

Drain aggregate so the moisture content is uniform and is accounted for during the batching process.

Do not use aggregates that contain ice, are frozen, or have been heated directly by combustible materials. Use direct steam, steam-coil, or water-coil heating when heating aggregates. When direct steam is used to thaw aggregate piles, drain aggregates to uniform moisture content before batching.

- c. Admixtures. Protect admixtures from contamination, evaporation, or damage. Store admixtures according to the manufacturer's instructions. Protect liquid admixtures from freezing and from temperature changes affecting the admixture's performance.

501-3.02 MIXING AND DELIVERY. Mix concrete, in proportioned amounts, according to the approved Job Mix Design. Mix ingredients into a thoroughly intermingled uniform mixture. Do not retemper concrete mixtures. Do not use concrete that has developed initial set prior to placement.

1. Addition of Water. Additional water may be added on-site provided the following are met:
 - a. The volume of concrete in the mixer after the additional water is added does not exceed the maximum mixing capacity.
 - b. The water measuring device is calibrated according to Subsection 501-3.01.1.c.
 - c. The Water-cement ratio for the batch as established by the approved Job Mix Design is not exceeded. Account for the actual volume of concrete remaining in the mixer.
 - d. Water additions are completed within 30 minutes after the introduction of the mixing water to the cementitious materials.

The addition of water is not prohibited from being several distinct additions of water. Inject additional water into the mixer under pressure and direction of flow to allow for proper distribution within the mixer. Provide additional mixing to ensure a thoroughly intermingled uniform mixture is attained.

2. Time for Placement. Discharge the concrete within 1.5 hours of the following:

- a. after adding the mixing water to the cementitious materials, and
- b. after adding the cementitious materials to the aggregates.

The time to complete discharging the concrete may be extended 2 minutes for every degree of temperature at which the concrete is discharged below 70°F, to a maximum total time of 2 hours. The Engineer may increase the time to discharge requirement provided the concrete can be placed before initial set occurs and without the addition of water.

501-3.03 EVALUATION OF MATERIAL FOR ACCEPTANCE. All concrete in the work will be evaluated for acceptance.

The Engineer may reject a batch or load of concrete failing to meet the requirements for proportions, slump, total air content, or temperature. Prior to sampling, the Engineer may reject a batch or load of concrete that appears defective in composition.

1. Sampling. The Department will take samples at the discharge point of the placement system, except Class DS concrete will be sampled at the truck discharge.

Provide adequate and representative fresh concrete for sampling and testing as directed by the Engineer. The Engineer will sample the concrete after a minimum of 1/2 cubic yard of concrete has discharged from the placement system. Do not add water or admixtures to the mix after the concrete has been sampled for acceptance testing.

The Engineer will determine aggregate gradation for acceptance based on random samples taken at the plant.

2. Sampling and Test Methods. The Department will sample and test according to the following:

WAQTC TM 2	Sampling Freshly Mixed Concrete
WAQTC FOP for AASHTO T 309	Temperature of Freshly Mixed Portland Cement Concrete
AASHTO T 22	Compressive Strength of Cylindrical Concrete Specimens
WAQTC FOP for AASHTO T 27/T 11	Sieve Analysis of Fine and Coarse Aggregates, and Materials Finer Than No. 200 Sieve in Mineral Aggregate by Washing
WAQTC FOP for AASHTO T 23	Method of Making and Curing Concrete Test Specimens in the Field
WAQTC FOP for AASHTO T 119	Slump of Hydraulic Cement Concrete
WAQTC FOP for AASHTO T 121	Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
WAQTC FOP for AASHTO T 152	Air Content of Freshly Mixed Concrete by the Pressure Method
AASHTO T 231	Capping Cylindrical Concrete Specimens
WAQTC FOP for AASHTO TP 83	Field Sampling and Fabrication of 50-mm (2-in) Cube Specimens using Grout (Non-Shrink) and or Mortar

3. Batch Tickets. Provide a ticket with each batch of concrete delivered to the project. Include the following information:

- a. Manufacturer plant (batching facility)
- b. Department contract number
- c. Date
- d. Time cementitious material added to batch
- e. Truck number
- f. Quantity (quantity batched this load)
- g. Batch facility mix identification number
- h. Weights of every type of cementitious material
- i. Weights of each aggregate
- j. Weight or volume of each admixture
- k. Weight or volume of water added at the plant
- l. Total moisture and absorption percentage for each aggregate
- m. Maximum weight or volume of water that may be added in the field
- n. Weight or volume of water added in the field

- o. Time discharge completed
- p. Signature of Contractor's representative, affirming the accuracy of the information provided

4. Proportion Requirements. Meet the proportion requirements of the approved Job Mix Design within the following proportion tolerances:

- a. Total Cementitious Material, weight $\pm 1\%$
- b. Aggregates, weight $\pm 2\%$
- c. Total Water, weight or volume $\pm 3\%$
- d. Air-Entraining Admixtures, weight or volume manufacturer's limits
- e. Type S Admixture, weight or volume $\pm 3\%$
- f. Type A, B, C, D, E, F, G Admixtures, weight or volume manufacturer's limits

If the total cementitious material weight is made up of different components, keep the component weights within the following tolerances:

- (1) Portland Cement $\pm 1\%$
- (2) Fly Ash $\pm 5\%$
- (3) Ground Granulated Blast-Furnace Slag $\pm 5\%$
- (4) Silica Fume $\pm 10\%$

Proportion tolerance will be calculated using consistent units for M_{JMD} and M_A as follows:

$$P = \frac{(M_A - M_{JMD})}{M_{JMD}} \cdot 100$$

Where: P = Proportion tolerance, percentage
 M_{JMD} = Weight or Volume of component according the approved Job Mix Design
 M_A = Weight or Volume of actual batched component

- 5. Slump Requirements. Do not exceed 9" slump for Class A, A-A, P, and DS concrete. For Class DS concrete, meet the following slump tolerances:
 - a. Using the wet-shaft process: 7 inches minimum, 9 inches maximum
 - b. Using the dry-shaft process: 6 inches minimum, 9 inches maximum
- 6. Total Air Content Requirements. Meet the total air content percentage within a tolerance of ± 1.5 of the approved Job Mix Design percentage.
- 7. Temperature Requirements. Unless otherwise noted, ensure the concrete temperature is between 50°F and 90°F when placed in the forms.
- 8. Compressive Strength Requirements. Meet the strength requirements for the Specified Compressive Strength. Concrete of the approved Job Mix Design will be considered to meet the Specified Compressive Strength requirements when both of the following conditions are met:
 - a. The lowest individual compressive strength test result is not less than the Specified Compressive Strength minus 500 psi, or 90.0 percent of the Specified Compressive Strength, whichever is lower.
 - b. The lowest averaged result of three consecutive individual compressive strength tests meets or exceeds the Specified Compressive Strength.

501-3.04 PREPARATION FOR CONCRETE PLACEMENT. Allow time for inspection prior to concrete placement.

Remove debris, concrete splatter, oil, paint, and other foreign substances from the surfaces of forms and reinforcing steel, against which the concrete is to be placed.

Remove soil and other debris from pipe piles to the bottom of concrete elevation shown on the Plan.

Prepare foundations according to Section 205.

Moisten foundations and forms with water before the concrete is placed. Remove standing water on the foundation, in the pile, and in the forms before placing concrete.

501-3.05 PLACING CONCRETE. Do not begin concrete placement without the Engineer's authorization. Place concrete conforming to the approved Job Mix Design. Place and consolidate each layer within 30 minutes and before the preceding layer takes initial set.

If concrete placement operations are delayed so initial set occurs before placement of the succeeding section or layer, place a joint according to Subsection 501-3.11. The resulting joint will be considered a construction joint. If, in the opinion of the Engineer, the location of the construction joint will affect the strength or durability of the concrete, the Engineer may reject the concrete, the structure, or a portion of the structure.

Place concrete in a sequence to obtain a well-consolidated concrete and to prevent cracks. Place concrete as near as possible to final position. Prevent segregation of the mix, displacement of reinforcing steel, and spattering of mortar on the reinforcing steel and forms above the elevation of the layer being placed. Do not deposit a large quantity of concrete at any point and run or work the concrete along the forms. Do not allow concrete to slide down the sides of the forms.

Regulate concrete placement so the pressures do not exceed the load capacity of the forms. Limit layer thickness to no more than 2.5 feet, or the capacity of the vibrators to consolidate and merge the concrete with the previous layer, whichever is less.

Unless otherwise specified, use a tremie, tube, or other such device to limit the free-fall height to less than 5.0 feet when placing operations would otherwise allow concrete to drop more than 5.0 feet. When using a tremie to place concrete, use a watertight tremie with an inside diameter of at least 10 inches. When using a concrete pump to place concrete, use concrete pump lines that are watertight with an inside diameter of at least 5 inches.

Concrete placed in piles or in dry-shaft process may free-fall more than 5 feet without use of tremie, tube or other such device, provided the falling concrete does not contact rebar or other objects before reaching the top surface of the placed concrete. When free-falling concrete more than 5 feet, use a drop chute at least 3 feet long.

After initial set, prevent movement of forms, projecting ends of reinforcing steel, and other embedded items.

Do not use aluminum components in contact with fresh concrete.

Place concrete in the superstructure only after substructure forms are removed and the substructure has been inspected.

1. Concrete Placement Plan. Submit a concrete placement plan to the Engineer, for concrete decks and drilled shafts. Submit each concrete placement plan to the Engineer, at least 30 days before placing concrete. Do not place concrete until after the Engineer has approved the plan. Include the following in each concrete placement plan:
 - a. concrete placement sequence,
 - b. schedule of concrete placement and curing,
 - b. estimated concrete volume of each section,

- c. placement rate and duration,
- d. description of finishing equipment,
- e. placement procedure,
- f. name of the concrete foreman,
- g. curing materials, equipment, and procedure.

2. Pre-concreting Conference. Hold a pre-concreting conference for concrete decks and Drilled Shafts, at least 5 working days before placing concrete. Include the Engineer, the Superintendent and foremen in charge of placing reinforcing steel, placing concrete, finishing concrete, and curing operations. Discuss construction procedures, personnel, and equipment to be used.

If the project includes more than one concrete placement operation, and if key personnel change between concreting operations, hold additional conferences to include replacement personnel before placing successive concrete sections.

3. Pumping Concrete. Use a pump producing a continuous stream of concrete without air pockets. When pumping is completed, the concrete remaining in the pipeline, if used, must eject without contaminating the concrete or separating the ingredients. Discard concrete contaminated by priming or cleaning the pump.
4. Conveying Concrete. Concrete may be conveyed if the equipment will handle the class of concrete, with the slump and air content specified and without segregation of the aggregate, and no equipment vibrations will damage freshly placed concrete or reinforcing steel. Limit the length of conveyor belts to prevent aggregate segregation or 300 feet, whichever is less. Cover the belt to protect the concrete from heat, evaporation, precipitation, or when the Engineer determines precipitation is likely.
5. Piles. Do not place concrete underwater in piles.
6. Drilled Shaft Foundations. Place concrete following either the wet-shaft process or dry-shaft process, as applicable.

The dry-shaft process may be used where the ground water level and soil and rock conditions are suitable to permit construction of the shaft in a relatively dry excavation, and where the sides and bottom of the shaft can be visually inspected by the Engineer prior to placing the concrete. Relatively dry excavation conditions exist when excavation fluids have been removed from the shaft and the rate of water intrusion is less than 6 inches of water accumulating above the base in a 1-hour period without pumping or other methods to drain or remove water. Suitable soil and rock conditions exist when the sides and bottom of the hole remain stable without caving, sloughing, or swelling between completion of excavation and concrete placement; and loose material and water can be satisfactorily removed prior to inspection and concrete placement. Do not begin concrete placement if there is more than 1 inch of water in the bottom of the shaft excavation. Use wet-shaft process if the requirements for dry-shaft process cannot be satisfied.

Provide process control testing during concrete placement. Test total air content and slump before placing each batch of concrete in the drilled shaft. Perform sampling and testing according to Subsection 501-3.03.2 using a WAQTC qualified concrete testing technician or ACI certified concrete field testing technician. Test every batch of concrete before placement. Record the time when each sample is collected. Submit test results to the Engineer within 72 hours of completing each test.

- a. Wet-Shaft Process. Place concrete using a tremie or concrete pump. Place concrete continuously until good quality concrete, as determined by the Engineer, is evident at top of the shaft or nearest construction joint. Good quality concrete is considered concrete of the same consistency, appearance, and quality as the concrete being delivered and meeting the applicable mix acceptance requirements. Remove a sufficient volume of concrete to ensure elimination of contaminated concrete at the top of shaft before continuing with subsequent construction operations.

Remove concrete laitance during or immediately after concrete placement operations have ended.

Do not allow water, fluids, drilling aids, or concrete from the top of the shaft to enter streams or other waterways.

Construct the discharge end of the tremie or pump line to prevent water intrusion and permit the free flow of concrete during concrete placement. Use caps, bottom plates, pigs, or other such devices inserted into or attached to discharge pipe to separate the concrete from the excavation fluid during initial charging of the discharge pipe. Ensure the discharge pipe has sufficient length and weight to rest on the shaft base before starting concrete placement.

When using a tremie, provide adequate support so the tremie can be raised to increase the discharge of concrete and lowered to reduce the discharge of concrete. Do not shake, vibrate, or rapidly raise or lower the tremie to increase the discharge of the concrete.

Maintain a positive head of concrete inside the tremie or pump line relative to the excavation fluid level. Position the discharge orifice within one pipe diameter of the shaft base. Do not re-position the discharge pipe until the orifice is at least 8 feet below the concrete surface. Maintain at least 8 feet of concrete above the discharge orifice during concrete placement. Monitor the concrete level during placement to ensure the tremie or pump line discharge orifice remains at least 8 feet below the concrete surface throughout placement.

If the discharge orifice rises above the concrete surface before concrete placement is complete, the shaft will be considered defective. Immediately terminate concrete placement operations and notify the Engineer.

- (1) Concrete Flowability Requirements. Ensure concrete placed in the shaft remains flowable throughout placement operations by maintaining a slump of at least 6 inches until placement is completed. Collect samples from the first batch of concrete. Test slump from the first batch of concrete at the beginning of the concrete placement operations and immediately after concrete placement operations are complete. Record the time when samples are collected and when tests are performed. Submit test results to the Engineer within 72 hours of completing each test.
- b. Dry-Shaft Process. Place concrete continuously until concrete is evident at top of the shaft or nearest construction joint. Concrete may be permitted to free-fall into place if the concrete does not contact the sides of the shaft, reinforcing steel, or other objects while free falling.

Remove concrete laitance during or immediately after concrete placement operations have ended.

- (1) Concrete Plasticity Requirements. Ensure concrete placed in the shaft remains plastic throughout placement operations by completing placement operations before initial set occurs.
7. Concrete Decks and Approach Slabs. Before placing concrete, operate the finishing machine over the entire length of the deck to check screed deflection, reinforcing steel clearance, and concrete thickness.

Limit the rate of placing concrete to what can be finished before initial set.

- a. Placement Sequence. Place the concrete deck in the sequence shown on the Plans. The Engineer may approve a revised placement sequence for casting the concrete deck continuously from one end to the other provided the following:
 - (1) Do not use Type III Portland cement.

- (2) Stockpile the materials necessary to complete the placement and have the equipment, incidentals, and workers on the site before beginning concrete placement operations.
- (3) Ensure the continuous concrete placement and finishing operation proceeds at a minimum rate of 30 feet per hour, measured longitudinally along the axis of the span.
- (4) The Engineer determines the revised placement sequence will not reduce the stability during construction and will not reduce the quality, capacity, or durability of the completed structure.

If the Engineer approves the proposal for a continuous concrete placement operation, the Department will observe and evaluate performance to the first planned construction joint in the sequence. At this point, the Engineer may authorize you to proceed with the continuous concrete placement operation or suspend the placement and install a construction joint. The Engineer's decision will be based on whether the concrete can be produced, delivered, and finished at a continuous rate permitting the structure to accommodate final dead load deflections while the concrete is plastic.

If the Engineer suspends the continuous concrete placement operations after the first sequential placement, submit modifications for improving the continuous concrete placement operations, beginning at the other end of the deck. If a second attempt at continuous concrete placement is authorized, the placement will be evaluated and allowed or terminated based on the same criteria as the first sequential placement.

If the Engineer suspends the continuous concrete placement operation after the second attempt, additional attempts will not be permitted. Follow the deck placing sequence shown on the Plans.

501-3.06 CONSOLIDATION OF CONCRETE. Consolidate concrete to make a dense homogeneous mass free of voids and rock pockets. Consolidate each layer to leave a compact, dense, and impervious concrete with smooth faces on exposed surfaces with no visible line of separation between adjoining layers.

Consolidate concrete, except underwater or other exempted placements, by mechanical vibration at the point of deposit. Use vibrators capable of visibly affecting concrete with a 1-inch slump for a distance of at least 18 inches from the vibrator.

Use vibrators and regulate placement in order to consolidate the fresh concrete within 15 minutes of placement and before initial set. Effectively vibrate the full depth of each layer.

For immersion-type vibrators, insert vibrators vertically to a depth penetrating into the previous layer. Withdraw vibrators slowly to avoid segregation or grout pockets. Vibrate in a uniform pattern spaced less than 1.5 times the radius of visible effectiveness.

Avoid vibration of initially set layers and reinforcing steel below the succeeding placement. Do not hold vibrators against reinforcing steel or use them to flow or spread the concrete into place. Manipulate vibrators to produce concrete free of voids, with proper texture on exposed faces, and maximum consolidation. Do not allow the concrete to segregate, form pools of mortar, or form laitance on the surface.

When immersion-type vibrators are used to consolidate concrete around epoxy-coated reinforcing steel, use rubber or nonmetallic vibrator heads that will not damage epoxy coatings.

Concrete may be placed directly into drilled shaft foundations and piles without mechanical vibration; except, vibrate the top 5 feet of concrete. For drilled shaft foundations, consolidate the top 5 feet of concrete after good quality concrete is evident at the top of the shaft and after water, slurry, drilling aids, and other materials other than concrete have been removed.

501-3.07 FINISHING CONCRETE SURFACES. After the concrete is consolidated and prior to the application of curing materials, strike-off unformed concrete surfaces to the required elevation and slope.

Finish the surface by floating the surface to remove local irregularities and leave sufficient mortar to seal the concrete surface. Do not use mortar topping for concrete surfaces. Do not use aluminum finishing equipment.

Complete initial floating operations before bleed water or excess moisture is present on the surface and before the concrete takes initial set. Complete final finishing before final set occurs. Do not use finishing aids or additional water to assist in finishing concrete surfaces. Do not finish concrete surfaces if bleed water, excess moisture, or curing materials are present.

Provide formed concrete surfaces with an ordinary finish unless otherwise noted.

1. Ordinary Finish. An ordinary finish is the finish left on a surface after removing the forms, filling the holes left by the form ties, and repairing defects. Ensure the surface is true and even and free from rock pockets and depressions or projections.

Immediately after removing the forms, remove the metal devices holding the forms in place and passing through the body of the concrete, or cut them back at least 1 inch beneath the surface of the concrete. Remove fins of mortar and irregularities caused by form joints.

Patch cavities produced by form ties, depressions, holes, and voids greater than 1/4 inch. Fill the cavity with stiff mortar composed of one part of Portland cement to two parts of fine aggregate. Proportion the mortar by loose volume with only enough water to form a small ball when squeezed gently by hand. Clean the cavity and saturate the concrete with water before filling the cavity. Thoroughly tamp the mixture into place. Float the surface of the mortar before initial set to make the surface neat in appearance. Cure the patch according to Subsection 501-3.08.

Do not repair concrete with rock pockets, cracks, or other defects until the concrete is inspected by the Engineer. Concrete repaired prior to inspection by the Engineer may be rejected. If, in the opinion of the Engineer, the defect will affect the strength or durability of the concrete, the Engineer may reject the concrete, the structure, or portion of the structure. If the defect is greater than 3/4 inch in depth, submit a repair plan including complete details of the method, materials, and equipment proposed for use in repairing the concrete. Obtain the Engineer's approval of the repair plan before repairing the defect. A repair plan is not required if the defect is 3/4 inch or less in depth.

Repair broken corners and edges, rock pockets, and other defects. If the defect is greater than 3/4 inch in depth, repair the defect according to the approved repair plan. If the defect is 3/4 inch or less in depth, chip away coarse or broken material according to Subsection 501-3.16 to obtain a dense, uniform surface of concrete exposing solid coarse aggregate. Cut feathered edges to form faces perpendicular to the surface. Apply an epoxy bonding agent to the concrete mating surfaces according to the manufacturer's instructions. Patch the repaired area with stiff mortar composed of one part of Portland cement to two parts of fine aggregate. Proportion the mortar by loose volume with only enough water to form a small ball when squeezed gently by hand.

Perform repairs prior to releasing falsework, prestressing, or applying additional loads to the concrete.

2. Rubbed Finish. Provide a rubbed finish at locations shown on the Plans. When forms can be removed, wet the surface and then rub with a wooden float until irregularities and form marks are removed and the surface is covered with a lather composed of cement and water. A thin grout composed of one part Portland cement and one part fine aggregate may be used. Allow this lather to set for at least 5 days. Then, smooth the surface by lightly rubbing with a fine carborundum stone.

If the concrete has hardened before being rubbed, use a medium coarse carborundum stone to finish the surface at least 4 days after placing the concrete. Spread a thin grout composed of one part Portland cement and one part fine aggregate over a small area of the surface. Immediately rub the surface with the stone until form marks and irregularities are removed and the surface is covered with a lather. Allow

this lather to set for at least 5 days. Then, smooth the surface by rubbing lightly with a fine carborundum stone.

Complete ordinary finish work before applying the rubbed finish.

3. Concrete Decks and Approach Slabs. Obtain a smooth riding surface of uniform texture, true to the required grade and cross section.

Use a self-propelled mechanical finishing machine:

- a. capable of forward and reverse movement,
- b. with a rotating cylindrical single or double drum screed,
- c. with necessary adjustments to produce the required cross-section, line, and grade,
- d. allowing screeds to be raised and lowered, and
- e. with an upper vertical limit of screed travel permitting the screed to clear the finished concrete surface.

When placing concrete abutting previously placed concrete, equip the finishing machine to travel on the existing concrete.

The Engineer may approve hand-operated motorized roller screeds (friction screeds) where jobsite conditions prohibit the use of conventional configuration finishing machines described above, for small areas less than 12 feet wide, and on approach slabs in which conventional configuration finishing machines are not used to finish the concrete deck. Do not use vibratory screeds.

Use equipment capable of striking off the full placement width without intermediate supports or rails. Use rails resting on adjustable supports that can be removed with the least disturbance to the concrete. Place the supports on structural members or on forms rigid enough to resist deflection. Use supports that are removable to at least 2 inches below the finished surface. If possible, place rails outside the finishing area. If not possible, place them above the finished surface.

Use rails (with their supports) that are strong and stiff enough for operation of the equipment without excessive deflection. Place and secure rails for the full length of the deck before placing concrete. Set the rails to the proper grade and elevations to ensure the required profile is provided.

After placing and consolidating the concrete, carefully strike off the concrete surface. Correct imperfections left on the deck. Provide a float finish to surfaces receiving a waterproof membrane. Texture other surfaces with a heavy-broom finish perpendicular to the direction of traffic.

Do not place finishing machines or other loads on the screed rail supports or on features supporting fresh concrete after the concrete has initially set and before the concrete attains at least 80 percent of the Specified Compressive Strength.

Do not release falsework or wedges supporting concrete on either side of a joint until each side has cured as specified.

4. Curb, Sidewalk, and Concrete Barrier Surfaces. Finish exposed faces of curbs, sidewalks, and concrete barriers to true surfaces and provide a broom finish. Broom finish sidewalks perpendicular to the direction of traffic.
5. Sandblasted Finish. Sandblast the cured concrete surface with hard, sharp abrasive media to produce an even fine-grained surface in which the mortar has been cut away, leaving the aggregate exposed.
6. Trowel Finish. Trowel the surface smooth and free of trowel marks.

501-3.08 CURING CONCRETE. Maintain a satisfactory moisture content and temperature in the concrete immediately after finishing operations are completed.

1. Initial Curing Period. Before final curing, ensure the surface of the concrete is kept moist. Concrete surface is beginning to dry when no bleed water is present and the surface color changes. If the concrete surface begins to dry before the final curing method can be applied, prevent further loss of moisture by one or more of the following methods:
 - a. Fog Spray. Use equipment producing a fog spray from an atomizing nozzle with sufficient velocity to cover the entire concrete surface. Direct the atomized water spray above the concrete surface to allow the fog to drift down to the concrete surface. Do not apply the discharge of the atomized water spray directly at the concrete surface. Continue fogging to maintain the reflective appearance of the damp concrete. Do not allow the surface to dry, or to undergo cycles of drying and wetting. Keep the concrete surface damp, but do not accumulate water until after final set has occurred. Use water meeting the requirements of Subsection 712-2.01.
 - b. Evaporation Rate Reducer. Apply a monomolecular film intended specifically as an evaporation rate reducer to entrap bleed water or excess moisture on the concrete surface. Apply the evaporation rate reducer according to the manufacturer's written instructions. Do not use the evaporation rate reducer during finishing operations or as a finishing aid. Do not use evaporation rate reducers on concrete surfaces receiving a waterproofing membrane such as concrete decks, approach slabs, end diaphragms and decked precast concrete members.
2. Final Curing Period. Unless otherwise noted, employ the final curing method immediately following finishing operations.

Use wet curing on construction joints, concrete with a mix design water-cement ratio less than 0.40, and concrete decks, approach slabs, and concrete surfaces subject to tire contact in the completed structure. For other concrete, use wet curing, liquid membrane-forming curing, forms-in-place curing, or a combination of these curing methods.

Do not use liquid membrane-forming curing compounds on concrete surfaces to which other materials will be cast against or bonded such as concrete and waterproofing membranes.

In addition to the requirements in this section, precast concrete members may use accelerated curing.

- a. Wet Curing. Until the end of the curing period, provide continuous moisture by:
 - (1) watering a covering of heavy burlap blankets or quilted cotton mats,
 - (2) keeping concrete surfaces wet with water continuously,
 - (3) wetting the outside surfaces of wood forms.

Wait to install curing materials until the concrete has sufficiently hardened to permit such operations without damaging the concrete or marring the finish. While waiting to employ curing materials, maintain the concrete surface moisture as specified for the initial curing period.

Uniformly distribute absorbent materials across the entire concrete surface. Apply water in a manner that will not displace the curing materials or erode the concrete surface. Keep the concrete surfaces continuously wet. Do not allow concrete surfaces to dry or alternate with wetting and drying cycles. Cover the concrete, wooden forms and absorbent material with impermeable sheeting. Use white reflective impermeable sheeting if direct sunlight is present, or if the Engineer determines direct sunlight may be present during the curing period.

Do not use absorbent materials containing harmful substances such as sugar or fertilizer, or materials that may discolor the concrete.

- b. Liquid Membrane-Forming Curing Compounds. Apply liquid membrane-forming compounds immediately after final finishing and as soon as the free water has disappeared, no water sheen is visible, and bleeding has essentially ceased. Apply two coats of liquid membrane-forming compound with the second coat at right angles to the first. Apply both coats of liquid membrane-forming compounds uniformly until the original color of the concrete is obscured. Apply liquid membrane-forming compound according to the manufacturer's instructions.

Do not apply the liquid membrane-forming compound to dry concrete surfaces. Moisten the concrete surface, without standing water, before applying the liquid membrane-forming compound. Protect the membrane from damage for the duration of the curing period. Re-apply the liquid membrane-forming compound if the membrane is cracked or damaged during the curing period.

- c. Forms-In-Place Curing. Formed concrete surfaces may be cured by retaining the forms in place for the entire curing period. Keep the forms moisture tight. Do not loosen forms. For wooden forms, keep the forms wet as required for wet curing. If gaps develop between the forms or between the forms and concrete:

- (1) remove the forms and implement another curing method
- (2) keep the gaps continuously filled with water for the remainder of the curing period.

- d. Accelerated Curing. Accelerated curing may be used only on Class P Concrete with a water-cement ratio of less than 0.35.

During the curing period, keep the concrete in a saturated curing atmosphere until the concrete achieves the required release strength.

The curing period may be accelerated by using saturated low-pressure steam, convection-heat, or radiant-heat in a suitable curing chamber to contain the live steam or heat. Provide at least 3 inches of clearance between the enclosure and forms to allow adequate circulation.

If accelerated curing methods are used, embed at least one temperature-recording device in the concrete to verify concrete temperatures are within the specified limits. Install one temperature-recording device, accurate to $\pm 5^{\circ}\text{F}$, near the member's midpoint, 6 to 8 inches from the top or bottom, and along the member's centerline. Monitor the concrete temperature with the temperature-recording device sensor arranged and calibrated to continuously record, date, and identify the concrete temperature throughout the heating cycle. Begin recording temperatures once concrete is placed in the forms. Stop recording temperatures after the heating cycle is complete and when the concrete temperature is within 20°F of the air temperature to which the concrete will be exposed. Upon request, submit the temperature record to the Engineer for each precast concrete member.

While waiting to begin the heating cycle, maintain the concrete temperature between 50°F and 90°F and maintain concrete surface moisture as specified for the initial curing period. Do not apply steam, convection-heat or radiant-heat prior to initial set except to maintain the concrete temperature. Determine the time of initial set according to AASHTO T 197.

Begin the heating cycle immediately after the initial set. Prevent hot air and steam from blowing directly onto the concrete or forms. Increase the concrete temperature at an average rate not exceeding 40°F per hour until the curing temperature is reached. Limit curing temperature within the concrete to 175°F maximum. Decrease the concrete temperature not more than 40°F per hour until reaching a temperature 20°F above the temperature of the air to which the concrete will be exposed.

Apply radiant heat by pipes circulating steam, hot oil, or hot water, or by electric heating elements.

3. Curing Temperature. To achieve adequate curing, maintain the concrete temperature at or above 50°F during the curing period. Add one additional day of curing for each day or portion of a day the concrete temperature falls below 50°F during the curing period.
4. Ending Curing Operations. Continue curing operations uninterrupted until the required concrete properties, strength, and durability have developed or until there is reasonable assurance these properties will be achieved after the curing operations have been terminated.

Curing operations may be terminated after both of the following are satisfied:

- a. The concrete has cured for:
 - (1) at least 7 days.
 - (2) at least 10 days when fly ash or ground granulated blast furnace slag in excess of 10 percent by weight of the Portland cement are used in the mix.
- b. The compressive strength from informational field tests reaches the following:
 - (1) 70 percent of the Specified Compressive Strength if post curing concrete temperature is expected to remain at or above 50°F until 100 percent of the Specified Compressive Strength is attained.
 - (2) 100 percent of the Specified Compressive Strength, if post curing conditions are expected to allow the concrete temperature to fall below 50°F before 100 percent of the Specified Compressive Strength is attained.

501-3.09 PROTECTION OF CONCRETE. Protect concrete from damage. Do not apply loads to the concrete for at least 7 days, until curing operations are completed, and until the Engineer determines the concrete has attained sufficient strength to safely carry the applied loads without damage. Unless otherwise noted, sufficient strength is attained when the concrete has a compressive strength, determined from informational field tests, of at least 80 percent of the Specified Compressive Strength.

Release forms and falsework according to Section 512.

During the curing period, protect concrete from damaging mechanical disturbances. Protect concrete surfaces from damage by construction traffic, equipment, materials, rain or running water, and other adverse weather conditions. Meet the vibration limits during pile driving of Section 505.

Do not backfill against concrete structures until the end of the curing period and until the concrete has attained a compressive strength, determined from informational field tests, of at least 80 percent of the Specified Compressive Strength.

Obtain authorization from the Engineer before driving vehicles or equipment, or storing materials on the structure. Keep the structure closed to traffic until the concrete has been accepted. Obtain authorization from the Engineer before opening the structure to traffic.

1. Rain Protection. Provide materials and equipment on site to protect concrete until final set. During precipitation, or when the Engineer determines precipitation is likely before final set, employ materials and equipment to protect the concrete until final set occurs. Do not expose the concrete to rain or flowing water before final set occurs.
2. Cold Temperature Protection. When air temperatures are expected to be below 35°F during concrete placement or the curing period, have materials and equipment in place to prevent the concrete temperature from falling below 35°F. Implement the cold temperature concreting plan when the air temperature in the shade, away from artificial heat, is less than 35°F or, in the opinion of the Engineer, is likely within 24 hours.

- a. Submittals. Submit a cold temperature concreting plan at least 5 days before placing concrete when the air temperature is expected to be below 35°F during the concrete placement or during the curing period. Submit detailed procedures for the production, transport, placement, protection, curing, and temperature monitoring of concrete during cold weather for each concrete placement. Include procedures for abrupt changes in weather conditions and equipment failures.
- b. Preparation. Remove snow, ice, and frost from surfaces that will touch the concrete. Before beginning concrete placement, thaw the subgrade to at least 2 feet below the concrete to be placed. Do not place concrete around or adjacent to forms, embedded items, concrete, steel, or other materials unless such items are preheated and maintained at a temperature above 35°F.
- c. Temperature of Concrete Before Placement. Ensure concrete is between 50°F and 70°F during placement. Obtain these temperatures by heating the mixing water and/or aggregate. Heat mixing water to no more than 150°F.

When the temperature of the water or aggregate exceeds 100°F, mix them together so temperature of the combined ingredients does not exceed 80°F when the cementitious materials are added.

- d. Temperature of In-place Concrete. Protect the concrete from damage due to cold weather immediately after concrete placement and ensure adequate curing conditions are maintained as required in Subsection 501-3.08.

If the minimum curing temperature cannot be maintained, do not allow the concrete temperature to drop below 35°F. Provide extra protection in areas especially vulnerable to temperatures below 35°F such as exposed top surfaces, corners and edges, thin sections, and concrete placed against steel.

Maintain the concrete temperature using methods such as insulated forms, enclosures, and indirect heat. When using combustion heaters, vent flue gases to the outside of the enclosure. Prevent overheating areas of concrete or drying during the curing period by directing heaters and ducts away from the concrete surface. Do not expose the concrete surface to air with a temperature more than 90°F, unless higher values are allowed according to the curing method.

Protection may be terminated when the air temperature in the shade, away from artificial heat is rising, above 35°F, and is expected to remain above 35°F until the end of the curing period. At the end of the protection period, remove the protection so the concrete surface drops in temperature gradually at a rate not more than 1.25°F per hour until the concrete temperature is within 20°F of the air temperature in the shade, away from artificial heat. If water curing is used, terminate the addition of water to the surface and allow the concrete surface to dry prior to exposure of the concrete to freezing temperatures.

3. Hot Temperature Protection. When air temperatures are expected to exceed 90°F during concrete placement, have materials and equipment in place to prevent the concrete temperature from exceeding 90°F before final set and exceeding 150°F during the final curing period. Implement the hot temperature concreting plan when the air temperature in direct sunlight is greater than 90°F.
 - a. Submittals. Submit a hot temperature concreting plan at least 5 days before placing concrete when the air temperature is expected to exceed 90°F during the concrete placement. Submit detailed procedures for the production, transport, placement, protection, curing, and temperature monitoring of concrete during hot temperature for each concrete placement. Include procedures for abrupt changes in temperature conditions or equipment failures.
 - b. Preparation. Prior to placing concrete, plan to minimize the exposure of the concrete to hot temperatures and direct sunlight. Cool surfaces that will touch the concrete to less than 90°F.

Do not sprinkle fine aggregate piles with water. If sprinkling coarse aggregates, monitor the moisture content and adjust the mixing water for the free water in the aggregate.

If replacing all or part of the mixing water with crushed ice, then ensure the ice is completely melted and thoroughly mixed with the other concrete materials before concrete placement commences.

- c. Temperature of Concrete Before Placement. Ensure concrete being placed in forms is between 50°F and 90°F. Obtain these temperatures by cooling the mixing water and/or aggregate.
- d. Temperature of In-place Concrete. Protect the concrete from damage due to hot weather immediately after concrete placement and ensure adequate curing conditions are maintained as required in Subsection 501-3.08.

Provide extra protection in areas especially vulnerable to temperatures above 90°F such as exposed top surfaces, corners and edges, thin sections, and concrete placed against steel.

Protection may be terminated when the air temperature in direct sunlight drops below 90°F and is expected to remain below 90°F for at least 24 hours.

501-3.10 TOLERANCES. Produce concrete elements conforming to the following tolerances:

1. Length: $\pm 3/4$ inch for members 100' and shorter. ± 1 inch for members longer than 100'
2. Cross-sectional Dimensions:
 - a. For dimensions 6 inches or less: $-1/8$ inch to $+1/4$ inch.
 - b. For dimensions over 6 inches but not over 18 inches: $-1/8$ inch to $+3/8$ inch.
 - c. For dimensions over 18 inches: $-1/4$ inch to $+3/8$ inch.
3. Distortion of Cross-section: Limit the slope with respect to the specified surface, plane, or line to less than $\pm 1/16$ inch per foot, but not to exceed $\pm 1/4$ inch measured perpendicular to the long axis of member.
4. Surface Irregularities (deviation from a 10-foot straight edge):
 - a. For surfaces receiving a topping or are buried: $\pm 1/4$ inch.
 - b. For surfaces not receiving a topping or are visible in the completed work: $\pm 1/8$ inch.
5. Camber: Do not vary from the approved camber more than $\pm 1/8$ inch per 10 feet of length, but not to exceed 1 inch. In addition, the camber of each girder may not differ from the camber or the other girders by more than 1 inch.
6. Lateral Sweep (deviation from a straight line parallel to centerline of member):
 - a. For member length 40 feet or less: $\pm 1/4$ inch.
 - b. For member length over 40 feet but not over 60 feet: $\pm 3/8$ inch.
 - c. For member length over 60 feet: $\pm 1/2$ inch.
7. Deck Width (measured out-to-out): Zero to +2 inches, except not more than +1/2 inch where more precision is dictated by the substructure details such as anchor bolts, parallel wing walls, etc.
8. Position and Alignment:
 - a. Bottom of footing elevation: ± 0.1 feet.
 - b. Profile grade: ± 0.05 feet.
 - c. Lateral position: ± 0.1 feet.

d. Skew: ± 0.05 degrees.

9. Bearing Seats:

- a. Elevation: ± 0.01 feet
- b. Variation between bearing seats: Do not vary from a straight line coincident with the centerline of bearings and parallel to the surface of the bottom flanges more than 0.01 feet.
- c. Grade and cross slope: ± 0.005 feet per foot.

10. Openings:

- a. Size of opening: $\pm 1/4$ inch.
- b. Location of centerline of opening: $\pm 1/2$ inch.

11. Embedded Items:

- a. Bolts: $\pm 1/4$ inch.
- b. Utility hangers: $\pm 1/2$ inch.
- c. Weld Plates: $\pm 1/2$ inch measured along the length of the member, $\pm 1/8$ inch measured perpendicular to the length of the member.
- d. Inserts: ± 1 inch.
- e. Rail post anchor plates: $\pm 1/4$ inch.
- f. Expansion joints: $\pm 1/8$ inch.
- g. Electrical conduits: $\pm 1/2$ inch.
- h. Deck drains: $\pm 1/2$ inch.
- i. Other embedded items: $\pm 1/2$ inch.

501-3.11 CONSTRUCTION JOINTS. Unless otherwise noted, locate construction joints where specified in the Contract documents. Obtain approval before adding, deleting, or relocating construction joints specified in the Contract documents. Make requests for such changes in writing, accompanied by a drawing depicting the joint. The Engineer will evaluate the proposed construction joint to determine if the joint will affect the strength or durability of the concrete. Joints noted as "permissible" do not need the Engineer's approval before deleting. When permitted, place the joints where they will not be exposed to view in the finished structure.

At horizontal construction joints, place gage strips 1-1/2 inches thick inside the forms along exposed faces to give the joints straight lines.

Do not use wire mesh forming material.

If the Plans require a roughened surface on the joint, create grooves at right angles to the length of the member. Make grooves that are 1/2 to 1 inch wide, 1/4 to 1/2 inch deep, and spaced equally at twice the width of the groove. Terminate the grooves within 1-1/2 to 2 inches from the edges of the joint.

If the Plans require a smooth surface on the joint, provide a trowel finish.

Include shear keys at the joint when the Contract documents do not require a roughened surface or a smooth surface. Make shear keys of formed depressions with slight beveling to ensure ready form removal. Do not use raised shear keys. Make shear keys that meet the following:

1. For tops of beams, at the tops and bottoms of boxed girder webs, in diaphragms, and in crossbeams, use shear keys 1-1/2 inches deep, 8 inches long, and spaced at 16 inches.
2. In other locations, use shear keys at least 1-1/2 inches deep and 1/3 of the joint width.

Terminate the shear keys within 1-1/2 to 2 inches of the joint edge.

Clean construction joints of surface laitance and other foreign materials before fresh concrete is placed against the surface of the joint. Flush construction joints with water and allow the joint to dry to a surface-dry condition immediately prior to placing concrete.

501-3.12 FORMS AND FALSEWORK. Use forms and falsework designed and constructed according to Section 512.

501-3.13 PRECAST CONCRETE MEMBERS. In addition to the requirements listed in this Section, conform to Section 502 when fabricating prestressed concrete members.

1. Shop Drawings. Provide shop drawings for precast concrete members. Include details not provided in the Plans for the construction and erection of the members. Cast members only after shop drawings are approved. Use precast methods for cast-in-place elements when approved. Submit shop drawings, showing construction joint details and other required information.
2. Manufacture. Prestress concrete according to Section 502. Fabricate and install reinforcing steel according to Section 503.

Unless otherwise noted, use Class P concrete for precast concrete members meeting the Specified Compressive Strength noted on the Plans.

3. Storage and Handling. Handle and move precast concrete members without damage. Store and transport precast concrete members in an upright position with the directions of the support reactions on the member during storage or transport as if in the final position. Locate support points during transport and storage within 30 inches of their final position, or as shown on approved shop drawings. Ship only after the member has cured at least 7 days and has a compressive strength not less than 100 percent of the Specified Compressive Strength.
4. Erection. Maintain member stability during transport, lifting, and erection operations. Limit concrete tension stresses due to transport, lifting, and erection operations to less than 500 psi.

Set interchangeable precast concrete members so the initial difference between the top surfaces of the edges of adjacent precast concrete members is no more than 1/2 inch at midspan and no more than 1/4 inch at the bearings.

Set and securely brace precast concrete members within a span before making shear connections. Secure the member to the structure, and provide temporary braces necessary to resist wind or other loads immediately after erecting each precast concrete member.

Provide and use forcing devices as shown in the Plans or as recommended by the precast concrete member manufacturer. Use devices maintaining the top edges of adjacent members at the same elevation while casting or welding diaphragms, welding shear connector plates, and while placing and curing grout in the shear keys.

Make field welds according to Section 503 and Section 504.

Install cast-in-place diaphragms within 2 weeks after setting precast concrete members on their bearings.

If cast-in-place diaphragms cannot be placed within the prescribed time limit, ensure the members are adequately braced to resist movement and rotation. Submit a bracing plan including complete details and substantiating calculations, sealed by a Professional Engineer registered in the State of Alaska.

Erect and place precast deck panels so the mating surfaces do not allow grout leakage. Seal joints where grout leakage may occur.

When the Plans require filling keyways between adjacent concrete members with grout, place grout according to the manufacturer's written instructions. Clean joints of surface laitance and other foreign material before placing grout. Do not place loads on the grouted members until the grout compressive strength has reached 5000 psi.

Tightly pack and rod the grout in the keys and spaces. Keep the grout surface smooth and neat. Ensure the grout surface meets the member edges throughout their lengths and matches the surface elevation of the members with a tolerance of $\pm 1/8$ inch.

501-3.14 PLACING ANCHOR BOLTS. Secure anchor bolt assemblies where shown on the Plans.

When casting anchor bolts in concrete, secure anchor bolts before placing concrete in the forms. Do not disturb anchor bolts after concrete has been placed.

When installing anchor bolts in pipe sleeves, pre-cast holes, cored holes, or drilled holes, completely fill the cavity with grout. Do not allow water to freeze in the cavity. Do not allow foreign material in the cavity.

501-3.15 UTILIDUCTS, PIPES, CONDUITS, DUCTS, AND UTILITY HOLES. When utiliducts, pipes, conduits, and ducts will be encased in concrete, install them in the forms before placing the concrete. Support the utiliducts, pipes, conduits, and ducts to prevent displacement during concrete placement.

Install utiliducts and utility holes parallel to the roadway centerline unless noted otherwise. Prevent bond between the utiliducts and concrete by tightly wrapping the utiliducts with at least two layers of asphalt felt.

501-3.16 REMOVING CONCRETE. Do not damage other portions of the structure remaining in place when removing concrete.

Determine and delineate the extent of removal area. Outline the area with a 3/4-inch deep saw cut to form faces perpendicular to the surface prior to the removal of concrete. Do not cut or damage existing reinforcing steel or prestressing steel. During the course of removal, the Engineer may suspend removal or may require additional removal and outline saw cut.

Use any combination of mechanical methods, water-blast cleaning, or abrasive-blast cleaning to remove coarse or broken concrete until a dense, uniform surface of concrete exposing solid coarse aggregate is obtained. When using mechanical methods for removal of concrete, meet the following:

1. Use impact tools weighing less than 15 lbs.
2. Operate impact tools at an angle less than 45 degrees relative to the surface of the concrete being removed.
3. Use hand tools such as hammers and chisels or small air chisels, water blast cleaning, or abrasive blast cleaning to remove final particles of unsound concrete.

During the removal operation do not damage existing reinforcing steel, prestressing steel, or concrete to remain in place.

Before applying the repair material, clean the surface according to ASTM D 4258 within 24 hours of applying the repair material.

Use water meeting the requirements of Subsection 712-2.01 for removal operations.

501-3.17 CRACK EVALUATION. The Engineer will evaluate concrete that is cracked during execution of the Contract. Measure cracks at their widest point.

For concrete decks and approach slabs, allow the Engineer to inspect any surface cracking immediately after termination of concrete curing operations, before prestressing (if applicable), and before releasing falsework. If any 500 square foot portion of the concrete deck or approach slab has cracks, whose width exceeds 0.020 inches and combined lengths total more than 16 feet, treat the surface by performing low-viscosity resin crack repair.

For other concrete, cracks will be evaluated based on the crack width.

1. For crack widths equal to and greater than 0.060 inches, the concrete will be considered unacceptable.
2. For cracks widths equal to and greater than 0.013 inches but less than 0.060 inches, the Engineer will evaluate the cracked concrete for structural adequacy and durability. If the Engineer determines the crack may affect structural adequacy or durability, the Engineer may reject the concrete, the structure, or a portion of the structure. If the Engineer determines the cracked concrete is acceptable, repair the crack by performing low-pressure crack repair according to 501-3.18.
3. For cracks widths less than 0.013 inches wide, the crack will be considered acceptable with no additional evaluation or repairs required.

501-3.18 CRACK REPAIR. Perform crack repairs and replace unacceptable concrete at no cost to the Department. No contract time extension will be given for repairing, removing, and replacing unacceptable material.

1. Low-Pressure Crack Repair. Repair cracked concrete according to the following requirements:
 - a. Crack Repair Plan. Submit a crack repair plan to the Engineer. Do not repair the crack until the Engineer has approved the crack repair plan. Include the following in the crack repair plan:
 - (1) Experience of the injection equipment technicians
 - (2) Evaluation of the crack width and the recommended epoxy viscosity allowing the epoxy to achieve and maintain the penetration requirements
 - (3) Material information including manufacturer's product data sheets
 - (4) Equipment
 - (5) Crack preparation, injection procedures, and injection sequence
 - (6) Cleanup procedures
 - b. Experience. Provide epoxy injection technicians who have a minimum of 2 years experience in performing repairs using the methods and materials of the selected system.
 - c. Materials. Use epoxy adhesive for crack sealing meeting the requirements of Subsection 501-2.01.5 and capable of containing the crack injection epoxy. Use epoxy adhesive for crack injection meeting the requirements of Subsection 501-2.01.5 and of viscosity capable of filling at least 90 percent of the crack volume.
 - d. Equipment. Use positive displacement plural component pumps, specifically designed to meter, mix, and to inject epoxy, and capable of filling at least 90 percent of the crack volume.
 - e. Surface and Crack Preparation. Remove contaminants and other foreign material reducing the effectiveness of the surface seal and repaired crack. Allow adequate time for drying. If cleaning solutions are used, perform trial tests to verify the contaminants can be removed. Prepare the surface and crack according to the epoxy manufacturer's instructions.
 - f. Entry and Venting Ports. Install entry/venting ports spaced equal to the thickness of the concrete member along one face of the crack. Acceptable types of entry/venting ports are fittings inserted into drilled holes, bonded flush fittings, and gasket devices covering unsealed portions of interrupted seals, allowing injection of epoxy directly into the crack without leaking epoxy.

- g. Mixing Epoxy for Crack Sealing. Mix the epoxy adhesive for crack sealing to the volume ratio prescribed by the manufacturer.
- h. Surface Sealing. Seal the surface of the crack with epoxy adhesive for crack sealing.
- i. Mixing Epoxy for Crack Injection. Mix the epoxy adhesive for crack injection to the volume ratio prescribed by the manufacturer.
- j. Epoxy Injection. Assure the crack seal is cured and capable of containing the crack injection epoxy. Inject the epoxy according to the epoxy manufacturer's instructions. Do not inject epoxy until the air, substrate, and epoxy are within the manufacturer's application temperature range. Limit injection pressure to prevent propagation of the crack, prevent additional damage, and injection pressure in excess of 50 psi.

Inject the epoxy in the sequence noted in the approved crack repair plan. Ensure at least 90 percent of the crack volume is filled.

Maintain the epoxy temperature within the manufacturer's application temperature range during injection operations and until the epoxy is cured.

- k. Finishing and Cleanup. After the injected epoxy is cured, remove ports and surface seal flush with the concrete surface. Do not damage the injected epoxy and do not heat the surface seal to aid in removal.

- 2. Low-Viscosity Resin Crack Repair. When concrete deck or approach slab crack repair is required, the Engineer will define the repair area with the following boundary limits:

- a. Beginning and ending on straight lines perpendicular to the direction of traffic and extending across the entire width of the concrete deck or approach slab, between the concrete barriers or curbs.
- b. Beginning and ending at least 5 feet beyond the furthest opposing cracks, measured from where the crack widths exceeds 0.020 inches

If grinding is required, treat the concrete before grinding.

Before treatment, ensure the concrete surface is clean, sound and free of foreign materials that may reduce the effectiveness of the repaired cracks. If the concrete surface becomes contaminated before placing the resin, repeat the cleaning process.

Apply low-viscosity resin to the repair area. Protect barriers, railing, joints, and drainage facilities to prevent contamination by the treatment material.

Completely cover the deck surface with resin so the resin penetrates and fills cracks. Ensure the relative humidity is less than 80 percent, the prepared area is dry, and the surface temperature is at least 50°F and not more than 90°F when the resin is applied. Apply the resin and distribute excess material within the manufacturer's listed pot life. For textured surfaces, including grooved surfaces, remove excess material from the texture indentations.

For concrete decks and approach slabs not receiving a waterproofing membrane, apply aggregate for abrasive finish within 20 minutes of resin application and before setting occurs. Broadcast the aggregate for abrasive finish evenly over the entire treated area at a rate of 1.5 to 2.5 pounds per square yard.

501-3.19 CLEANUP. Remove concrete splatter, paint marks, laitance, rust staining, chamfer strips, and other material not providing a uniform texture and color to the concrete surface.

SECTION 502

PRESTRESSING CONCRETE

502-1.01 DESCRIPTION. Furnish, place, and tension prestressing steel for pretensioning precast concrete or post-tensioning cast-in-place concrete.

502-2.01 MATERIALS. Use materials that conform to the following:

Concrete	Section 501
Reinforcing steel	Section 503
Portland Cement	Section 701
Grout	Section 701
Prestressing Steel and Fittings	Section 721
Corrosion inhibitor	Federal Specification MIL-P-3420F-87
Approved Ducts	<i>AASHTO LRFD Bridge Design Specifications</i>

Expanded polyethylene material: Closed-cell expanded polyethylene planks with a density of 2.2 (± 0.2) lb/ft³ as determined by ASTM C 271. Use planks that have a maximum compressive deflection of 50% at 15 (± 3) psi, and that do not retain a compression set of more than 15% of the plank thickness after maintaining 50% compression deflection for 22 hours with a following 24-hour recovery period, as determined by ASTM D 1056. Use planks that have a maximum water absorption by weight of 10% as determined by ASTM C 272.

CONSTRUCTION REQUIREMENTS

502-3.01 PRESTRESSING METHODS. Select a prestressing method that provides the magnitude and distribution of prestressing force and ultimate strength without exceeding allowable temporary stresses, subject to the requirements in this specification.

Perform the prestressing by either pretensioning or post-tensioning methods, or a combination of the two methods.

1. Submittals.

- a. Working Drawings. Before casting members to be prestressed, submit for approval working drawings including complete details and substantiating calculations of the method, materials, and equipment proposed for use in the prestressing operations, any additions or rearrangement of reinforcing steel, and any revision in concrete dimensions.

Include an outline of the method and sequence of stressing, complete specifications and details of the prestressing steel and anchoring devices to be used, anchoring stresses, strand release sequence, type of enclosures, and other data pertaining to the prestressing operations, including the proposed arrangement of the prestressing units in the members. Include conformance test data for the post-tensioning system, conforming with Subsection 721-2.05.

Compute the anticipated camber at the time of prestressing force transfer and at other significant times. Show the values on the shop drawings as a time/deflection curve, subject to approval.

Include on working drawings embedded items such as the post-tensioning ducts, vents, anchorage reinforcement and hardware, reinforcing steel, anchor bolts, earthquake restrainers, deck joint seal assemblies, drainage systems, utility conduits and other such items. Ensure there will be no conflict between the planned positions of any embedded items and that concrete cover will be adequate.

- b. Quality Control Program. Submit for approval a quality control program that verifies that all materials and workmanship incorporated into the precast prestressed concrete members conform with the requirements.

502-3.02 FABRICATION.

1. General. Place reinforcing steel according to the requirements of Section 503. Produce and place concrete for prestressed concrete structural members according to the requirements of Section 501. Both are subject to the modifications and amendments contained in this specification.

Before depositing concrete in the forms, obtain an inspection and approval of the placement of the reinforcing, enclosures, anchorages, and prestressing steel.

Provide a technician, skilled in the prestressing method, to aid and instruct in using the prestressing equipment and in installing the materials to obtain required results.

2. Placing Ducts, Prestressing Steel, and Anchorage Hardware. Rigidly support ducts in the forms by ties, supplementary support bars, and hold-down ties to prevent displacement during concrete placement and to maintain proper alignment of the duct.

Couple joints between sections of duct with positive connections that do not result in angle changes at the joints and that will prevent the intrusion of cement paste.

Vent all ducts for continuous structures at the high points of the duct profile, except where the curvature is small. Install drains at low point in ducts.

Remove the ends of vents and drains 1 inch below the surface of the concrete after grouting is completed. Fill the void with mortar.

Install prestressing steel accurately in the forms and hold in place by the stressing jack or temporary anchors and, when tendons are to be draped, by hold-down devices.

Set and hold anchorage devices or block-out templates for anchorages with their axes parallel to the axis of the tendon, and anchor plates perpendicular to the tendon.

Ensure prestressing steel installed in members or ducts, but not grouted within 10 days, is continuously protected against rust or other corrosion by means of a corrosion inhibitor placed in the ducts or directly applied to the steel. Protect the prestressing steel until grouted or encased in concrete.

Seal the openings at the ends of the ducts to prevent entry of moisture after tendons are placed in ducts. Install steel for post-tensioning until after steam curing is completed.

3. Tensioning. Tension prestressing steel using hydraulic jacks to produce the forces on the approved working drawing with appropriate allowances for all losses. For post-tensioned work, the losses must also include the anchor set loss appropriate for the anchorage system employed.

You may use the following formula to estimate the stress losses due to friction between the duct and prestressing steel:

$$T_o = T_x e^{(KL+ua)}$$

Where: T_o = Steel stress at jacking end

T_x = Steel stress at any point x

e = Base of Napierian logarithms

u = Friction curvature coefficient

a = Total angular change of prestressing steel profile in radians from jacking end to point x

L = Length of prestressing steel element from jacking end to point x

K = Friction wobble coefficient per foot of prestressing steel

Values of K and u to be applied in the preceding formula are listed in Table 502-1.

TABLE 502-1

Type of Steel	Type of Duct	K	u
Wire cables	Bright metal sheathing	0.0020	0.30
	Galvanized metal sheathing	0.0015	0.25
	Greased or asphalt- coated and wrapped	0.0020	0.30
	Direct contact with concrete	0.0015	0.45
High-strength bars	Bright metal sheathing	0.0003	0.20
	Galvanized metal sheathing	0.0002	0.15
	Direct contact with concrete	0.0005	0.40
Galvanized strand	Bright metal sheathing	0.0015	0.25
	Galvanized metal sheathing	0.0010	0.20
	Direct contact with concrete	0.0015	0.50

Use jacks equipped with pressure gauges or other devices for measuring jacking force. Calibrate all devices, whether hydraulic jack gauges or otherwise. If necessary, recalibrate the devices to permit the stress in the prestressing steel to be computed at all times. Include a certified calibration curve with each device.

Ensure that the tension load indicated by the gauge(s) is within 5% of the calculated tension load based on elongation measurements for each tendon.

Limit the strand stress in pretensioned members before seating (jacking stress) to 80 percent of the minimum ultimate tensile strength ($0.80 f'_s$) of the prestressing steel.

Limit the standard stress in post-tensioned members prior to seating (jacking stress) and the stress in the steel immediately after seating to the values allowed in *AASHTO LRFD Bridge Design Specifications*.

Apply or transfer prestressing forces to the concrete after the concrete has attained the strength specified for initial stressing.

Provide a record of gauge pressures and tendon elongations for each tendon for review.

Determine the stress in tendons during tensioning by the gauge or load cell readings and verify with the measured elongations using the modulus of elasticity, based on nominal area, as furnished by the manufacturer for the lot of steel being tensioned, or as determined by a bench test of strands used in the work.

Use a dynamometer or other approved method to measure the initial force so that its amount can be used as a check against elongation computed and measured. Mark each strand prior to final stressing to permit measurement of elongation and to ensure all anchor wedges set properly.

a. Pretensioning. Stress strands by either single strand stressing or multiple strand stressing.

Bring all strands to be stressed in a group (multiple strand stressing) to a uniform initial tension, prior to being given their full pretensioning, that is within the range specified and sufficient to eliminate all slack and equalize the stresses in the tendons.

Use approved low-friction devices at all points of change in slope of tendon trajectory when tensioning draped pretensioned strands, regardless of the tensioning method used.

Tension draped strand from both ends of the bed if the load, as determined by elongation measurements, is more than 5 percent less than that indicated by the jack gages. Ensure the computed load from the sum of elongation at both ends is within 5 percent of that indicated by the jack gages.

Permit only one splice per strand when using single strand jacking. Splice all strands or splice no more than 10 percent of the strands when multistrand jacking is used. Splice strands with similar physical properties, from the same source, and with the same "twist" or "lay." Locate all splices outside of the prestressed units.

Keep the temperature of the strands during tensioning and concrete placement within 25 °F of the concrete temperature. During the interval between tensioning and concrete placement, do not let a temperature drop increase the stress level in the strands more than 0.05 GUTS (guaranteed ultimate tensile strength), nor cause the stress in the strand to exceed 0.75 GUTS.

Cut all pretensioned-prestressing strands flush with the end of the member. Cut or release the elements in an order that minimizes the lateral eccentricity of the pre-stress. Clean and paint the exposed ends of the strand and a 1-inch strip of adjoining concrete.

b. Post-Tensioning. Stress all strands in each tendon simultaneously with a multi-strand jack, except for those in flat ducts with not more than four strands. Tension tendons in continuous post-tensioned members by jacking at each end of the tendon. Provide the prestressing steel with permanent protection and bond to the concrete by completely filling the void space between the duct and the tendon with grout.

4. Grouting. Flush ducts with concrete walls (cored ducts) to ensure that the concrete is thoroughly wetted. Remove water from ducts with oil-free compressed air.

Add water to the mixer first, followed by Portland cement and admixture, or as required by the admixture manufacturer. Mix to obtain a uniform, thoroughly blended grout, without excessive temperature increase or loss of expansive properties of the admixture. Agitate grout continuously until it is pumped. Limit the water content to the minimum necessary for proper placement, and when Type I or II cement is used, to a water-cement ratio of 0.45.

Open all grout and high-point vent openings when grouting starts. Allow grout to flow from the vent nearest the inlet pipe until any residual flushing water or entrapped air has been removed. Cap or otherwise close the vent.

Inject grout at any vent that has been, or is ready to be, capped if the grouting pressure exceeds the maximum recommended pumping pressure to maintain a one-way flow of grout.

Pump grout through the duct and continuously waste at the outlet pipe until no visible slugs of water or air are ejected and the efflux time of the ejected grout, as measured by a flow cone test, if used, is not less than that of the injected grout. Close the outlet and build the pumping pressure to a minimum of 75 psi before the inlet vent is closed.

Ensure the temperature of the concrete is 35 °F or higher from the time of grouting until job-cured 2-inch cubes of grout reach a minimum compressive strength of 800 psi. Ensure the temperature of the grout is below 90 °F during mixing or pumping.

5. **Camber.** Camber is the upward deflection which occurs in prestressed concrete flexural members due to the combination of stressing forces and dead load. It does not include dimensional inaccuracies from manufacturing errors.

Form girders so the roadway surface conforms to the indicated grade line with an allowance for 1/2 inch of positive camber at midspan. Form girders to adjust for the predicted long-term camber from loss of prestress and from dead load deflection. When estimating this adjustment, assume that future paving will be applied 3 years after erection.

Control the concrete properties and the placing, curing, curing times, tensioning procedures, and the storage of precast prestressed beam sections. Control these elements so that the shape and amplitude of the deflection curves for all girders will be within specified tolerances and as nearly alike as possible.

Measure camber with the girder supported at bearing points only. When it is impractical to support the girder on its bearing points, you may use alternative support points. Obtain approval of the alternative supports and submit calculations of the effects of the supports on girder camber. Measure actual camber during prestressing force transfer and compare it with computed values and tolerance.

502-3.03 TOLERANCES. Precast prestressed concrete members must conform to the following dimensional tolerances:

1. Length: $\pm 3/4$ inch (± 1 inch for girders longer than 100 feet).
2. Girder Width (overall): $\pm 1/4$ inch, subject to item 11 below.
3. Depth: $\pm 1/4$ inch.
4. Width of Webs, Stems, and Bottom Flanges: $-1/8$ inch to $+3/8$ inch.
5. Flange Thickness: $+1/4$ inch, $-1/8$ inch.
6. Horizontal Alignment (deviation from straight line parallel to centerline of member): $1/2$ inch, subject to item 11 below.
7. Camber: Do not vary from approved camber more than $\pm 1/8$ inch per 10 feet of length with a maximum of 1 inch. In addition, the camber of any girder may not differ from that of any other girder by more than 1 inch.
8. Position of Tendons: $\pm 1/4$ inch ($\pm 1/2$ inch where harped strands exit the member).
9. Longitudinal Position of Deflection Point for Deflected Strands: ± 12 inches.
10. Position of Weld Plates: ± 1 inch measured along joint. $\pm 1/8$ inch transverse to joint.
11. Deck Width (measured out-to-out of all girders in the span): $+2$ inches, except not more than $+1/2$ inch where more precision is dictated by substructure details such as anchor bolts, parallel wing walls, etc.

12. Parallelism of Top and Bottom Flanges: Do not vary the depth of any deck type girder at any transverse cross section more than 1/4 inch, when measured perpendicular from a line coincident with the surface of the bottom flange(s) to the deck surface at the edges of the girder.

SECTION 503

REINFORCING STEEL

503-1.01 DESCRIPTION. Furnish and place reinforcing steel according to the Plans.

503-2.01 MATERIALS.

Reinforcing Steel

Subsection 709-2.01

Substitute different reinforcing bars only when authorized. Ensure substitute bars have an area equivalent to the design area, or larger, and meet *AASHTO LRFD Bridge Design Specifications*.

CONSTRUCTION REQUIREMENTS

503-3.01 BAR LIST. When the Contract documents include bar lists and/or bending schedules, verify the quantity, size, and shape of all bar reinforcement against the structure drawings and make any corrections before ordering.

Where bar lists and bending schedules do not appear on the Plans, furnish order lists and bending diagrams for approval according to Subsection 105-1.02. Despite approval of the order lists and bending diagrams, be responsible for their accuracy. Bear any expenses for revising material furnished according to lists and diagrams to make the material comply with the design drawings.

503-3.02 PROTECTION OF MATERIALS. Protect reinforcing steel from damage at all times. Before placing it in the work, ensure that the reinforcing steel is free of dirt, loose rust or scale, paint, oil, or other foreign substance.

Handle epoxy-coated bars using systems with padded contact areas for the bars, wherever possible. Use padded bundling bands. Lift bundles with a strongback, multiple supports, or a platform bridge to prevent bar-to-bar abrasion from sags in the bar bundle. Do not drop or drag the bars or bundles. Protect epoxy-coated bars from sunlight, salt spray, and weather exposure.

503-3.03 BENDING. Cut and bend reinforcing bars to the shapes shown in the Contract documents. Reinforcing steel dimensions shown are out-to-out of bar, unless otherwise noted. Meet fabrication tolerances in ACI 315, *Detailing Manual*. Bend bars when they are cold. Do not field bend bars that are partially embedded in concrete except as shown on the Plans. If the Engineer approves applying heat for field bending reinforcing bars, take precautions to avoid materially altering the physical properties of the steel. Use hooks and bends that conform to the current *CRSI Manual of Standard Practice*.

503-3.04 PLACING AND FASTENING. Place reinforcing bars as shown on the Plans and securely hold them in position during concrete placing and setting. Tie the bars with No. 14 or No. 16 steel wire. Tie the bars at all intersections around the perimeter of each mat. Elsewhere, tie the bars at not less than 2-foot centers or at every intersection, whichever is greater. Obtain written authorization before welding reinforcing steel.

Maintain distances from the forms using approved precast mortar blocks, metal or plastic chairs, spacers, metal hangers, or supporting wire strong enough to resist movement under construction loads. Use stainless steel metal supports if they extend to the surface of the concrete, or protect them with a plastic coating to prevent corrosion. Do not use wooden supports. Space supports under deck slab reinforcement not more than 4 feet apart in each direction.

Use coated hardware or plastic supports to support and fasten epoxy-coated reinforcing steel. Use hardware coated with plastic, epoxy, or similar material.

As the work progresses, do not place bars on layers of fresh concrete or adjust bars while placing concrete. Securely fasten dowels in position before placing the concrete that will contain the dowels into the form. You may place curb or sidewalk dowels after the deck concrete has received the preliminary finish.

Cover reinforcing steel, other than stirrups or spacers, with 2 inches of concrete, measured from the surface of the concrete to the outside of the bar, unless otherwise shown. Embed stirrups and spacers at least 1 inch clear, except when exposed to earth. The minimum embedment is 1-1/2 inches.

Repair detectable coating damage on epoxy-coated reinforcing steel using patching material that is comparable to the coating material and inert in concrete. Apply according to the patching material manufacturer's recommendation.

503-3.05 SPLICING. Furnish all reinforcement in the full lengths specified. Obtain the Engineer's written approval before splicing, except for splices shown on the Plans and splices for No. 16 or smaller bars. Stagger splices as far as possible.

1. Lap Splice. Lap bars to be spliced at least 50 bar diameters, unless otherwise shown on the Plans. If bars are near the top of the beams and girders and have more than 12 inches of fresh concrete below them, lap them at least 70 bar diameters.
2. Welded Splice. Use welded splices only where shown on the Plans or authorized in writing. Apply radiographic testing to all welded splices. Meet ANSI/AWS D1.4.
3. Mechanical Splice. Use mechanical splices only where shown on the Plans or authorized in writing. Ensure that such mechanical splices develop at least 1.5 times the specified yield strength of the spliced bar. The Engineer may randomly sample and test mechanical splices.

SECTION 504

STEEL STRUCTURES

504-1.01 DESCRIPTION. Construct steel structures and the structural metal portions of composite structures according to the Plans.

Furnish, fabricate, erect, and coat structural metals shown on the Plans, including structural steel of all grades, bolts and fasteners, stud shear connectors, welding, special and alloy steels, metallic electrodes, steel forgings and castings, and iron castings. Furnish, fabricate, and install incidental metal construction and elastomeric material not otherwise provided for, according to the Contract.

504-2.01 MATERIALS. Use materials that conform to the following:

Paint	Subsection 708-2.01
Structural Steel	Section 716
Arc Welding Electrodes	Section 716
Bolts	Section 716
Steel Grid Floors	Section 716
Steel Pipe	Section 716
Galvanized Metal	Section 716
Steel Forgings	Section 718
Steel Pins & Rollers	Section 718
Castings	Section 719
Elastomeric Pads	Section 720

With written approval, substitute a grade of steel, for that specified, for a particular application where it is desired. Substituted steel must be equal or superior in both physical and chemical properties.

504-2.02 TEFLON COATED BEARINGS. When shown on the Plans, furnish bearings with a 3/32 inch thick pad of filled Poly Tetrafluoroethylene (TFE), bonded to the sliding surfaces of the sliding plates, by the manufacturer.

Use a TFE pad meeting the following requirements:

TFE PAD REQUIREMENTS

Tensile Strength, minimum	2000 psi
Tensile Elongation, minimum	200%
Hardness	55-65 Shore D
Coefficient of Friction (TFE against Stainless Steel), maximum	0.08 (for loads greater than 1000 psi and speeds less than 1 inch/min.)
Compressive Strength (0.2% offset), minimum	1800 psi
Shear Strength (between TFE and steel plate), minimum	100 psi

CONSTRUCTION REQUIREMENTS

504-3.01 FABRICATION.

1. Shop Inspection. Furnish 30 days notice of when work will begin at the fabrication shop to allow for an inspection.

Furnish 4 signed copies of mill reports covering all steel used on the project.

2. General. Fabricate steel main members subject to tensile stress and fracture critical members, except for rolled shapes, at a plant certified under the American Institute of Steel Construction (AISC) Quality Certification Program as “Major Steel Bridge,” with endorsement “F.”

Provide workmanship and finish that equal the best general practice in modern bridge shops. Neatly finish portions of the work exposed to view. Carefully and accurately perform shearing, flame cutting, and chipping.

Store plain or fabricated structural material at the fabricating shop above the ground on platforms, skids, or other supports. Keep it free from dirt, grease, or other foreign matter. Protect it from corrosion.

Ensure that rolled material is straight before being laid off or worked. If straightening is necessary, use methods that will not injure the metal. Do not use material with sharp kinks or bends.

Steel or wrought iron may be flame cut provided a mechanical guide is used to secure a smooth surface. Flame cut by hand only where approved, and smooth the surface by planing, chipping, or grinding. Manipulate the cutting flame to avoid cutting beyond the prescribed lines. Fillet re-entrant cuts to a radius of at least 3/4 inch.

Ensure that finished members are true to line and free from twists, bends, and open joints.

Plane sheared edges of plates more than 5/8 inch thick and carrying calculated stresses to a depth of 1/4 inch deep. Fillet re-entrant cuts before cutting.

Make sure the surface finish of bearing and base plates and other bearing surfaces that will contact each other or concrete meets the surface roughness requirements as defined in ANSI/ASME B-46.1, surface roughness, waviness and lay, Part I:

Steel slabs	ANSI 2,000
Heavy plates in contact in shoes to be welded	ANSI 1,000
Milled ends of compression members, stiffeners, and fillers	ANSI 500
Bridge rollers and rockers	ANSI 250
Pins and pin rockers	ANSI 125
Slide bearings	ANSI 125

Face and bring to an even bearing abutting joints in compression members and girder flanges, and in tension members where specified on the drawings. Where joints are not faced, keep the opening at 1/4 inch or less.

Build floor beams, stringers, and girders with end construction angles to the exact length shown on the Plans, as measured between the heels of the connection angles. The permissible tolerance is plus 0 inch to minus 1/16 inch. Where continuity is required, face end connections.

Cold bend load-carrying rolled-steel plates as follows:

Take the rolled-steel plates from the stock plates so that the bendline is at right angles to the direction of rolling.

Bend until the radius of the bends, measured to the concave face of the metal, is not less, and preferably more, than shown in the following table, where T is the thickness of the plate.

Angle Through Which Plate is Bent	Minimum Radius
61-90 degrees	1.0 T
91-120 degrees	1.5 T
121-150 degrees	2.0 T

If a shorter radius is essential, bend the plates when hot, but not shorter than a radius of 1.0 T.

Before bending, round the edges of the plate to a radius of 1/16 inch throughout the portion of the plate to be bent.

Fit up and attach end and intermediate stiffeners as shown on the Plans. Do not weld ends of stiffeners and other attachments to flanges unless shown on the Plans.

Where called for on the Plans, stress relieve welded members according to the requirements of the AWS specifications.

3. Shop Splices. In addition to those shown on the Plans, girder webs and flanges may contain a maximum of 2 shop splices per plate per span. Indicate all splices on the shop drawings. These splices are subject to approval and are subject to the following limitations:

Make splices complete penetration butt welds. Grind flange splices flush. Grind web splices flush on the outside face of exterior girders only. Grind parallel to the longitudinal axis of the girder.

Do not place a bottom flange splice within the middle third of any span. Use tension flange splices only as shown on the Plans or as approved.

Completely weld each element of a girder, such as flange or web, before attaching it to another element.

Make all splices at least 6 inches from the nearest stiffener plate. Offset web and flange splices at least 6 inches.

4. Pins and Rollers. Turn pins and rollers to the dimensions shown on the drawings. Keep them straight, smooth, and free from flaws.

In pins larger than 9 inches in diameter, bore a hole at least 2 inches in diameter full length along the axis. Bore the hole after the forging has cooled to a temperature below the critical range and before it is annealed. Bore under conditions that prevent injury from too rapid cooling.

Bore pin holes true to the specified diameter, smooth and straight, at right angles with the axis of the member, and parallel with each other. Finish cut the final surface.

Do not vary the distance outside to outside of holes in tension members and inside to inside of holes in compression members more than 1/32 inch from that specified. Bore the holes in built-up members after completing the assembly.

The diameter of the pin hole must not exceed that of the pin by more than 1/50 inch, for pins 5 inches or less in diameter, or 1/32 inch for larger pins.

Furnish 2 pilot nuts and 2 driving nuts for each size of pin.

5. **Bolt Holes.** Either drill or punch bolt holes. Make finished bolt holes 1/16 inch larger than the nominal diameter of the bolt. Ensure holes are clean cut and without burrs or ragged edges. Material with poorly matched holes will be rejected.

When material forming parts of a member is composed of not more than 5 thicknesses of metal, and whenever the thickness of the metal is not greater than 3/4 inch for structural carbon steel or 5/8 inch for alloy steel, either punch or drill the holes to full size.

When there are more than 5 thicknesses or when any of the main material is thicker than 3/4 inch in carbon steel, or 5/8 inch in alloy steel, or when required under paragraph 5 below, subpunch or subdrill the holes 3/16 inch smaller. After assembling, ream them to size or drill them from the solid to full size.

For punched holes, the diameter of the die must not exceed the diameter of the punch by more than 1/16 inch. Ream any holes that must be enlarged to admit bolts.

Ream holes cylindrical and perpendicular to the member. Direct reamers mechanically, where practicable.

Ream and drill using twist drills. Assemble connecting parts requiring reamed or drilled holes and securely hold them while reaming or drilling them. Match mark them before disassembling.

Subpunch (or subdrill if required) holes for field connections and field splices of main truss or arch members, continuous beams, towers (each face), bents, plate girders, and rigid frames while assembled in the shop according to paragraph 9 of this Subsection. Obtain approval of the assembly, including camber, alignment, and accuracy of holes and milled joints before beginning reaming.

Subpunch and ream holes for floor beam and stringer field end connections to a steel template, or ream them while assembled. When partial assembly is permitted, as provided in paragraph 9 of this Subsection, ream holes for web member connections to steel templates.

When using templates to ream field connections of web members of a truss, arch, bent or tower, mill or scribe at least one end of each web member normal to the long axis of the member. Accurately set the templates at both ends from this milled or scribed end. Accurately set and locate templates for reaming gussets of a truss before reaming or drilling them to their true geometric dimensions, as shown on the shop plans.

Ream or drill the full size of the field connection through templates after carefully locating the templates as to position and angle and firmly bolting them. Use exact duplicate templates used to ream matching members or the opposite faces of one member. Accurately locate templates for connections that duplicate so that like members are duplicates and require no matchmarking.

Accurately punch holes full-size, subpunch them, or subdrill them so that after assembling (before reaming), a cylindrical pin 1/8 inch smaller in diameter than the nominal size of the punched hole may be entered perpendicular to the face of the member, without drifting, in at least 75% of the contiguous holes in the same plane. If the requirement is not fulfilled, the badly punched pieces will be rejected. If any hole will not pass a pin 3/16 inch smaller in diameter than the nominal size of the punched hole, the material will be rejected.

Ream or drill holes so that 85% of the holes in any contiguous group after being reamed or drilled show no offset greater than 1/32 inch between adjacent thicknesses of metal.

Provide in steel templates hardened steel bushings in holes accurately dimensioned from the center lines of the connection as inscribed on the template. Use the center lines to locate accurately the template from the milled or scribed ends of the members.

6. Shop Assembling. Except as modified below, assemble in the shop each main truss, arch member, continuous beam, tower (each face), bent plate girder, and rigid frame. Make milled ends of compression members in full bearing before starting reaming. Completely shop assemble an entire structure, including floor system, when indicated on the Plans or in the Special Provisions. When the Plans or Special Provisions indicate "partial assembly," assemble trusses, continuous beams, plate girders, and open spandrel arches in lengths of 3 or more abutting panels. The assembled length must be at least 150 feet.

Clean metal surfaces in contact before assembling them. Assemble, pin well, and firmly draw together the parts of a member with bolts before beginning reaming. Take apart assembled pieces, if necessary, to remove burrs and shavings produced by reaming. Keep the members free of twists, bends, and other deformities.

To prepare to shop bolt material punched full-size, spear-ream the bolt holes, if necessary, to admit the bolts. Make the reamed holes no more than 1/16 inch larger than the nominal diameter of the bolts.

Secure end connection angles, stiffeners, and similar parts using shipping bolts to prevent damage in shipment and handling.

Furnish a camber diagram showing the camber at each panel for each truss. Take the camber from actual measurement while the truss is assembled, or base it on calculated values when full assembly is not required.

Allow holes to drift during assembly only as needed to position the parts, and not enough to enlarge the holes or distort the metal. To enlarge holes to admit the bolts, ream them.

Match mark connecting parts assembled in the shop to allow for reaming holes in field connections. Furnish to the Engineer a diagram showing the marks.

7. Bolted Connections, High-Strength Bolts. Determine bolt lengths by adding the values given in Table 504-1 to the total thickness of connected material. These values compensate for thickness of nut, bolt point, and washers. Add 5/32 inch to the grip length per each additional flat washer. Adjust the total length to the next longer 1/4 inch increment up to a 5 inch length and to the next longer 1/2 inch increment for lengths over 5 inches.

Fit bolted parts solidly together when assembling them and do not separate them by gaskets or other interposed compressible material. Place hardened washers under the turned element.

**TABLE 504-1
BOLT LENGTH DETERMINATION**

Bolt Diameter (inches)	Added Length (inches)
1/2	11/16
5/8	7/8
3/4	1
7/8	1-1/8
1	1-1/4
1-1/8	1-1/2
1-1/4	1-5/8

Keep assembled joint surfaces, including those adjacent to washers, free of scale except tight mill scale. Clean off dirt, loose rust, burrs, and other defects that would prevent the parts from seating. Keep contact surfaces free of oil, paint, or lacquer.

When the outer face of the bolted parts has a slope of more than 1:20, use a smooth beveled washer in contact with the sloped surface.

Tighten fasteners to give at least the required minimum tension values shown in Table 504-2 when the joint is completed. Use bolts and nuts made by the same manufacturer in a connection.

**TABLE 504-2
REQUIRED BOLT TENSION**

Bolt Size (inches)	Required Minimum Tension (pounds)
3/4	28,400
7/8	39,250
1	51,500

To achieve the minimum tension values shown in Table 504-2, use direct load indicating washers that conform to ASTM F 959. Demonstrate the suitability of the device by testing a representative sample of at least three devices for each diameter and grade of fastener used in the structure. Test with a calibration device capable of indicating bolt tension. Include in the test assembly flat, hardened washers, if required in the actual connection, arranged as those in the actual connection to be tensioned. Demonstrate with the calibration test that the device indicates a tension at least 5% greater than that required by Table 504-2. Follow manufacturer's installation procedures when installing bolts in the calibration device and in all connections. Be careful to properly install flat, hardened washers when using load indicating devices with bolts installed in oversized or slotted holes and when using the load indicating devices under the turned element. The load indicating device will count as one washer for the purpose of determining bolt length.

Place the load indicating device under the bolt head and turn only the nut when tightening the bolt. The device must indicate full tensioning of the bolt when the opening reaches zero.

Install bolts in all holes of the connection and bring them to a snug tight condition. Then, tighten fasteners, progressing systematically from the most rigid part (usually near the center) of the connection to the free edges, or as directed. Keep previously tightened fasteners from relaxing. Multiple systematic tightening cycles may be required.

Do not reuse high-strength bolts. Remove previously fully tightened bolts that were loosened by tightening adjacent bolts. Replace them with new bolts, nuts, and load indicating devices.

8. Welding. Perform all welding and Nondestructive Examination (NDE) as specified or shown on the Plans. Conform to the ANSI/AASHTO/AWS Bridge Welding Code D1.5 when welding new steel bridge girders, beams and stringers. Conform to the Structural Welding Code AWS D1.1 when welding all other steel structures.

At least 30 days prior to welding, submit for approval a welding plan that has been signed and stamped by a Certified Welding Inspector (CWI) responsible for Quality Control (QC) and consisting of the following documents:

- a. Quality Control personnel qualifications listing CWI number;
- b. Welding Procedure Specifications (WPS) using forms in AWS D1.1, Sample Welding Forms;
- c. Procedure Qualification Records (PQR) when applicable, using forms in AWS D1.1, Sample Welding Forms;
- d. Welder Performance Qualification Records (WPQR) using forms in AWS D1.1, Sample Welding Forms with the documentation of current welder certification;
- e. Sample daily inspection sheet; and
- f. Type and extent of NDE to be conducted, as required in the specifications.

Perform all Quality Control inspection necessary to ensure the materials and workmanship meet the requirements of the contract documents. Use a CWI for welding inspection.

Correct all deficiencies in materials and workmanship revealed by Quality Control and Quality Assurance inspections without additional compensation.

Furnish all completed Quality Control inspection documents to the Engineer and to the Quality Assurance representative designated by the State (when designated).

Meet Charpy V-notch impact test requirements as shown on the Plans and according to Sections 715 and 716; except that the impact energy values for filler metals must not be less than that of the base metals to be joined, when tested at the same temperature as the base metal.

504-3.02 ERECTION.

1. General. Provide the falsework and all tools, machinery, and appliances, including driftpins and fitting-up bolts, needed to perform the work efficiently. Erect the structural steel, remove the temporary construction, and do the work to complete the structure, as required by the Contract and according to these Plans and Specifications. Make temporary field welds to structural steel according to the procedures required by these Specifications. Steel with sharp kinks or bends will be rejected. Heat straightening of A 514 or A 517 steel will be governed by special provision when used.

Install stud shear connectors on beams, stringers, girders, diaphragms, and other surfaces that may be used as walkways. Install stud shear connectors after erecting the structural steel and placing the concrete deck forms and before placing the deck reinforcing steel.

2. Handling and Storing Materials. Store material on skids above the ground. Keep it clean and properly drained. Place girders and beams upright and shore them. Adequately support long members, such as columns and chords, on skids to prevent injury from deflection.
3. Falsework. Use falsework according to Section 512.
4. Method and Equipment. Before starting erection work, inform the Engineer of the proposed erection method and the proposed amount and character of the equipment.

Follow handling and erection procedures so as to avoid inducing critical buckling stresses in the girders.

Submit plans for approval showing the erection method. For trusses, except for simple span trusses supported throughout by falsework during erection, submit stress sheets showing the calculated stresses and deflections resulting from the planned erection sequence. Revise the truss as necessary to suit this erection method. Furnish stress sheets and deflection diagrams for any other unusual design or erection method.

The above methods and equipment are subject to the Engineer's approval. However, even with this approval, maintain responsibility for the safety of the method or equipment and complete the work according to the Plans and Specifications. Obtain approval before doing any work.

5. Straightening Bent Material. Straighten plates and angles or other shapes using methods not likely to fracture or injure the material. Heat the metal only when the Engineer permits. Do not heat to a higher temperature than what produces a "dark, cherry-red" color.

After heating, cool the metal as slowly as possible. After straightening a bend or buckle, carefully inspect the metal surface for fractures.

6. Assembling Steel. Accurately assemble the parts as shown on the Plans and follow match-marks. Handle the material carefully to avoid bending, breaking, or otherwise damaging the parts. Do not hammer if doing so will injure or distort the members. Clean bearing surfaces and surfaces to be in permanent contact before assembling the members. Unless erecting by the cantilever method, erect truss spans on blocking placed to give the trusses proper camber. Leave the blocking in place until the tension chord splices have been fully bolted and pinned and all other truss connections have been bolted. Wait to tighten the bolts in splices of butt joints of compression members and bolts in railing until the span has been swung. Fit up and tighten bolted joints as specified in Subsection 504-3.01.7.
7. Pin Connections. Furnish pilot and driving nuts for use in driving pins. Drive pins so that the members will take full bearing on them. Screw up tight and secure pin nuts as shown on the Plans.
8. Setting Shoes and Bearings. Place shoes, bearing plates, and elastomeric bearing pads set directly on concrete surfaces on properly finished bearing areas. Float the concrete surfaces on a level plane that varies no more than 1/16 inch from a straightedge placed in any direction across the area. Limit the variation of the finished surface to 1/8 inch from the elevation shown on the Plans. Set the shoes, elastomeric bearing pads, and bearing plates as shown on the Plans in exact position with full and even bearing.

Place under masonry plates grout that meets Subsection 701-2.03. Mix and place grout according to the manufacturer's written recommendations. Clean concrete areas that will contact the grout. Remove loose or foreign matter that would prevent the bond between the mortar and the concrete surfaces.

Tightly pack the grout under the masonry plates to provide full bearing. After placing, cover exposed surfaces of grout pads with a heavy thickness of burlap saturated with water for 3 days. Do not place a load on the grout until it has attained a compressive strength of 5000 psi.

Locate the anchor bolts in relation to the slotted holes in the expansion shoes to correspond with the temperature during erection. Adjust the nuts on anchor bolts at the expansion ends of spans to permit the span to move freely.

Apply epoxy adhesive, meeting AASHTO M 235, to the bottom surface of the elastomeric bearing pads before placing them. Do not move the pad until the epoxy has cured and full adhesion is achieved.

9. Attachment of Formwork. When approved, use 1-inch maximum diameter holes in steel girder webs for attaching formwork. Place holes 6 inches minimum clear distance from all horizontal or vertical welds and space them at least 4 feet center to center. Drill or subpunch and ream holes. They may be left open.

Include in the request enough detail of the formwork for determining the stresses that will be imposed on the girder.

504-3.03 PAINTING.

1. Preparing Metal Surfaces for Painting. Prepare metal surfaces according to Specification SSPC-SP 10, Near White Blast Cleaning to a profile depth of 1 to 3 mils. Use a profile comparator to ensure minimum profile depth. Do not reuse sand or flint abrasives.

Clean grit or shot of contamination before reusing it. Blow dust and grit from the surface with clean dry air. Remove weld spatter and round sharp edges to a smooth curve. To remove contamination, jet wash or scrub with a stiff brush and clear water or brush blast. Remove light rust with a steel brush or mechanical tool.

2. Schedule of Paint Coats for Metals. Unless otherwise specified, if structural steel will be exposed to weathering, shop-paint it at least 3 coats: prime coat, intermediate coat, and finish coat.

3. Painting Metal Surfaces.

- a. Time of Application. Apply 1 or more applications of prime coat. Apply the initial application within 4 hours after blast cleaning. Allow at least 30 minutes of drying time between primer applications. Before painting and after preparing the surface, remove any oil, grease, soil, dust, or foreign matter on the surface. If rusting occurs after the surface is prepared, clean the surface again.

Avoid contaminating cleaned surfaces with salts, acids, alkali, or other corrosive chemicals before applying the prime coat and between applications of the remaining coats of paint. Remove any contamination from the surface.

- b. Storage of Paint and Thinner. Store paint and thinner in a separate building or in a room that is well ventilated and free from excessive heat, sparks, flame, or direct sun rays. Keep paints susceptible to damage from freezing in a heated storage space when necessary.

Leave paint containers unopened until required for use. Use open containers first. Seal left-over, partial containers.

Do not use paint that has begun to polymerize, solidify, gel, or deteriorate.

- c. Mixing and Thinning. Mix paint thoroughly before use and agitate often during application.

Do not transfer paint mixed in the original container until all settled pigment is incorporated into the vehicle. Pouring off part of the vehicle temporarily to simplify mixing, is permitted.

Mix by mechanical methods, except use hand mixing for containers up to 5 gallons.

Do not use an air stream bubbling under the paint surface to mix paint or keep it in suspension. Remove and discard any skin that has formed in the container. Do not use the paint if the skin exceeds 2% of the paint volume.

When mixing paint, break up all lumps, completely disperse settled pigment, and create a uniform composition. If mixing by hand, pour off most of the vehicle into a clean container.

Lift the pigment in the paint from the bottom of the container using a broad, flat paddle. Break up lumps and thoroughly mix the pigment with the vehicle. Return the poured-off vehicle to the paint by simultaneously stirring or pouring repeatedly from one container to another until the composition is uniform. Inspect the bottom of the container for unmixed pigment.

Wet tinting pastes or colors with a small amount of thinner, vehicle, or paint and thoroughly mix them. Add the thinned mixture to the large container of paint and mix until the color is uniform.

If paint does not have a limited pot life, or does not deteriorate on standing, mix it at any time before use. However, if it has settled, remix it immediately before use. Do not keep paint in spray pots, painters' buckets, etc., overnight. Gather it into a container and remix it before use.

When the engineer deems it necessary to obtain satisfactory application, add paint thinner according to the manufacturer's instructions.

- d. Application of Paint. Use the oldest of each kind of paint first. Apply paint by spraying. Use brushes, daubers, or sheepskins when no other method can properly apply paint in difficult access areas. Use dipping, roller coating, or flow coating only when authorized.

Blast clean all areas with mudcracking in the zinc-rich primer and then paint them with primer to the specified thickness.

After applying the prime coat, apply the intermediate and finish coats to exposed surfaces according to the manufacturer's recommendations.

Apply the intermediate coat in 2 applications. Apply the first application as a mist coat. Apply the second application after the mist coat has dried to a set-to-touch condition.

Apply the finish coat in 1 application.

Apply paint within the environmental limitations specified by the coating manufacturer. Do not apply paint when the temperature of the steel surface is less than 40 °F or more than 125 °F.

Do not apply paint in fog or mist, when it is raining or snowing, or when the relative humidity exceeds the manufacturer's recommendations. Do not apply paint to wet or damp surfaces. Do not apply paint on frosted or ice-coated surfaces.

With approval, apply paint in damp or cold weather, and only under the following conditions. Paint the steel under cover and protect and shelter it, or heat the surrounding air and the steel to a satisfactory temperature. Meet the above temperature and humidity conditions. Keep the steel under cover or protected until it is dry or until weather conditions permit its exposure.

Allow to dry any applied paint exposed to freezing, excess humidity, rain, snow, or condensation. Then, remove damaged areas of paint, prepare the surface again, and repaint it with the same kind as the undamaged areas.

Stripe paint before applying each coat of paint. Spot paint edges, corners, crevices, rivets, bolts, welds, and sharp edges before applying the full coat of paint on the steel. Extend striping for at least 1 inch from the edge. Let this stripe coat dry before applying the full coat, if possible. Otherwise, set-to-touch the stripe coat before applying the full coat. However, do not permit the stripe coat to dry long enough to allow the unprimed steel to rust.

Apply each coat of paint as a continuous film of uniform thickness, free of pores. Repaint any thin spots or areas missed in the application. Allow them to dry before applying the next coat.

Wait until each coat of paint is in the proper state of cure or dryness before applying the next coat.

Ensure a minimum dry film thickness of 3 mils and a maximum dry film thickness of 5 mils for each coat of paint. The dry film thickness of the paint will be measured in place with a calibrated magnetic film thickness gauge. If any coat of paint is thinner than specified, obtain the minimum dry film thickness by applying additional coats of paint.

A Tooke gauge may be used to perform destructive testing of each coat's dry film thickness. Repair damaged areas.

- e. Brush Application. Brush paint areas inaccessible to a spray gun. Work paint into crevices and corners. Paint surfaces not accessible to brushes using daubers or sheepskins. Brush out runs or sags. Leave a minimum of brush marks in the applied paint.
- f. Spray Application of Paint. To apply paint by spraying, use equipment capable of properly atomizing the paint to be applied. Use equipment with pressure regulators and gauges and use air caps, nozzles, and needles recommended by the equipment manufacturer for the material being sprayed. Keep the equipment in satisfactory condition to permit proper paint application. In closed or recirculating paint spray systems, where gas is used under pressure over the liquid, use an inert gas, such as nitrogen.

Provide adequately sized traps or separators to remove oil and water from the compressed air. Drain them periodically during operations. Ensure that the air from the spray gun impinging against the surface shows no water or oil.

Keep paint ingredients properly mixed in the spray pots or containers while applying the paint. Use either continuous mechanical agitation or frequent intermittent agitation.

Adjust the pressure on the material in the pot and adjust the air pressure at the gun for optimum spraying effectiveness. Adjust the pressure on the material in the pot when changing the elevation of the gun above the pot. Keep the atomizing air pressure at the gun high enough to atomize the paint properly but not so high as to cause the paint to fog or the solvent to evaporate, or to cause loss by overspray.

Keep spray equipment clean to avoid depositing dirt, dried paint, and other foreign materials in the paint film. Remove any solvents left in the equipment before applying paint to the surface.

Apply paint in a uniform layer, overlapping at the edge of the spray pattern. During application, hold the gun perpendicular to the surface and at a distance that will deposit a wet layer of paint on the surface. Release the gun's trigger at the end of each stroke.

Apply coats free of runs, sags, and dry spray.

- g. Shop Painting. Perform shop painting after fabrication and before the surface is damaged from weather or other exposure.

Do not paint shop contact surfaces. Paint surfaces to be in contact after field erection.

Apply only a mist coat (0.5 to 0.8 mil dry film thickness) of inorganic zinc-rich primer, meeting SSPC Paint Specification No. 30, Weld-Through Inorganic Zinc Primer, Class 5, on the following surfaces:

- (1) High strength bolted connection contact surfaces
- (2) Top flange steel surfaces
- (3) Areas within 2 inches from the edges to be welded
- (4) Areas where the full 3 coats of paint will interfere with field assembly

Apply the full paint coats specified to steel surfaces that will contact wood.

Remove anti-weld spatter coatings before painting.

Before abrasive blasting, grind smooth all metal defects, fins, slivers, burrs, weld spatter, and sharp edges from shearing or similar operations, including flame hardened edges from cutting or burning.

Grind flame hardened edges to a 1/16 inch minimum radius. Repair defects that become evident after abrasive blasting or prime coat application. Retexture the surface to match the blasted profile.

Copy erection marks and weight marks on areas that have been previously painted with the shop coat.

- h. Field Painting. If steel surfaces have not received the full paint coats, paint them as soon as possible after erection.

Touch up metal that has been shop coated with the same type of paint as the shop coat. Touch up by cleaning and painting field connections, welds, bolts and all damaged or defective paint and rusted areas.

If concreting or other operations damage any paint, clean the surface and repaint it. Remove concrete spatter and drippings before applying paint.

Protect wet paint against damage from dust or other detrimental foreign matter.

- i. Drying of Painted Metal. Allow the paint to dry before recoating or exposing it. Do not add a dryer to paint on the job unless the paint specification calls for one. Do not immerse painted metal until the paint has dried. Protect paint from rain, condensation, contamination, snow, and freezing until dry.
- j. Handling of Painted Steel. Do not handle painted steel until the paint has dried except for turning it for painting or stacking it for drying. Minimize damage to paint films from stacking steel members.

Remove paint that is damaged during handling and touch it up with the same number of coats and kinds of paint previously applied.

Wait until painted steel is dry before loading it for shipment.

Repair damaged galvanized coating per AASHTO M 36, Section 11. Use inorganic zinc rich primer meeting Subsection 708-2.01.

- k. System Durability and Certification. Have the coating manufacturer review the project and the proposed service environment and issue you written recommendations and instructions to properly prepare the surface, apply the coating, and achieve maximum durability on this project.

Certify to the Department that the system was applied according to the manufacturer's recommendations and instructions. Enclose a copy of the recommendations and instructions with the certificate.

504-3.04 CLEANUP. Upon completion and before final acceptance of the structure, remove falsework and falsework piling down to 2 feet below the finished ground line.

SECTION 505

PILING

505-1.01 DESCRIPTION. Furnish and drive piles, including test piles, as specified. Assist in pile testing

Furnish piles sufficient in length to obtain the required ultimate bearing capacity and to extend to the minimum tip elevation shown on the Plans.

Drive additional test piles, make borings, or make other investigations needed to determine pile lengths required, without extra compensation.

505-2.01 MATERIALS. Use materials that conform to the following:

Concrete	Section 501
Reinforcing Steel	Section 709
Timber Piles	Section 713
Preservatives for Timber	Section 714
Steel Shell	Section 715
Steel Pipe	Section 715
Structural Steel Piles	Section 715
Sheet Piles	Section 715

CONSTRUCTION REQUIREMENTS

505-3.01 TEST PILES. When called for in the bid schedule, furnish and drive test piles at the locations designated.

Drive test piles to the specified tip elevation or bearing value, as directed, and as follows:

1. Before driving the pile, excavate the ground at the test piles to the elevation of the bottom of the footing.
2. Drive test piles using the same hammer you will use for service piles.
3. Drive required test piles before beginning any other pile driving work on the structure.

Test piles may be included as part of the completed structure if they conform to the requirements for service piles. Cut off test piles not included in the completed structure as directed.

505-3.02 LOAD TESTS. When called for on the Plans, perform pile load tests according to the Special Provisions.

505-3.03 PILE BEARING VALUES. Drive piles to the required ultimate bearing capacity. The required ultimate bearing capacity is the design pile load as indicated on the Plans multiplied by a factor of safety.

The Engineer will determine the pile driving criteria using wave equation analysis. When the wave equation is not used, drive all piles to a bearing value not less than the design load, as shown on the Plans.

When called for in the bid schedule, check bearing values using load tests as specified above. Determine the safe bearing value of each pile using the applicable dynamic formula from those listed below.

1. Gravity hammers:
$$P = \frac{2WH}{S+1}$$

2. Single-acting hammers with unrestricted rebound of ram:

$$P = \frac{2WH}{S+0.1}$$

3. Double-acting hammers with enclosed rams:

$$P = \frac{2E}{S+0.1}$$

Where: P = Safe bearing value, in pounds
W = Weight of the striking parts of the hammer, in pounds
H = Effective height or fall of the ram, in feet
S = Average penetration per blow, in inches, for the last 5 to 10 blows for gravity hammers and the last 10 to 20 blows for steam, air, or diesel hammers
E = The actual energy delivery by the hammer per blow, in foot-pounds

The above formulas are applicable only when

1. the hammer has free fall,
2. the head of the pile is square and in good condition,
3. the penetration rate is reasonably quick and uniform,
4. there is no appreciable bounce of gravity hammers after the blow, and
5. a follower is not used.

If there is appreciable bounce for gravity hammers, deduct twice the height of bounce from H to determine its value in the formula.

505-3.04 JETTED PILES. Do not use jets during the test blows when determining the safe bearing values of jetted piles.

505-3.05 MINIMUM PENETRATION. Make all efforts to drive each pile to the minimum desirable tip elevation and to the desired bearing, as shown on the Plans.

505-3.06 CAST-IN-PLACE CONCRETE PILES. Build cast-in-place concrete piles to the design shown on the Plans. Drive steel shells or pipes and fill with Class A Concrete.

Use the type of steel shell or closed-end pipe and the minimum thicknesses of material shown on the Plans.

Do not allow water to freeze in cylinder-type piles.

Before placing concrete, inspect the shells for damage or distortion. Furnish a suitable light for this purpose.

Do not fill shells or pipe with concrete until all adjacent shells, pipes, or piles within a radius of 5 feet or 4.5 times the average pile diameter, whichever is greater, have been driven to the required resistance.

Place concrete as follows:

1. Remove all water and foreign material from shells and pipes.
2. Place the concrete in one continuous operation from bottom to top. Concrete may be discharged directly into the pile and permitted to free-fall into place.
3. Use interior reinforcement where shown on the Plans.
4. Vibrate the top 20 feet of concrete.
5. After filling a shell or pipe with concrete, do not drive any shell, pipe, or pile within 20 feet for at least 7 days after filling.

505-3.07 EXTENSIONS, SPLICES, AND BUILD-UPS. When necessary, make extensions, splices, and build-ups as shown on the Plans and according to the following:

1. Steel Piles. If the length of a steel pile is not sufficient to obtain the required bearing capacity, splice an additional length to it. Use additions with cross sections identical to the pile cross sections.

Make splices with complete penetration butt welds over the entire cross section. If approved, piles may be spliced using pile cut-offs and short pieces if no piece used is less than 10 feet long.

2. Shell or Pipe for Cast-in-Place Piles. If pile shell or pipe must be extended to reach desired penetration or required bearing capacity, splice additional lengths to the shell or pipe using complete penetration butt welds over the entire cross section or other splice details recommended by the manufacturer and approved.

Meet the welding requirements of Subsection 504-3.01.8.

505-3.08 TIMBER PILE BENTS. Distribute piles of various sizes within each bent to obtain uniform strength and rigidity in the bents of each structure and to avoid undue bending or distortion of the sway bracing.

Make accurate cut-offs to ensure full bearing between the caps and piles.

505-3.09 DRIVING PILES. Size the pile driving equipment to drive the piles to the required minimum depth and ultimate bearing capacity without damage. Use the approved hammer and pile cushions recommended in the hammer manufacturer's guidelines. Limit the compressive driving stresses as indicated by a wave equation analysis to 90% of the pile yield stress.

Submit a pile driving plan at least 15 days before driving piles. Include a completed Pile Driving Equipment Data (Form 25D-098) and any attachments necessary to describe all pile driving equipment and techniques to be used. The Department will base approval of the pile driving equipment on a wave equation analysis and the Engineer's recommendations. Submit changes to the approved pile driving plan on a revised Pile Driving Equipment Data form with necessary attachments. Allow at least 5 working days for the Engineer's approval.

Steel piles when placed in the leads must not exceed the camber and sweep permitted by allowable mill tolerance. Piles bent or otherwise injured will be rejected.

Drive all piles as shown on the Plans or as ordered in writing. Drive abutment piles and pier piles in footings within an allowed variation as to direction of pile of not more than 1/4 inch per foot. Position the piles at the bottom of the footing within 6 inches of the position shown on the Plans. Do not vary the distance between any 2 piles more than 6 inches from that shown on the Plans, and keep the clear distance from the edge of pile to the edge of footing to at least 9 inches. Place exposed pile bents within 1/2 inch of the plan position at cut-off elevation and within 3 inches of the plan position at the original ground line elevation. Limit the rotation of such steel piles about their longitudinal axis to 15 degrees from the plan position.

Install piles in groups starting from the center of the group and proceed outward in either direction.

Use a metal collar on every timber pile, except when the head is fitted into a steel head block. Protect the heads of the piles with caps of approved design, when needed.

Provide driving heads, mandrels, or other devices according to the manufacturer's recommendations so that the pile may be driven without damage. Use cast steel combination driving heads and pilots with suitable cushion blocks. Ensure that the driving heads closely fit the top of a steel H-pile or steel pipe pile, and cut the steel piles squarely. Provide a driving cap to hold the axis of the pile in line with the axis of the hammer.

Use full-length piles where practical. Where splices are required, follow the provisions of Subsection 505-3.07.

Use metal shoes or reinforced tips of the design shown on the Plans or as ordered in writing.

Use impact hammers or a combination of hammers to drive piles. However, with written permission, use gravity hammers to drive timber piles. The Department will consider the use of vibratory hammers when requested by the Contractor and when circumstances permit the determination of bearing capacity and required penetration by means other than a dynamic driving formula. Remove inefficient hammers from the work. Do not use followers to drive piles.

Use pile driver leads that allow the hammer to move freely. To ensure rigid lateral support to the pile during driving, hold the pile driver leads in position at the top and bottom by using guys or steel braces or by securely fastening them to the ground. Except where piles are driven through water, use leads that are long enough to avoid using a follower. The design of the leads must permit proper placing of batter piles.

If you cannot obtain the desirable penetration shown on the Plans by using the specified driving methods and equipment, or if the Engineer believes structural damage to the piling is likely to result from continuing these methods, attempt other methods (as approved in writing) to obtain penetration. These methods may include, but are not necessarily limited to:

1. Pre-boring
2. Blasting
3. Spudding
4. Jetting
5. Using a heavier or faster striking hammer

Attempt all approved methods before starting work on more than 5 piles or 50% of the piles, whichever is lesser, in any one substructure unit (such as pier or abutment), or within a 30 foot length of retaining wall.

After exhausting all practicable means to obtain the desired penetration but without success, the Engineer may consider accepting the piling at a lesser penetration if the Engineer believes the adequacy and safety of the resulting structure will not be jeopardized by such acceptance.

Obtain written approval before employing any alternative methods of pile driving or variations from the desirable tip elevation accepted.

When driving piles through new embankment and the depth of the embankment at the pile location is in excess of 5 feet, drive the pile in a hole made through the embankment. Make the hole diameter not less than the nominal size of the pile plus 6 inches. After driving the pile, fill the annular space around the pile with dry sand or pea gravel. Dispose of excess excavated material as provided in Subsection 203-3.01.

505-3.10 DEFECTIVE PILES. Use a pile driving method which does not subject the piles to excessive and undue abuse producing crushing and spalling of the concrete, injurious splitting, splintering, and brooming of the wood or deformation of the steel. Do not manipulate the piles to force them into proper position. Correct damaged or improperly driven piles by one of the following approved methods:

1. Withdraw and replace the pile with a new and, when necessary, longer pile.
2. Drive a second pile adjacent to the defective pile.
3. Splice or build up the pile as provided in Subsection 505-3.07, or extend a sufficient portion of the footing to properly imbed the pile. Do not splice timber piles without specific permission. Drive down all piles pushed up by driving adjacent piles or by any other cause.

505-3.11 CUTTING OFF PILES. Cut off the piles at the elevations indicated on the Plans. Ensure that all injured material is removed.

505-3.12 PROTECTING TREATED TIMBER PILES. Carefully handle the treated piles. Do not drop the piles, break the outer fibers, bruise the surface, or penetrate the piles with tools.

Carefully trim all cuts and abrasions in treated piles and coat with at least 3 applications of hot creosote oil and cover with hot roofing pitch. Treat all bolt holes according to AWPA standards before driving bolts. After treating the holes, plug all unfilled holes with treated plugging.

After cutting each treated pile to receive the cap, give the sawed surface 3 coats of hot creosote oil. Cover it with hot tar pitch and place 2 layers of 20 inches x 20 inches heavy canvas saturated with hot pitch over the surface. Place a 28 gage galvanized metal cover which overlaps the pile at least 6 inches in each direction. Bend the metal cover down over the edges and secure it with galvanized roofing nails.

505-3.13 COATING OF STEEL PILES AND SHELLS. Galvanize steel piles and steel pile shells from the top to a distance not less than 10 feet below the ground line. Galvanize according to AASHTO M 111 and to a thickness of 4 mils. Steel piles and pile shells that do not protrude above the final ground line do not require galvanizing.

SECTION 507

BRIDGE RAILING

507-1.01 DESCRIPTION. Construct concrete, timber, or steel bridge railing and pedestrian railing as shown on the Plans. Furnish and install bridge number plates as shown on the Plans.

507-2.01 MATERIALS. Use materials that conform to the following:

Steel Railing	Section 722
Timber Railing	Section 506
Concrete	Section 501
Reinforcing steel	Subsection 709.-2.01 (Epoxy-Coated)
Grout	Section 701-2.03

507-3.01 CONSTRUCTION REQUIREMENTS.

1. General. Construct railing to the line and grade shown on the Plans. Ensure that the rail does not reflect any unevenness of the bridge structure. Set rail posts normal to the grade. Place railing after all falsework is removed and the span is self-supporting. Do not paint bridge railing.

Furnish and install concrete curbing, associated reinforcing steel, and the approach rail transition bracket for steel bridge railing.

2. Steel. Erect steel railing in conformance with Subsection 504-3.02. Weld in conformance with Subsection 504-3.01.8. Complete welding before galvanizing the railing.
3. Timber. Fabricate and install timber railing in conformance with Section 506.
4. Concrete. Construct concrete railing to meet applicable requirements of Sections 501 and 503. Base concrete mix design on Class A. Apply a rubbed finish to exposed surfaces of concrete.

SECTION 508

WATERPROOFING MEMBRANE

508-1.01 DESCRIPTION. Furnish and install preformed waterproofing membrane on concrete bridge decks, as specified.

508-2.01 MATERIALS. Use materials that conform to the following:

Membrane Material Manufactured type single or multiple component elastomeric material from the Department's Qualified Products List.

CONSTRUCTION REQUIREMENTS

508-3.01 APPLICATION OF MEMBRANE WATERPROOFING.

1. General. Install membranes under the on-site supervision of a representative from the membrane manufacturing company and according to the manufacturer's published instructions. Achieve the following results:
 - a. Complete bond between the membrane and the concrete surface of deck and curb face
 - b. Unbroken waterproof membrane in place between the concrete deck surface and the asphalt overlay
 - c. Complete bond between the membrane and the asphalt overlay
2. Preparation of Concrete Deck. Before applying membrane:
 - a. Ensure that all concrete to receive membranes has achieved at least 80% of the 28 day ultimate strength (f'c) indicated on the Plans.
 - b. Ensure that grout in keyways between precast concrete deck components has cured at least 5 days.
 - c. Remove any contaminants such as grease, oil, or paint with solvents, detergents, or by sand blasting.
 - d. Correct any sharp concrete edges on the deck surface that may puncture the membrane.
 - e. Power sweep the deck to remove all foreign materials such as dirt, dust, moisture, and loose concrete.
 - f. Before applying the tack coat, primer, or emulsion, thoroughly clean the deck with compressed air.
3. Weather and Moisture Limitations. Apply membrane only when:
 - a. The deck is completely dry
 - b. The temperature of the deck and ambient air is above 40 °F
4. Overlying and Protection of Membrane. When overlying membrane, observe the following requirements:
 - a. Do not place the asphalt overlay until the membrane has cured enough to prevent damage from the overlying operation.
 - b. Do not operate vehicles, except the asphalt paver and trucks used for hauling the asphalt overlay mix, on the membrane.
 - c. Use only rubber-tired or rubber-tracked paving machines over the membrane.
 - d. Use only steel-wheeled rollers to compact the asphalt paving on the bridge decks.
 - e. Do not use vibratory rollers with vibrator turned on.
 - f. Place, spread, and roll the asphalt so that the membrane will not be damaged.

- g. Adhere to the manufacturer's published minimum and maximum temperature limitations for asphalt overlay material.

SECTION 511

MECHANICALLY STABILIZED EARTH (MSE) WALL

511-1.01 DESCRIPTION. Furnish and install mechanically stabilized earth wall. Construct the Mechanically Stabilized Embankment (MSE) Retaining Walls at the locations shown on the Plans and as provided in these specifications. Constructing the MSE retaining walls shall consist of precast concrete facing panels connected to a metallic strip or grid reinforcement. The MSE wall shall be an acceptable wall system as listed in RFP Part III, Section 4, Bridges and Structures.

The construction of the MSE wall system shall conform to the Release for Construction Plans, the details on the approved working drawings and to the details of the acceptable wall system.

511-2.01 MATERIALS. Meet the following:

Class A Concrete	Section 501
Precast and Cast-in-Place Concrete Panels	Section 501
Reinforcing Steel	Section 503
Structural Steel	AASHTO M 270
Pipe and Perforated Pipe	Section 706
Geotextile for Drainage	Subsection 729-2.01
Geogrid	Subsection 729-2.04
Geocomposite Drainage System	As Specified
Porous Backfill Material	Subsection 703-2.10

1. Structure Backfill and Foundation Fill. Meet Subsection 703-2.07, Selected Material, Type A. Use materials with a sodium sulfate soundness loss less than 30% after four cycles as determined by AASHTO T 104 and free of shale or other particles of low durability.

When using backfill material with 80% passing the 3/4 inch sieve, the minimum angle of internal friction on the portion of the material finer than the No. 10 sieve must be 34 degrees, as tested by AASHTO T 236.

When using steel soil reinforcement, use backfill material meeting the following electrochemical requirements:

- pH of 5 to 10 (AASHTO T 289)
- Resistivity not less than 30 ohmmeters (AASHTO T 288)
- Chlorides not greater than 100 ppm (AASHTO T 291)
- Sulfates not greater than 200 ppm (AASHTO T 290)

The IQF shall perform and report corrosion tests. Notify the IQF and the Engineer of the MSE backfill source at least 21 days before wall construction for corrosion testing of the backfill materials.

2. Wall Members. Provide facing consisting of precast concrete panels, modular units, cast-in-place concrete, or welded wire fabric, as specified.

Manufacture concrete panels with a minimum concrete compressive strength of 4,000 psi. Finish the exposed face with ordinary finish. For the face not exposed to view, provide a uniform surface finish free of open pockets of aggregate or surface distortions in excess of 1/4 inch. Locate soil reinforcement connection hardware during concrete placement to avoid contact with the panel reinforcing steel. Shop-fabricate welded wire fabric reinforcement from cold-drawn wire meeting AASHTO M 32, and the finished fabric meeting AASHTO M 55.

- a. Concrete Face Panels. Fabricate panels conforming to Section 501, with the following exceptions and additions:
- 1) Do not strip the units until the concrete reaches a minimum compressive strength of 1000 psi. Ship the units after reaching a minimum compressive strength of 3300 psi. The Engineer will not accept panels with hairline cracks in them.
 - 2) Angle Points: Changes in the wall alignment shall be accomplished using prefabricated angled corner panels or special columns of the same texture and size as the flat panels, such that a continuous panel is traversing the angle point without a break in the normal horizontal and vertical joint pattern unless directed otherwise by the Engineer. Bevel panels or field outs that disrupt the normal joint pattern and/or result in a single vertical line are not permissible.
 - 3) Marking: Clearly scribe the date of manufacture, the production lot number, and the piece mark, on the unexposed face of each panel.
 - 4) Handling, Storage and Shipping: Handle, store, and ship all panels in such a manner as to protect them from chipping, discoloration, cracks, fractures, and excessive bending stresses. Support panels in storage on firm blocking to protect the panel connection devices and the exposed exterior finish.
 - 5) Tolerances: Manufacture all panels within the following tolerances:
 - a) Panel Dimensions: Position of panel strap connection devices within 1 inch. All other dimensions within 3/16 inch.
 - b) Panel Squareness: Squareness as determined by the difference between the two diagonals, shall not exceed 1/2 inch.
 - c) Panel Surface Finish: Surface defects on smooth formed surfaces measured on a length of 5 feet shall not exceed 0.1 inch. Surface defects on the textured- finished surfaces measured over a length of 5 feet shall not exceed 3/16 inch.
 - 6) Testing:

Compressive Strength: Production lots shall determine the acceptance of concrete panels with respect to compressive strength. A single compressive strength sample will represent a production lot of a group of panels. A production lot will consist of either 10 panels or a single day's production, whichever is less.

During the production of the concrete panels, the manufacturer will randomly sample the concrete in accordance with WAQTC TM 2. A single compressive strength sample, consisting of a minimum of four cylinders, will be randomly selected for every production lot.

Perform compression tests on a standard 6 inches by 12 inches test specimen in accordance with WAQTC FOP for AASHTO T 23. Conduct compressive strength testing in accordance with AASHTO T-22.

For every compressive strength sample, cure a minimum of two cylinders in accordance with WAQTC FOP for AASHTO T-23 and test at 28 days. The average compressive strength of these cylinders, when tested in accordance with AASHTO T-22, will provide a compressive strength test result that will determine the compressive strength of the production lot.

If the compressive strength test result is greater than or equal to 4000 psi the Engineer will accept the production lot. If the compressive test result is less than 4000 psi, then the

acceptance of the production lot will be based on its meeting the following acceptance criteria in their entirety:

- a) Ninety percent of the compressive strength test results for the overall production shall exceed 4060 psi.
- b) The average of any six consecutive compressive test results shall exceed 4200 psi.
- c) No individual compressive strength test result shall fall below 3600 psi.

Air Content: Perform air content tests in accordance with WAQTC FOP for AASHTO T 152 or AASHTO T-196. Take air content samples at the beginning of each day's production and take compressive samples at the same time to insure compliance.

Slump Test: Perform the slump test in accordance with WAQTC FOP for AASHTO T-119. Determine the slump at the beginning of each day's production and take the compressive samples at the same time.

Rejection: Rejection of units shall be because of failure to meet any of the requirements specified above. In addition, any of the following defects shall be sufficient cause for rejection.

- a) Faulty casting causing defects.
- b) Defects indicating honeycombed or open texture concrete.
- c) Cracked or severely chipped panels.
- d) Unreasonable color variation on front face of panels.

Joint Materials: Bearing pads, joint filler, and joint cover materials shall be according to the MSE wall supplier's recommendations.

- b. **Concrete Leveling Pad.** The concrete leveling pad shall be cast in place Class A and conform to Section 501. The concrete for the pad shall be placed at least 24 hours prior to erecting the face panels.

3. **Soil Reinforcement.** Use approved geogrid reinforcement.

Galvanize all steel soil reinforcement and any steel connection hardware to meet AASHTO M 111. Manufacture steel strip reinforcement by hot rolling to meet ASTM A 572, Grade 450, or approved alternate.

4. **Working Drawings.** Submit all working drawings and design calculations, including:
- a. Earthwork requirements including specifications for material and compaction of backfill.
 - b. Details of revisions or additions to drainage systems or other facilities required to accommodate the system.
 - c. Existing ground elevations verified by the Contractor for each location involving construction wholly or partially in original ground.
 - d. Complete design calculations substantiating that all proposed designs satisfy the design parameters in the Contract documents.
 - e. Complete details of all elements required for the proper construction of the system, including complete material specifications.

Prohibit work on earth retaining systems for which working drawings are required until such drawings have been approved.

511-3.01 CONSTRUCTION.

1. Excavation and Backfill. Excavate and backfill earth retaining systems to meet Section 205. Replace excavated material with structure backfill material meeting Section 205. Compact the material as specified under Subsection 203-3.04.
2. Drainage. Provide outlet works at sags in the profile and at the low ends of the gutter.
 - a. Weep Holes. Place a minimum of 2 cubic feet of porous backfill material encapsulated with geotextile at each weep hole. Cover joints between retaining wall panels, which function as weep holes, with geotextile. Dry and thoroughly clean the face panels that are to receive the geotextile.
 - b. Drainage Blankets. Construct drainage blankets consisting of porous backfill material encapsulated in geotextile, collector pipes, outlet pipes, and cleanout pipes. Construct and compact the subgrade to receive the geotextile so it is free of loose or extraneous material and sharp objects that may damage the geotextile. Stretch, align, and place the fabric in a wrinkle-free manner. Overlap adjacent borders of the fabric from 12 to 18 inches. Repair torn or punctured fabric by covering the damaged area with a piece of fabric large enough to cover the damaged area and meet the overlap requirement.

Place the porous backfill material in horizontal layers and thoroughly consolidate by the same methods specified for structure backfill. Prohibit ponding or jetting of porous backfill material or structure backfill material. Maintain a minimum of 6 inches of porous backfill material, structure backfill, or embankment material between the fabric and the equipment during spreading and compaction of the porous backfill material.

Place perforated collector pipe, when required, within the porous backfill material to the flow line elevations shown. Place outlet pipes at sags in the flow line and at the low end of the collector pipe. Construct rock slope protection, when required, at the end of outlet pipes, as shown on the Plans. Place cleanout pipes at the high ends of collector pipes.

- c. Geocomposite Drainage Systems. Place and secure the geocomposite drainage material tightly against the excavated face, lagging or back of wall. Protect the drainage material against physical damage and grout leakage when concrete is to be placed against geocomposite drainage material.
3. Retaining Wall Construction. Construct mechanically stabilized earth walls consisting of a facing system to which steel or polymeric soil reinforcement is connected. Provide facing of precast concrete panels, cast-in-place concrete.

Install polymeric soil reinforcement under Section 634.

When constructing cast-in-place concrete facing, embed soil reinforcement which extends beyond the temporary facing into the facing concrete.

Form welded wire facing by bending the horizontal soil reinforcement 90 degrees upward to form the wire face. Connect the vertical portion of the welded fabric forming the face to the next upper level of soil reinforcement. Place a separate backing mat and hardware cloth immediately behind the vertical portion of soil reinforcement.

Provide a precast reinforced or cast-in-place concrete leveling pad at each panel foundation level. Place panels or wire fabric and support to achieve the final position.

Place and compact structure backfill material at the same time as placement of facing and soil reinforcement, without distortion, damage, or displacement of the facing or soil reinforcement. Backfill to an elevation approximately 1-1/4 inch above the facing connection level before placing the next level

of soil reinforcement. Roughly level the backfill material before placing the soil reinforcement. Uniformly tension all soil reinforcement to remove any slack in the connection or material.

Install joint filler, bearing pads, and joint-covering material concurrently with face panel placement.

Furnish and install instrumentation for monitoring corrosion, where specified.

4. Tolerances. Precast concrete panels shall be placed so that their final position is vertical, or battered as shown in the Plans. Handle panels for erection by means of lifting devices connected to the upper edge of the panel or as per the MSE wall suppliers recommendations. Panels shall be placed in successive horizontal lifts in the sequence shown on the working drawings as backfill placement proceeds. As backfill material is placed behind the panels, maintain the panels in a vertical position by means of temporary wedges or bracing according to the wall supplier's recommendation. For structures with precast facing panels, concrete vertical tolerances and horizontal alignment tolerances shall not exceed $\frac{3}{4}$ inch when measured with a 10 foot straight edge. During construction, the maximum allowable offset in any panel joint shall be $\frac{3}{4}$ inch. The overall vertical tolerance of the wall (top to bottom) shall not exceed $\frac{1}{2}$ inch per 10 foot of wall height. The plumb and tolerances of each panel row at the face shall be checked before erection of the next panel row. Should panels be out of tolerance, remove the fill, and reset panels to proper tolerances. Horizontal, vertical and slope joint openings between panels shall be uniform and no larger than $1\frac{1}{4}$ inch and no smaller than $\frac{1}{2}$ inch.
5. Reinforcement. Reinforcement elements shall be placed normal to the face of the wall, unless otherwise shown on the Plans. Before placement of the reinforcing elements, backfill shall be compacted according to Section 205.
6. Backfill Placement. Backfill placement shall closely follow erection of each course of panels. Backfill shall be placed in such a manner as to avoid damage or disturbances of the wall materials or misalignment of the facing panels. Remove and replace wall materials that become damaged during backfill placement at the Contractor's expense. Correct misalignment or distortion of the wall facing panels due to placement of backfill outside the limits of this specification.

Backfill shall be compacted to 95 percent of the maximum density as determined by AASHTO T99/T180 or ATM 212. Where spread footings support bridge or other structural loads, the top 5 feet below the bottom of the footing elevation shall be compacted to 98 percent as determined by AASHTO T99/T180 or ATM 212. The maximum lift thickness after compaction shall not exceed 8 inches. Decrease this lift thickness, if necessary to obtain the specified density. The Engineer will determine field density using ALASKA FOP for AASHTO T 205 or WAQTC FOP for AASHTO T 310 AND WAQTC FOP for AASHTO T 224.

Use a lightweight mechanical tamper, roller, or vibratory system with at least three passes to achieve compaction within 3 feet of the back face of the wall facing. Obtain a minimum of one density test at each level of soil reinforcement material. Slope the last level of backfill away from the wall facing to permit rapid water runoff away from the wall face at the end of operations each day. Do not allow surface runoff from adjacent areas to enter the wall construction site.

SECTION 512

FORMS AND FALSEWORK

512-1.01 DESCRIPTION. Design, construct, and remove forms and falsework to temporarily support structural concrete, girders, and other major structural elements.

512-2.01 MATERIALS. As specified or approved.

DESIGN AND CONSTRUCTION REQUIREMENTS

512-3.01 DRAWINGS. When complete details for forms and falsework are not shown, prepare and submit drawings according to Subsection 105-1.02. Include the following, as applicable:

1. Design and show the details for constructing safe and adequate forms and falsework that provide the necessary rigidity, support the loads imposed, and produce in the finished structure the required lines and grades. See Subsection 512-3.02 for design loads. See Subsection 512-3.03 for design stresses, loadings, and deflections. See Subsection 512-3.04 for manufactured assemblies.
2. Show the maximum applied structural load on the foundation material. Include a drainage plan or description of how foundations will be protected from saturation, erosion, and/or scour. See Subsection 512-3.05.
3. Precisely describe all proposed material. Describe the material that is not describable by standard nomenclature (such as AASHTO or ASTM specifications) based on manufacturer's tests and recommended working loads. Evaluate falsework material and ascertain whether the physical properties and conditions of the material is such that it can support the loads assumed in the design.
4. Furnish design calculations and material specifications showing that the proposed system will support the imposed concrete pressures and other loads. Provide an outline of the proposed concrete placement operation listing the equipment, labor, and procedures to be used for the duration of each operation. Include proposed placement rates and design pressures for each pour. Include a superstructure placing diagram showing the concrete placing sequence and construction joint locations.
5. Provide design calculations and working drawings for proposed bridge falsework. Show the stresses and deflections in load supporting members in the falsework design calculations. Use a person proficient in falsework design to perform the work. The design calculations and working drawings must be stamped with the seal of, dated by, and signed by a Professional Engineer registered in the State of Alaska.
6. Show anticipated total settlements of falsework and forms. Include falsework footing settlement and joint take-up. Design for anticipated settlements not to exceed 1 inch. Design and detail falsework supporting deck slabs and overhangs on girder bridges so there is no differential settlement between the girders and the deck forms during placement of deck concrete. Design and construct the falsework to elevations that include anticipated settlement during concrete placement and required camber to compensate for member deflections during construction.
7. Show the support systems for form panels supporting concrete deck slabs and overhangs on girder bridges.
8. Show details for strengthening and protecting falsework over or adjacent to roadways and railroads during each phase of erection and removal. See Subsection 512-3.06.

9. Include intended steel erection procedures with calculations in sufficient detail to substantiate that the girder geometry will be correct. See Subsection 512-3.07.
10. Submit details of proposed anchorage and ties for void forms. See Subsection 512-3.09 for void form requirements.

Submit separate falsework drawings for each structure, except for identical structures with identical falsework design and details. Do not start construction of any unit of falsework until the drawings for that unit are reviewed and approved.

512-3.02 DESIGN LOADS.

1. Vertical Design Loads. Dead loads include the weight of concrete reinforcing steel, forms, and falsework. Consider the entire superstructure, or any concrete mass being supported by falsework to be a fluid dead load with no ability to support itself. If the concrete is to be prestressed, design the falsework to support any increased or readjusted loads caused by the prestressing forces.

Assume the density of concrete, reinforcing steel, and forms to be not less than 160 lb/ft³ for normal concrete and not less than 130 lb/ft³ for lightweight concrete.

Consider live loads to be the actual weight of equipment to be supported by falsework applied as concentrated loads at the point of contact plus a uniform load of not less than 20 lb/ft² applied over the area supported, plus 75 lb/ft applied at the outside edge of deck falsework overhangs.

The total vertical design load for falsework is the sum of vertical dead and live loads. Use a total vertical design load of not less than 100 lbs/ft².

2. Horizontal Design Loads. Use an assumed horizontal design load on falsework towers, bents, frames, and other falsework structures to verify lateral stability. The assumed horizontal load is the sum of the actual horizontal loads due to equipment, construction sequence, or other causes and an allowance for wind. However, in no case is the assumed horizontal load to be less than 2% of the total supported dead load at the location under consideration.

The minimum wind allowance for each heavy-duty steel shoring having a vertical load-carrying capacity exceeding 30,000 pounds per leg is the sum of the products of the wind impact area, shape factor, and the applicable wind pressure value for each height zone. The wind impact area is the total projected area of all the elements in the tower face normal to the applied wind. Assume the shape factor for heavy-duty shoring to be 2.2. Determine wind pressure values from Table 512-1.

**TABLE 512-1
DESIGN WIND PRESSURE - HEAVY-DUTY STEEL SHORING**

Height Zone (ft) Above Ground	Wind Pressure Value (lb/ft ²)	
	Adjacent to Traffic	At Other Locations
0	20	15
30 - 50	25	20
50 - 100	30	25
Over 100	35	30

The minimum wind allowance on all other types of falsework, including falsework supported on heavy-duty shoring, is the sum of the products of the wind impact area and the applicable wind pressure value for each height zone. The wind impact area is the gross projected area of the falsework and unrestrained portion of the permanent structure, excluding the areas between falsework posts or towers where diagonal bracing is not used. Use design wind pressures from Table 512-2.

**TABLE 512-2
DESIGN WIND PRESSURE - OTHER TYPES OF FALSEWORK**

Height Zone (ft) Above Ground	Wind Pressure Value (lb/ft ²)	
	For Members Over and Bents Adjacent to Traffic Openings	At Other Locations
0	2.0 Q	1.5 Q
30 - 50	2.5 Q	2.0 Q
50 - 100	3.0 Q	2.5 Q
Over 100	3.5 Q	3.0 Q

NOTE: Determine the value of Q, if applicable, in the above table as follows:

$Q = 1 + 0.2W$, but not more than 10. W is the width of the falsework system in feet measured in the direction of the wind force being considered.

Design the falsework so the falsework has sufficient rigidity to resist the assumed horizontal load without vertical dead load. Neglect the effects of frictional resistance.

3. Lateral Fluid Pressure. Design forms, form ties, and bracing for concrete with retarding admixture, fly ash, or other pozzolan replacement for cement, for a lateral fluid pressure based on concrete with a density of 150 lb/ft³. Determine the lateral fluid pressure for concrete containing no pozzolans or admixtures, which affect the time to initial set, based on concrete temperature and rate of placement according to ACI standard 347, *Formwork for Concrete*.

512-3.03 DESIGN STRESSES, LOADS, AND DEFLECTIONS. The allowable maximum design stresses and loads listed in this Section are based on the use of undamaged, high-quality material. Reduce the allowable stresses and loads if lesser quality material is used. Do not exceed the following maximum stresses, loads, and deflections in the falsework design:

1. Timber.

Compression perpendicular to the grain = 450 psi

Compression parallel to the grain = $\frac{480,000}{(L/d)^2}$ psi
(Not to exceed 1600 psi)

Where:

L = The unsupported length

d = The least dimension of a square or rectangular column or the width of a square of equivalent cross-sectional area for round columns

Flexural stress = 1800 psi

(Reduced to 1450 psi for members with a nominal depth of 8 inches or less.)

Horizontal shear = 190 psi

Axial tension = 1200 psi

Deflection due to the weight of concrete may not exceed 1/500 of the span even if camber strips compensate for the deflection.

The modulus of elasticity (E) for timber = 1.6×10^6 psi

Maximum axial loading on timber piles = 45 tons

Design timber connections according to the stresses and loads allowed in the *National Design Specification for Wood Construction*, published by the National Forest Products Association except:

- (1) Reductions in allowable loads required therein for high moisture condition of the lumber and service conditions do not apply.
- (2) Use 75% of the tabulated design value as the design value of bolts in two member connections (single shear).

2. **Steel.** For identified grades of steel, do not exceed the design stresses (other than stresses due to flexural compression) specified in the *AISC Manual of Steel Construction*.

When the grade of steel cannot be positively identified, do not exceed the design stresses, other than stresses due to flexural compression, either specified in the *AISC Manual of Steel Construction* for ASTM A 709, Grade 36 steel or the following:

Tension, axial and flexural = 22,000 psi

Compression, axial = $16,000 - 0.38(L/r)^2$ psi (except that L/r may not exceed 120)

Shear on the web gross section of rolled shapes = 14,500 psi

Web crippling for rolled shapes = 27,000 psi

For all grades of steel, do not exceed the following design stresses and deflection:

Compression, flexural* = $\frac{12 \times 10^6}{Ld/bt}$ psi

(*Not to exceed 22,000 psi for unidentified steel or steel meeting ASTM A 709. Not to exceed 0.6 Fy for other identified steel.)

Where:

L = The unsupported length, inches

d = The least dimension of a square or rectangular column or the width of a square of equivalent cross-sectional area for round columns or the depth of beams, inches

b = The width of the compression flange, inches

t = The thickness of the compression flange, inches

r = The radius of gyration of the member

Fy = The specified minimum yield stress for the grade of steel used

Deflection due to the weight of concrete may not exceed 1/500 of the span even if camber strips compensate for the deflection.

The modulus of elasticity (E) for steel = 30×10^6 psi

3. **Other Requirements.** Limit falsework spans supporting T-beam girder bridges to 14 feet plus 8.5 times the overall depth of T-beam girder.

512-3.04 MANUFACTURED ASSEMBLIES. For jacks, brackets, columns, joists and other manufactured devices, do not exceed the manufacturer's recommendations or 40% of the ultimate load carrying capacity of the assembly based on the manufacturer's tests or additional tests ordered. Limit the maximum allowable dead load deflection of joists to 1/500 of their spans.

Furnish catalog or equivalent data showing the manufacturer's recommendations or perform tests, as necessary, to demonstrate the adequacy of any manufactured device proposed for use. Do not substitute other manufacturer's components unless the manufacturer's data encompasses such substitutions or field tests reaffirm the integrity of the system.

If a component of the falsework system consists of a steel frame tower exceeding 2 or more tiers high, do not exceed a differential leg loading within the steel tower unit of 4 to 1. An exception may be approved if the manufacturer of the steel frame certifies, based on manufacturer's tests, that the proposed differential loadings are not detrimental to the safe load carrying capacity of the steel frame.

512-3.05 FALSEWORK FOUNDATIONS. Field verify all ground elevations at proposed foundation locations before design.

Where spread footing type foundations are used, determine the bearing capacity of the soil. The maximum allowable bearing capacity for foundation material, other than rock, is 4000 lb/ft².

Do not locate the edge of footings closer than 12 inches from the intersection of the bench and the top of the slope. Unless shoring adequately supports the excavation for footings, do not locate the edge of the footings closer than 4 feet or the depth of excavation, whichever is greater, from the edge of the excavation.

When a pile type foundation is used, use according to Section 505. When falsework is supported by footings placed on paved, well-compacted slopes of berm fills, do not strut the falsework to columns unless the column is founded on rock or supported by piling.

Size spread footings to support the footing design load at the assumed bearing capacity of the soil without exceeding anticipated settlements. Provide steel reinforcement in concrete footings.

When individual steel towers have maximum leg loads exceeding 30,000 pounds, provide for uniform settlement under all legs or each tower under all loading conditions.

Protect the foundation from adverse effects for the duration of its use. Advise the Engineer of actions that will be taken to protect the foundation.

512-3.06 FALSEWORK OVER OR ADJACENT TO ROADWAYS AND RAILROADS. Design and construct the falsework to be protected from vehicle impact. This includes falsework posts that support members crossing over a roadway or railroad and other falsework posts if they are located in the row of falsework posts nearest to the roadway or railroad and if the horizontal distance from the traffic side of the falsework to the edge of pavement or to a point 10 feet from the centerline of track is less than the total height of the falsework.

Provide additional features to ensure that this falsework will remain stable if subjected to impact by vehicles. Use vertical design loads for these falsework posts, columns, and towers (but not footings) that are not less than either:

1. 150% of the design load calculated according to Subsection 512-3.02, but not including any increased or readjusted loads caused by prestressing forces, or
2. the increased or readjusted loads caused by prestressing forces.

Install temporary traffic barriers before erecting falsework towers or columns adjacent to an open public roadway. Locate barriers so that falsework footings or pile caps are at least 3 inches clear of concrete traffic barriers and all other falsework members are at least 12 inches clear. Do not remove barriers until approved.

Use falsework columns that are steel with a minimum section modulus about each axis of 9.5 in³) or sound timbers with a minimum section modulus about each axis of 250 in³.

Mechanically connect the base of each column or tower frame supporting falsework over or immediately adjacent to an open public road to its supporting footing or provide other lateral restraint to withstand a force of not less than 2000 pounds applied to the base of the column in any direction. Mechanically connect such columns or frames to the falsework cap or stringer to resist a horizontal force of not less than 1000 pounds in any direction. Neglect the effects of frictional resistance.

Brace or tie exterior girders, upon which overhanging bridge deck falsework brackets are hung, to the adjacent interior girders as necessary to prevent rotation of the exterior girders or overstressing the exterior girder web.

Mechanically connect all exterior falsework stringers and stringers adjacent to the end of discontinuous caps, the stringer or stringers over points of minimum vertical clearance and every fifth remaining stringer, to the falsework cap or framing. Provide mechanical connections capable of resisting a load in any direction, including uplift on the stringer, of not less than 500 pounds. Install connections before traffic is allowed to pass beneath the span.

Use 5/8 inch diameter or larger bolts to connect timber members used to brace falsework bents located adjacent to roadways or railroads.

Sheath falsework bents within 20 feet of the centerline of a railroad track solid in the area between 3 and 17 feet above the track on the side facing the track. Construct sheathing of plywood not less than 5/8 inch thick or lumber not less than 1 inch nominal thickness. Provide adequate bracing on such bents so that the bent resists the required assumed horizontal load or 5000 pounds, whichever is greater, without the aid of sheathing.

Provide at least the minimum required vertical and horizontal clearances through falsework for roadways, pedestrians, and boats.

512-3.07 FALSEWORK FOR STEEL STRUCTURES.

1. Use falsework design loads consisting of the weight of structural steel, the load of supported erection equipment, and all other loads supported by the falsework.
2. Design falsework and forms for concrete supported on steel structures so that loads are applied to girder webs within 6 inches of a flange or stiffener. Distribute the loads in a manner that does not produce local distortion of the web.
3. Strut and tie exterior girders supporting overhanging deck falsework brackets to adjacent interior girders to prevent distortion and overstressing of the exterior girder web.
4. Do not apply loads to existing, new, or partially completed structures that exceed the load carrying capacity of any part of the structure according to the Load Factor Design methods of the AASHTO *Bridge Design Specifications* using Load Group IB.
5. Build supporting falsework that will accommodate the proposed method of erection without overstressing the structural steel, as required, and will produce the required final structural geometry, intended continuity, and structural action.

512-3.08 FALSEWORK CONSTRUCTION. Construct falsework to conform to the approved drawings.

Build camber into the falsework to compensate for falsework deflection and anticipated structure deflection. Camber shown on the Plans or specified by the Engineer is for anticipated structure deflection only.

Attach tell-tales to soffit of concrete forms in enough systematically placed locations to be able to determine from the ground the total settlement of the structure while concrete is placed.

Do not apply dead loads, other than forms and reinforcing steel, to any falsework until authorized.

Discontinue concrete placement and take corrective action, if unanticipated events occur, including settlements that cause a deviation of more than 0.325 inches from those shown on the falsework drawings. If satisfactory corrective action is not taken before initial set, remove all unacceptable concrete.

512-3.09 FORMS. For exposed concrete surfaces, use U.S. Product Standard PS 1 for Exterior B-B (Concrete Form) Class I Plywood or other approved material that will produce a smooth and uniform concrete surface. Use only form panels in good condition free of defects on exposed surfaces. If form panel material other than plywood is used, it must have flexural strength, modulus of elasticity, and other physical properties equal to or greater than the physical properties for the type of plywood specified.

Furnish and place form panels for exposed surfaces in uniform widths of not less than 2 feet and in uniform lengths of not less than 4 feet except where the width of the member formed is less than 2 feet.

Arrange panels in symmetrical patterns conforming to the general lines of the structure. Place panels for vertical surfaces with the long dimension horizontal and with horizontal joints level and continuous. For walls with sloping footings which do not abut other walls, placement of panels with the long dimension parallel to the footing is permitted.

Increase the thickness of concrete members that receive an architectural finish to maintain the specified minimum cover to reinforcing steel.

Precisely align form panels on each side of the panel joint by means of supports or fasteners common to both panels. Provide 3/4 inch triangular filets at all sharp edges of the concrete.

Devices may be cast into the concrete for later use in supporting forms or for lifting precast members. Do not use driven devices for fastening forms or form supports to concrete. Use form ties consisting of form bolts, clamps, or other devices necessary to prevent spreading of the forms during concrete placement.

Do not use form ties consisting of twisted wire loops. Use form ties and anchors that can be removed without damaging the concrete surface. Construct metal ties or anchorages within the forms to permit their removal to a depth of at least 1 inch from the face without damage to the concrete. Fill cavities with cement mortar and finish to a sound, smooth, uniform colored surface.

Construct all exposed concrete surfaces that will not be completely enclosed or hidden below the permanent ground surface so the formed surface of the concrete does not undulate more than 0.1 inch or 1/360 of the center to center distance between studs, joists, form stiffeners, form fasteners, or wales. Interior surfaces of underground drainage structures are considered to be completely enclosed surfaces. Form all exposed surfaces for each element of a concrete structure with the same forming material or with materials that produce similar surface textures, color, and appearance.

Support roadway slab forms of box girder type structures on wales or similar supports fastened, as nearly as possible, to the top of the web walls.

Construct concrete forms mortar-tight, true to the dimensions, lines, and grades of the structure, and of sufficient strength to prevent appreciable deflection during placement of concrete. Place all material required to be embedded in the concrete before concrete placement. Clean inside surfaces of forms of all dirt, mortar and foreign material. Remove all loose material before the completion of forming for the roadway deck slab of cast-in-place box girders or cells or voids of other members in which the forms are to either remain in place or be removed.

Coat forms to be removed with form oil. Use commercial quality form oil or an equivalent coating that permits release of the forms and does not discolor the concrete. Do not place concrete in forms until the forms have been inspected and approved.

Store void forms in a dry location to prevent distortion. Secure the forms using anchors and ties which leave a minimum of metal or other supporting material exposed at the bottom of finished slab.

Make the outside surface of void forms waterproof. Cover the ends with waterproof mortar tight caps. Use a premolded 1/4 inch thick rubber joint filler around the perimeter of the caps to permit expansion.

Provide a PVC vent near each end of each void form. Construct vents so the vent tubes do not extend more than 1/2 inch below the bottom surface of the finished concrete after form removal. Protect void forms from the weather until concrete is placed.

512-3.10 REMOVAL OF FORMS AND FALSEWORK. Remove all forms except as follows:

1. Interior soffit forms for roadway deck slabs of cast-in-place box girders.
2. Forms for the interior voids of precast members.
3. Forms for abutments or piers when no permanent access is available into the cells or voids.

Remove forms that do not support the dead load of concrete members, other than railings and barriers, only after the concrete for the member has been in place for at least 24 hours and the concrete has sufficient strength to resist damage to the surface. Protect exposed concrete surfaces from damage.

Do not begin the removal of forms and falsework until the requirements specified in Table 512-3 for concrete strength or minimum time in the forms, when applicable, have been met.

Remove falsework for arch bridges uniformly and gradually, beginning at the crown and working toward the springing. Remove falsework for adjacent arch spans simultaneously.

Do not release falsework for cast-in-place prestressed portions of structures until after the prestressing steel has been tensioned.

Do not remove falsework supporting the deck of rigid frame structures excluding box culverts, until compacted backfill material has been placed against vertical legs of the frame.

Falsework supporting the sides of girder stems with slopes steeper than 1:1 may be removed before placing deck slab concrete, providing a reshoring system is installed. Design the lateral supports of the reshoring system to resist all rotational forces acting on the stem, including those caused by the placement of deck slab concrete. Install the lateral supports immediately after each form panel is removed and before release of supports for the adjacent form panel.

**TABLE 512-3
FORM/SUPPORT RELEASE CRITERIA**

Structural Element	Percent of Specified 28-Day Strength (f'_c), min.	Days Since Last Pour, min.
(a) Columns and wall faces (not yet supporting loads)	50	3
(b) Mass piers and mass abutments not yet supporting loads (except pier caps)	50	3
(c) Box girders	80	14
(d) Simple span girders, T-beam girders, slab bridges, cross beams, caps, pier caps not continuously supported, struts, and top slabs of concrete box culverts	80	14
(e) Trestle slabs where supported on wood stringers	70	10
(f) Slabs and overhangs where supported on steel stringers or prestressed concrete girders	70	10
(g) Pier caps continuously supported	60	7
(h) Arches, continuous span bridges, rigid frames	90	21

Completely remove falsework material. Remove falsework piling at least 2 feet below the surface of the original ground or original stream bed. Where falsework piling is driven within the limits of ditch or channel excavation, remove the piling to at least 2 feet below the bottom and side slopes of the excavated areas.

Leave the forms for footings constructed within a cofferdam or crib in place when their removal would endanger the safety of the cofferdam or crib, and where the forms will not be exposed to view in the finished structure.

Remove all other forms whether above or below groundline or water level.

SECTION 514

CONCRETE SURFACE TREATMENTS

514-1.01 DESCRIPTION. This work consists of providing an aesthetic fascia and anti-graffiti protection on exposed faces of precast and cast-in-place concrete. Use form liners where designated on the Plans. Apply anti-graffiti protection where designated on the Plans.

514-2.01 MATERIALS.

1. Aesthetic Fascia. Provide standard reusable, non-porous form liners conforming to the pattern as specified on the Plans; or approved equal.
2. Anti-graffiti Protection. Use a two-step graffiti protection system designed specifically for this use. The system shall consist of a single component clear acrylic base coat covered by a clear urethane finish coat. This material is not a sealer or vapor barrier and no appreciable discoloration is allowed.

514-3.01 AESTHETIC FASCIA. The wall dimensions and concrete quantities provided on the Plans are minimum and do not include allowances for the thickness of the form liners. Account for the thickness of the form liners. Do not decrease the required minimum clear cover when using aesthetic fascia. Measure provided clear cover at the point where it is a minimum due to the aesthetic fascia.

Cover the form, leaving 6 inches between the edge of liner and the finished top of the wall, pathway or ground grade at the bottom, and edge or expansion joints on the sides. The Engineer shall approve the liner placement on the form prior to the concrete placement.

514-3.02 ANTI-GRAFFITI PROTECTION. Let all concrete surfaces set at least 28 days before applying any coatings. Apply the base coat with a roller or sprayer in accordance with the manufacturer's recommendations. Apply two coats of the finish coat after the base coat has cured for 72 hours. Apply appropriate masking as required. Exposed faces of wall extend 1 foot below finished grade.

SECTION 515

DRILLED SHAFTS

515-1.01 DESCRIPTION. Construct drilled shaft foundations where indicated in the plans. This work includes all labor, materials, equipment, incidentals and services necessary to perform all operations to complete drilled shaft installation.

515-1.02 QUALITY CONTROL. Provide a Quality Control Inspector to ensure that all materials, techniques and methods are suitable to meet or exceed the minimum requirements of the contract.

The Quality Control Inspector shall submit daily reports during drilled shaft installation and testing operations verifying the Contractor's compliance with requirements of the contract. Include field measurement data, procedural discrepancies, installation problems, names of personnel, equipment usage data, and all other significant information in the daily reports.

515-1.03 PERMITS. Conform to the requirements of the Department obtained permits when constructing drilled shafts and disposing of excavated materials. Obtain all other permits not obtained by the Department required to construct the drilled shafts and dispose of excavation materials.

515-1.04 QUALIFICATIONS. Experience is required for constructing drilled shafts of at least 8 feet in diameter and lengths similar to those indicated on the plans for three separate projects during the previous five years. Experience must include drilling in deep water (greater than 30 feet), drilling in soils with ground water, in soils with large boulders, and in rock.

515-1.05 GENERAL REQUIREMENTS AND SUBMITTALS. Submit the following documents for review and approval no more than one week after the Notice to Proceed:

1. Project Experience. Provide a list of three drilled shaft projects performed by the Drilled Shaft Contractor that involved drilling in sand, gravel, large boulders and rock similar to those conditions expected at this project location. Provide the drilled shaft plans, logs of test holes, dates of work, type of work, description of work, and amount of work performed. Provide the name and telephone number of a contact person at the agency or company for which the work was completed.
2. Personnel Experience. Provide a list of the key personnel involved in the drilled shaft construction. Include the name of the superintendent and of the superintendent's assistants who will be performing and directing the actual drilling operations. Include a resume of each superintendent and assistant involved in drilled shaft construction indicating:
 - a. A minimum of five years experience in directing drilled shaft construction of which two years being in responsible charge or operating equipment proposed for this project.
 - b. The number of years of recent continuous relevant experience in performing similar drilling operations and operating the contractor proposed equipment for this job.
 - c. Detailed recent relevant experience (3 project minimum) including project description, date of work, actual work performed by individual, and a reference for each project including telephone number.
 - d. A list of relevant equipment operated including type of equipment and amount and nature of experience.

Only those personnel approved by the Engineer may work on the drilled shaft construction. The Engineer may suspend the drilled shaft work if the Contractor substitutes unauthorized personnel for authorized personnel during construction. If work is suspended due to unauthorized substitution of

personnel, the Contractor shall be fully liable for all additional costs resulting from the suspension of work and no adjustment in contract time will be allowed.

Submit the following for review and approval no less than 45 days prior to the anticipated start of drilled shaft construction:

1. Drilled Shaft Installation Plan. Provide the installation plan for the drilled shaft foundations. Include the following:
 - a. Personnel Experience information identified in item number 1.
 - b. List the type, number and size of all proposed equipment, including cranes, barges, drills, augers, bailing buckets, final cleaning equipment, desanding equipment, slurry pumps, tremies, concrete pumps, casings, grout pumps, etc. Include manufacturer's recommended capacities for each piece of equipment.
 - c. Details and methods required for construction including temporary work structures and access roads.
 - d. Details of sequence of construction operations and sequence of shaft construction including dates and anticipated duration of work.
 - e. Details of shaft excavation methods.
 - f. Procedure for maintaining correct horizontal and vertical alignment during shaft installation.
 - g. Casing diameter and thickness required but not less than that indicated on the plans.
 - h. Method to advance casing.
 - i. Methods and equipment proposed to prevent displacement of casing and/or shafts throughout shaft construction.
 - j. Details for obstruction removal.
 - k. The casing grouting plan and procedure if required.
 - l. Details of proposed methods to clean shaft after initial excavation.
 - m. Details of shaft reinforcement, including methods to ensure centering/required cover, reinforcement cage integrity during placement, placement procedures, cage support, tie downs, etc.
 - n. Details of concrete placement, including proposed operational procedures for concrete tremie or pump, concrete placement rates, initial concrete placement procedure, method for raising tremie during concrete placement, and overfilling of the shaft concrete. Also provide provisions to ensure proper final shaft cutoff elevation.
 - o. Action plan for correcting defects in the shaft. Defects include but are not limited to the following: tilted casing, partially or completely collapsed casing, partially or completely collapsed reinforcement cage, improper concrete placement, and equipment failure.
 - p. Required submittals, including shop drawing, mill certification and concrete mix designs.
 - q. Welding Quality Control plan conforming to the requirements of AWS D1.1:2002.
 - r. Details for CSL testing procedure including testing schedule, inspector's name, inspector's qualifications, required instrumentation and power sources.

- s. Safety plan to be implemented to ensure employee safety. Provide worker safety procedures around the shaft excavation and in the shaft when personnel descend for inspection.
- t. Details of environmental control procedures used to prevent loss of slurry, concrete or other shaft materials into waterways or other protected areas.
- u. Wastewater and concrete disposal procedures.
- v. Other information shown in the Plans, requested by the Engineer or deemed necessary by the Contractor.

The Engineer will evaluate the drilled shaft installation plan for conformance with the Contract Documents and will reject any portion of the plan that is unacceptable. Partial submittals will not be accepted for approval. Within 20 days after receipt of the complete plan, the Engineer will notify the Contractor of any additional information required and/or changes that may be necessary in the opinion of the Engineer to satisfy the Contract Documents. Submit agreed upon changes for reevaluation. The Engineer will notify the Contractor within 10 days after receipt of proposed changes of their acceptance or rejection. All approvals given by the Engineer are subject to trial and satisfactory performance in the field. Do not begin any drilled shaft work without an approved Drilled Shaft Installation Plan. Do not begin any drilled shaft work without the written approval of the Engineer.

Identify all Critical Path Schedule Items in the drilled shaft installation plan. Provide adequate lead time to obtain concrete mix design approval and permanent metal casing delivery.

Submit the Crosshole Sonic Logging (CSL) results within 5 days of testing. Provide the following:

1. Crosshole Sonic Testing Report. A report that contains the following:
 - a. The CSL logs for all tested tube pairs. Identify the CSL log for each test tube pair indicating the orientation relative to the structure.
 - b. The traditional signal peak diagram (time versus depth).
 - c. The computer first pulse arrival time verses depth.
 - d. The computed pulse wave speed versus depth.
 - e. The computed relative pulse energy or amplitude versus depth.
 - f. Identification of defect zones, if any, on the CSL logs. Defect zones are defined by an increase in arrival time of more than 20% relative to arrival time in a nearby zone of good concrete.

515-1.06 CERTIFICATIONS. Provide certification that all available geotechnical information provided by the Department has been reviewed and considered in the bid preparation.

515-2.01 MATERIALS. Use materials that conform to the following:

DS Concrete	Section 501
DS Grout	Subsection 701-2.04
Reinforcing Steel	Section 503
Steel for Casing	ASTM A709, Grade 50 or higher
CSL Tubes	ASTM A53

CONSTRUCTION REQUIREMENTS

515-3.01 GENERAL METHODS AND EQUIPMENT. Perform the excavations required for the shafts through all materials encountered to the dimensions and elevations shown in the Contract Documents. Use methods and equipment suitable for the intended purpose and the materials encountered. Provide equipment capable of constructing shafts to a depth equal to the deepest shaft shown in the plans plus three times the shaft diameter.

Construct drilled shafts according to the Contract Documents except when permitted otherwise by the Engineer. An alternate method of shaft construction may be proposed. Acceptance for other proposed shaft installation methods will be based upon the suitability of the method to the site conditions and the effect of the method on the structural system. Submit alternate methods of shaft construction for approval.

Maintain a construction method and soil log during shaft excavation. Submit copies of the log daily. Resolve all differences in the production logs between the Engineer and the Contractor within 24 hours of submittal to the Engineer. Provide at least the following items in the log:

1. Description and approximate top and bottom elevation of each soil or rock material encountered
2. Location of all obstructions and time spent removing the obstruction
3. Drilling rate, down thrust, and torque
4. Seepage or groundwater
5. Remarks and comments

Barges, temporary work structures and roads may be required to install the drilled shaft foundation, piers, and bridge superstructure.

515-3.02 CONSTRUCTION METHOD. Use the permanent casing method.

Permanent Casing Method: Excavate through the casing and advance the casing until reaching the desired penetration. Overreaming the outside diameter of the casing before placing the casing may be necessary.

Casing may be placed in oversized holes and grouted in place using the pre-approved grouting procedure identified in Subsection 515-1.05.

Vibratory and impact hammers may be used to install casing. Casing that is driven or vibrated into place need not be grouted.

Oscillating and rotary type casing installation devices may be used with the Engineer's approval. Casing that is driven or vibrated into place need not be grouted.

After the concrete has cured according to Section 501, cut the casing off at the prescribed elevation and leave the remainder of the casing in place.

515-3.03 POSITION AND ALIGNMENT. When drilling from a barge, provide a fixed template, adequate to maintain shaft position and alignment during all excavation and concreting operations. Do not use floating templates (attached to a barge). A fixed template for shafts drilled on land will not be required if the Contractor demonstrates satisfactorily to the Engineer that shaft position and alignment can be properly maintained. The Engineer will require a fixed template adequate to maintain shaft position and alignment during all excavation and concreting operations for shafts drilled on land when the Contractor fails to demonstrate to the Engineer's satisfaction that he can properly maintain shaft position and alignment without use of a template.

515-3.04 EXCAVATIONS AND EQUIPMENT. All shaft excavation from the mudline to the top of bedrock, including the rubble layer, is Unclassified Shaft Excavation. All shaft excavation from the top of bedrock to the bottom of the shaft is Special Shaft Excavation. Mudline, top of bedrock, and bottom of shaft elevations are shown on the Plans. The Engineer will require Drilled Shaft Sidewall Overreaming when necessary.

1. Unclassified Shaft Excavation. All processes required to excavate a drilled shaft of the dimensions shown in the Contract Documents, completed and accepted. Include in the work all shaft excavation,

whether the material encountered is soil, rock, boulders, weathered rock, stone, natural or man-made obstructions, or any other materials. Special Shaft Excavation begins either when top of bedrock elevation is reached or when drilling operations using conventional equipment reach practical refusal. Practical refusal is defined as the point where the rate of hole advancement using earth augers with soil or rock teeth, drill buckets, and/or under reaming tools with the drilling equipment operating at maximum power, torque and downthrust, is less than 1 foot after 15 minutes of continuous drilling.

2. Special Shaft Excavation. All processes required to excavate a drilled shaft of the dimensions shown in the Contract Documents, completed and accepted. Include in the work all shaft excavation, whether the material encountered is soil, rock, boulders, weathered rock, stone, natural or man-made obstructions, or any other materials. Payment for excavation below the point where Special Shaft Excavation has been authorized will be for Special Shaft Excavation only and will not include payment for Unclassified Shaft Excavation.
3. Drilled Shaft Sidewall Overreaming. The unclassified excavation required to enlarge the drilled shaft diameter to accommodate the installation of the permanent metal casing. Increase the shaft radius a maximum of 6 inches by overreaming.

If the Engineer determines that the material encountered while drilling the shaft excavation is unsuitable and/or is not the same as anticipated in the design of the drilled shaft, extend the drilled shaft excavations as required by the Engineer.

Provide areas for the disposal of unsuitable materials and excess materials that are removed from shaft excavations, and dispose of them subject to permit requirements and in a manner meeting all requirements pertaining to the approved storm water pollution prevention (SWPP) plan.

Use excavation and drilling equipment having adequate capacity, power, torque, and downthrust to perform the work. Use excavation and overreaming tools of adequate design, size, and strength to perform the work. If the material encountered cannot be drilled using conventional earth augers and/or underreaming tools, provide special drilling equipment, including but not limited to rock augers, core barrels, rock tools, air tools, blasting materials, and other equipment as necessary to continue the shaft excavation to the size and depth required.

515-3.05 CASINGS. Use casings that are of ample strength to withstand handling and driving stresses and the pressure of concrete and surrounding earth materials. Casing may be thickened or reinforced to withstand applied stresses. Internally brace casing during shipping.

Use casings that are smooth and water tight. Provide a casing that is continuous along the entire length of the shaft.

Ensure that the inside diameter of casing is not less than the specified size of shaft. Oversized casing may be used with the Engineer's approval. The Department will not provide extra compensation for excess concrete required to fill an oversized casing.

If the installed casing does not satisfy the requirements of Subsection 515-3.10, submit casing repair procedure for approval.

Special casing systems may be used with the Engineer's written approval. Design special casings so that no damage occurs to the drilled shaft foundation.

1. Grouting. For drilled shaft foundation casings installed in oversized holes or where gaps exist between the shaft excavation and the casing, grout the zone between the casing and the soil with DS Grout. Grout the casing the full depth of the shaft. Use at least six grout placement tubes placed uniformly around the perimeter the full length of the casing. Grout the casing in one continuous operation. Withdraw the grout tubes vertically during grout placement operations. Provide at least two water

relief/release pipes on opposite sides of the casing. Withdraw the water relief/release pipes vertically during the grout placement operations.

Submit the grout placement procedure for approval.

515-3.06 INSPECTION OF EXCAVATIONS. Do not enter the shaft unless the casing is installed and adequate safety equipment and procedures have been provided.

Inspect the excavations for the following:

1. Dimensions and Alignment. Provide equipment for checking the dimensions and alignment of each shaft excavation. Verify the dimensions and alignment of the shaft excavation under the observation and direction of the Engineer. Check the following:
 - a. Shaft excavation dimensions and alignment.
 - b. Casing dimensions and alignment periodically throughout the installation process.
 - c. Casing dimension and alignment in final position.
2. Depth. Reference the depth of the shaft during drilling using marks on the Kelly bar or other suitable methods. Measure final shaft depths with a suitable weighted tape or other approved methods after final cleaning.
3. Shaft Cleanliness Requirements. Clean the shaft so that at least 50 percent of the base of each shaft has less than 3/4 inch of sediment at the time of concrete placement. Ensure that the maximum depth of sedimentary deposits or other debris does not exceed 1½ inches at any location on the bottom of the excavation. The Engineer will approve shaft cleanliness based on visual inspection for dry shafts. The Engineer will approve shaft cleanliness using divers, Shaft Inspection Device (SID) or other appropriate methods for wet shafts.

Refer to Subsection 515-3.15 for SID requirements.

4. Casing. Visually inspect casings above water. Use a Shaft Inspection Device (SID), diver, or other methods as directed by the Engineer to examine the casings below water for defects.

Refer to Section 515-3.15 for SID requirements.

515-3.07 REINFORCING STEEL CONSTRUCTION AND PLACEMENT.

1. Reinforcement Cage Construction and Placement. Tie all intersections of drilled shaft reinforcing steel with cross ties or "figure 8" ties. Use double strand ties or ties with larger tie wire when necessary. The Engineer will give final approval of the cage construction subject to satisfactory performance in the field.

Assemble and place as a single unit the cage of reinforcing steel consisting of; longitudinal bars, ties, spirals, cage stiffener bars, crosshole sonic logging (CSL) tubes and all other components. Place the cage immediately after the Engineer inspects and accepts the shaft excavation and immediately prior to placing concrete. The Engineer will give final approval of the placement subject to satisfactory performance in the field.

2. Splicing Reinforcement Cage. If the bottom of the constructed shaft elevation is lower than the bottom of the shaft elevation in the plans, extend a minimum of one half of the longitudinal bars required in the lower portion of the shaft the additional length. Continue the tie bars throughout the extra depth and extend the stiffener bars to the final depth. Splice the longitudinal bar extensions as required.
3. Support, Alignment, and Tolerance. Tie and support the reinforcing steel in the shaft so that the reinforcing steel will remain within allowable tolerances as specified in Section 515-3.10.

Use concrete wheels or other approved, non-corrosive spacing devices near the bottom and at intervals not exceeding 15 feet up the shaft to ensure concentric spacing for the entire length of the cage. Do not use block or wire type spacers. Use a minimum of one spacer for each 30 inches of cage circumference.

Provide concrete or other Engineer-approved spacers at the bottom of the drilled shaft reinforcing cage. Maintain the specified distance between the bottom of the cage and the bottom of the shaft. Use one spacer per longitudinal bar unless directed otherwise by the Engineer. Use spacers sized to prevent vertical movement of the cage. Use spacers constructed of material equal in quality and durability to the shaft concrete. Submit spacer information for approval.

Check the elevation of the top of the steel cage before and after placing the concrete. If the cage is not maintained within the specified tolerances, correct it as approved by the Engineer. Do not construct additional shafts until modifying the reinforcement cage support in a manner satisfactory to the Engineer.

515-3.08 FLUID IN EXCAVATION AT TIME OF CONCRETE PLACEMENT. Prior to placing concrete in any shaft excavation, ensure that contaminated suspensions, which could impair the free flow of concrete from the tremie pipe, have not accumulated in the bottom of the shaft. Take samples of the fluid in the shaft starting 1 foot from the base of the shaft and at intervals not exceeding 10 feet up the shaft, using an approved sampling tool. Ensure that the density of the fluid in the shaft excavation prior to concreting is less than 70 lb/ft³ for mineral slurries including bentonite and attapulgite and less than 54 lb/ft³ for polymer slurries according to ASTM D 4380. If desanding equipment is required, ensure that the sand content does not exceed 4 percent. Take whatever action is necessary to modify the fluid in the shaft excavation prior to placing the concrete to bring the fluid within the contract requirements.

515-3.09 CONCRETE PLACEMENT. Place concrete in accordance with Section 501 and the requirements herein.

At no expense to the Department, furnish the additional drilled shaft concrete (over the theoretical amount required to fill the shaft as shown in the Plans) required to complete filling shafts larger than required by the Plans or authorized by the Engineer.

If the pressure head is lost during concrete placement for any reason, the Engineer may direct the Contractor to perform integrity testing at no expense to the Department.

Cure the top surface of the shaft in accordance with Section 501.

Install grout in all voids between the casing and shaft excavation after placing shaft concrete. Grout permanent metal casing in conformance with the requirements of Section 501.

Pressure wash all concrete overflow from the outside surface of the shaft casing. Do not allow loose concrete and other debris generated during pressure washing the casing to flow into adjoining bodies of water.

515-3.10 CONSTRUCTION TOLERANCES. Conform to the following:

1. Ensure that the top of the drilled shaft is no more than 3 inches laterally from the position indicated in the plans.
2. Ensure that the vertical alignment of the shaft excavation does not vary by more than ¼ inch horizontally for each foot of depth.
3. After placing all the concrete, ensure that the top of the reinforcement cage is no more than 2 inches above and no more than 3 inches below plan position.

4. Ensure that the column and shaft reinforcement cages are concentric with the shaft within a tolerance of 1 inch. Ensure that concrete cover is within 1½ inches of the plan dimension.
5. Ensure that the top elevation of the drilled shaft concrete is within 6 inches of the top of shaft elevation shown in the plans.
6. Do not exceed a difference between the major and minor outside diameters at any point along the length of the permanent metal casing (out-of-roundness) of 1 percent of the nominal diameter. The circumference of the permanent metal casing shall not vary more than 3/16 inch from the nominal circumference.
7. Ensure that the cutting edges of excavation equipment are normal to the vertical axis of the equipment within a tolerance of ±3/8 inch per foot of shaft diameter.
8. The completed shaft excavation shall have a flat bottom as shown on the plans. The flat bottom of the shaft excavation shall be fully founded on rock and be level within ±3/8 inch per foot of shaft diameter.
9. Provide a solid concrete shaft without voids or sections of unsound concrete as determined by Crosshole Sonic Logging.

515-3.11 INSTRUMENTATION AND DATA COLLECTION.

1. Shaft Inspection Device. The Engineer may use a Shaft Inspection Device (SID) comprised of a television camera sealed inside a watertight jacket to inspect the bottoms of the shafts. Cooperate with the Engineer in using this device. Place the device in position for inspection and removing it after the inspection. Furnish 110 V single-phase current (minimum 30 A service), 220 V single-phase current (minimum 15 A service), and a 150 psi compressor (230 in³/s minimum) to operate the SID.

Notify the Department at least ten days prior to the desired pick-up date. Notify the Department at least ten working days prior to returning the SID.

The Contractor is responsible for the device from the time it leaves its storage area until the time it is returned. During this time, insure the device against loss or damage for the replacement cost (\$500,000 minimum) or for the full insurable value if replacement cost insurance is not available. Return the device in good working condition to its proper location within 30 days after completing drilled shaft installation.

2. Crosshole Sonic Logging. Provide crosshole sonic logging (CSL) inspection of all drilled shaft foundations along their entire lengths in accordance with Subsection 515-1.05. Provide an independent CSL inspector with at least three years experience in CSL testing to inspect the drilled shaft and prepare the CSL report.

Secure CSL tubes (steel pipes) to the inside of the reinforcing steel cage on regular intervals not exceeding 3 feet. Place CSL tubes as near parallel and plumb as possible and around the reinforcement cage perimeter as indicated on the plans. Extend the CSL tube from the bottom of the shaft to at least three feet above the top of the shaft or as directed by the Engineer.

Do not damage CSL tubes. Prior to beginning CSL testing, assure that the test probes can pass through every tube to the bottom. If a tube is obstructed, at your expense core a hole that is near to the obstructed tube and extends to its full depth. The corehole should be large enough to accommodate the CSL probe.

Prior to coring, submit for approval a coring plan including corehole locations and coring equipment and procedures. Provide for complete core recovery and minimize abrasion and erosion of the core. Place the core hole at a position in the shaft that will not produce damage to the reinforcing steel in the shaft. Log the corehole and submit the log. Indicate in the log voids and defects located in the core

hole. Preserve the cores and make them available for inspection by the Engineer. Commence downhole testing with the corehole treated as an access tube.

CSL tubes shall be schedule 40 pipes that provide an inside diameter of at least 2 inches. Provide CSL tubes with smooth, regular inside surface free of defects and obstructions (including pipe joints) to permit the free movement of a 1¼ inch diameter probe over the entire length of the tube.

Use mechanical couplers to extend CSL tubes. Seal all CSL tube joints. Do not weld CSL tube joints.

CSL tubes must be watertight. Provide a watertight cap at the bottom of the CSL tube. Provide a watertight, removable cap at the top of the CSL tube. Fill CSL tubes with potable water prior to or within 1 hour after placement of shaft concrete.

The exterior surface of CSL tubes must be free from corrosion, oil, and coatings so that a good bond is provided between the concrete and the tube.

Test the drilled shaft no sooner than 3 days and no later than 10 days after placement of drilled shaft concrete.

Provide the shaft installation and drilling record to the Engineer and CSL Inspector within 3 days of placing shaft concrete.

Perform CSL testing between all adjacent tube pairs and across at least two major diagonals. Perform additional diagonal testing if shaft defects are identified. At your expense, perform as many additional diagonal tests as needed to determine the extent of the shaft defect.

If the CSL results indicate a potential defect, the core the location of the defect as described above for blocked CSL tubes.

If the cores indicate the presence of a defect, repair the shaft at your expense and at no extra cost to the Department. If a defect is not observed in the cores, the Department will pay for all coring costs and compensation for the delay will be granted by an appropriate time extension. "

After CSL testing has been completed and accepted by the Engineer, remove water from the CSL tube, cut the tube flush with the top of the shaft, and fill the tube with DS Grout.

515-3.12 DRILLED SHAFT EXCAVATIONS CONSTRUCTED OUT OF TOLERANCE. Do not construct drilled shaft foundations in such a manner that the concrete shaft cannot be completed within the required tolerances. If the contract tolerances are not met, the Contractor may request design changes in the pier to incorporate shafts installed out of tolerance. The Contractor shall bear the costs of redesign and all related costs resulting from approved design changes to incorporate shafts installed out of tolerance. Furnish additional materials and work necessary, including engineering analysis and redesign, to implement corrections of out of tolerance drilled shafts at no expense to the Department.

Provide a proposal on correcting out of tolerance shafts. Do not begin any redesign until the proposal has been reviewed for acceptability and approved by the Engineer in writing.

A Professional Engineer registered in the State of Alaska must perform all redesign to correct for out of tolerance shafts. The Registered Professional Engineer performing the redesign is subject to the approval of the Engineer.

Repair all defects in the shaft identified by Crosshole Sonic Testing. Submit repair procedure for review and approval.

SECTION 516

EXPANSION JOINTS AND BEARINGS

516-1.01 DESCRIPTION. Furnish and install expansion joints and bearings according to the Plans.

516-2.01 MATERIALS. Use materials that conform to the following:

Grout	Subsection 701-2.03
Bridge Seals	Subsection 705-2.03
Expanded Polyethylene	Subsection 705-2.06
Structural Steel	Section 716
Elastomeric Bearing Pads	Subsection 720-2.01
Epoxy Adhesive for Elastomeric Bearing Pads	Subsection 720-2.02
Polytetrafluoroethylene (PTFE) Bearings	Subsection 720-2.03
Water Stops	Section 723

CONSTRUCTION REQUIREMENTS

516-3.01 EXPANSION JOINTS. Locate and form expansion joints as shown on the Plans.

1. Shop Drawings. Provide shop drawings for expansion joints having a total movement of more than 1.75 inches. Submit drawings showing installation procedures and joint assembly details. Install joints only after shop drawings are approved.
2. Manufacture and Fabrication.
 - a. Open Joints. Place open joints where shown on the Plans. Remove forms without chipping or breaking the corners of the concrete. Do not extend reinforcement across an open joint, unless shown on the Plans.
 - b. Filled Joints. Construct expansion joints with expanded polyethylene joint filler as thick as the width of the joint.

Cut the joint filler to the same shape and size as the adjoining surfaces. Fix the joint filler against the concrete surfaces in place to keep the joint filler from displacing when concrete is placed.

Immediately after removing the forms, inspect the expansion joints. Remove concrete or mortar that has sealed across the joint.

- c. Compression Seals. Shape the joint as shown on the Plans. Install the seal according to the manufacturer's instructions.

Install the seal in one piece for the full width of the roadway joint. Install the seal immediately after the curing period of the concrete.

- d. Strip Seals. Use expansion joint strip seals in one piece for the length of the joint. Shape the steel components to conform to the section of the concrete. Ensure that the surface in the finished plane is true and free of warping. When placing the joints, use methods to keep them in correct position during concrete placement that do not affect or modify the structure or joint.

Install the expansion joints according to the manufacturer's recommendations. Adjust the joint opening for the dimensions indicated on the Plans.

- e. Steel Joints. At the shop, shape the plates, angles, or other structural components to conform to the section of the concrete. Fabricate and paint structural shapes to meet the specifications covering those items. Ensure that the surface in the finished plane is true and free of warping. When placing the joints, use methods to keep them in correct position during concrete placement that do not affect or modify the structure or joint. Meet the joint opening dimension shown on the Plans.
- f. Modular Seals. Shape the joint as shown on the Plans. Use expansion joint modular seals in one piece for the length of the joint. Ensure that the surface in the finished plane is true and free of warping. When placing the joints, use methods to keep them in correct position during concrete placement that do not affect or modify the structure or joint.

Install the expansion joints according to the manufacturer's recommendations. Adjust the joint opening for the dimensions indicated on the Plans.

- g. Silicone Expansion Joint Seals. Prepare concrete surface by sandblasting each face until the surface is roughened and all contaminants are removed. Ensure all joint faces are sound, clean, dry, and free of frost immediately prior to sealant application. Install a bond breaking backing material that is configured per the sealant manufacturer's specifications. Install the sealant according to the manufacturer's recommendations.
3. Tolerances. Install expansion joints conforming to the following tolerances:
 - a. Top Surface Profile: 1/4 to 5/8 inch recessed from the finished roadway profile.
 - b. Surface Irregularities (deviation from a 10-foot straight edge): $\pm 1/8$ inch.
 - c. Gap Width: $\pm 1/4$ inch.

516-3.02 BEARINGS. Install bearing at locations shown on the Plans.

1. Shop Drawings. Provide shop drawings showing all details of the bearings and of the materials proposed for use. Fabricate bearings only after shop drawings are approved.
2. Packaging, Handling, and Storage. Prior to shipment from the point of manufacture, package the bearings in a manner to ensure that each bearing will be protected from damage during shipment, handling, and storage. Store the bearings in an area that provides protection from environmental and physical damage. Prior to installation, clean the bearings of all foreign substances.
3. Construction and Installation. Set the bearing plates, sole plates and elastomeric bearing pads as shown on the Plans in the exact position with full and even bearing on properly finished bearing seats.

Finish bearing areas or grind them to elevation and parallel to the roadway grade and parallel to the roadway cross slope or crown, unless otherwise shown on the Plans.

When shown on the plans, place grout under masonry plates. Mix and place grout according to the manufacturer's written recommendations. Clean concrete areas that will contact the grout. Remove loose or foreign matter that would prevent the bond between the mortar and the concrete surfaces.

Tightly pack the grout under the masonry plates to provide full bearing. After placing, cover exposed surfaces of grout pads with a heavy thickness of burlap saturated with water for 3 days. Do not place a load on the grout until the grout has attained a compressive strength of 5000 psi as determined by field specimen.

Locate sole plates to correspond with the temperature during erection. Anchor bearing securely. Adjust the nuts on anchor bolts at the expansion ends of spans to permit the span to move freely. Burr threads sufficiently to prevent removal of nuts.

Apply epoxy adhesive to the bottom surface of the elastomeric bearing pads before placing them. Do not move the pad until the epoxy has cured and full adhesion is achieved. Do not apply epoxy adhesive to elastomeric bearings used in PTFE bearing assemblies.

4. Tolerances. Install bearings conforming to the following tolerances:

- a. Horizontal Position: $\pm 1/8$ inch
- b. Elevation: $\pm 1/8$ inch
- c. Grade and cross slope: $\pm 1/16$ inch per foot.

516-3.03 WATER STOPS. Furnish water stops in continuous, full-length segments without field splices. Do not field splice water stops. Ensure all spliced performed by the Manufacturer are fully vulcanized.

Use spacers, supporting wires, or other approved devices to secure the water stop in the position shown on the plans.

Remove and replace water stops that are out of position or shape at no expense to the Department.

DIVISION 600 – MISCELLANEOUS CONSTRUCTION

SECTION 601

METAL FLUME DOWNDRAINS

601-1.01 DESCRIPTION. Furnish and install tapered inlet assemblies, metal flume downdrains, and anchor assemblies, at the locations shown on the Plans.

601-2.01 MATERIALS. Fabricate tapered inlets and flume downdrains using any one of the base metals listed in AASHTO M 36 or AASHTO M 196. Use a minimum sheet thickness of 0.060 inches. Use steel nuts and bolts, galvanized according to AASHTO M 232.

601-3.01 CONSTRUCTION REQUIREMENTS. Fabricate downdrains according to the details and dimensions shown on the Plans. Weld bulkheads and flume pieces to the inlet assembly to form watertight connections.

Do not use dissimilar metal at any one installation. Anchor assemblies shown on the Plans may be used with an aluminum installation if the anchor assemblies are electrically insulated.

Connect flume downdrain sections together and to the inlet assembly using galvanized bolts as shown on the Plans.

SECTION 602

STRUCTURAL PLATE PIPE

602-1.01 DESCRIPTION. Construct galvanized corrugated steel plate or aluminum alloy plate pipes, at the locations shown on the Plans.

602-2.01 MATERIALS. Use materials that conform to the following:

Pipe	Subsection 707-2.04
Bedding and backfill	Subsection 204-2.01

602-3.01 CONSTRUCTION REQUIREMENTS. Lay field-assembled plate pipes in conformance to the lines and grades approved by the Engineer. Excavation, grading, and backfill must conform to Subsection 204-3.01.

Repair damage to the zinc coating according to AASHTO M 36.

Pre-shape bedding material to fit the lower portion of the pipe. Pre-shape to a depth of one-tenth of the pipe height and wide enough to permit compaction under the haunches. Strutting is not permitted.

When elongated pipes are specified, form the plate sections at the factory so that the pipe's vertical dimension is increased by 5% of the specified diameter.

Provide the Engineer with a copy of the manufacturer's recommendations and instructions and comply with them.

SECTION 603

CULVERTS AND STORM DRAINS

603-1.01 DESCRIPTION. Construct or reconstruct culverts and storm drains (pipe), to the lines and grades shown on the Plans. Install culvert marker posts.

603-2.01 MATERIALS. Use materials that conform to the following:

Bedding and Backfill	Subsection 204-2.01
Joint Mortar	Subsection 705-2.04
Flexible Watertight Gaskets	Subsection 705-2.05
Non-Reinforced Concrete Pipe	Subsection 706-2.01
Reinforced Concrete Pipe	Subsection 706-2.02
Corrugated Steel Pipe and Pipe Arches	Subsection 707-2.01
Bituminous Coated Corrugated Steel Pipe and Pipe Arches	Subsection 707-2.02
Corrugated Aluminum Pipe	Subsection 707-2.03

When Item 603(17), Pipe, is listed in the bid schedule, furnish either Corrugated Steel Pipe (CSP), Corrugated Aluminum Pipe, or Reinforced Concrete Pipe. End Sections for Metal Pipe must be of the same material as the pipe.

When extending in-place metal culverts and/or reattaching end sections with dissimilar metal, provide an electrical insulating material to separate the dissimilar materials. The insulating material must be at least 1/16 inch thick and be approved by the Engineer.

Select pipe for each installation which meets or exceeds the requirements shown on the Plans for height of cover.

Culvert marker posts shall meet the requirements of subsection 730-2.05, Flexible Delineator Posts. The color shall be blue with no other markings. The 2.5 inch by 6 foot post shall be rectangular in cross section with reinforcing ribs capable of withstanding a bending radius of 9 inches.

CONSTRUCTION REQUIREMENTS

603-3.01 GENERAL. Excavation, bedding, and backfill must conform to the requirements of Subsections 204-2.01 and 204-3.01, and the details on the Plans.

603-3.02. LAYING PIPE. Begin the pipe laying at the downstream end of the pipe. Keep the lower segment of the pipe in contact with the shaped bedding throughout its full length. Place bell or groove ends of rigid pipe and outside circumferential laps of flexible pipe facing upstream.

Lay paved or partially lined pipe so that the longitudinal center line of the paved segment coincides with the flow line. Install elliptical conduit and circular conduit reinforced with other than a full circular cage or cages so the orientation of a vertical plane through the longitudinal axis of the conduit does not vary more than 5 degrees from the design orientation.

Repair damaged metallic coating on metal pipe according to AASHTO M 36.

603-3.03 JOINING PIPE.

Make joints watertight. Install flexible watertight gaskets at joints between new sections of pipe and joints between new and existing sections of pipe.

1. Rigid Pipe. Use either bell and spigot or tongue and groove joints. Join pipe sections so that the ends are fully entered and the inner surfaces are reasonably flush and even.

Use one or more of the following joint materials, or any other if approved:

- a. Portland cement mortar
- b. Portland cement grout
- c. Rubber gaskets
- d. Oakum and mortar
- e. Oakum and joint compound
- f. Coupling bands
- g. Preformed plastic sealing compound

Make mortar joints using an excess of mortar to form a bead around the outside of the pipe. Finish the joint smooth on the inside.

For grouted joints, use molds or runners to retain the poured grout. Install rubber ring gaskets to form a flexible, watertight seal. When using oakum, caulk the joint and then seal it with the specified material.

When using Portland cement mixtures, protect the completed joints against rapid drying using suitable covering material.

2. Metal Pipe.

Provide coupling bands that have the same coating and same material as the pipe.

2. Metal Pipe. Join metal pipe firmly using one of the types of coupling bands shown on the Plans and as described below. Provide coupling bands that are no more than two nominal sheet thickness lighter than the pipe being joined and in no case thinner than the minimum sheet thickness of the material. The minimum sheet thickness is 0.048 inches for aluminum and 0.052 inches for steel. Furnish and install flexible watertight gaskets or O-rings as shown on the Plans.

- a. Annular, Spiral, Semi-Corrugated, and Rod and Lug Bands. Provide standard bands as described by ASTM A760 and ASTM B745. Join the pipe so the gap between the pipes is in the center of the band and is no wider than one corrugation width.
- b. Dimple and Bias Bands. Use these band only where it is not possible to use other bands, such as on field-cut pipe ends or joining new pipe to existing pipe. Join the pipe so the gap between the pipes is in the center of the band and is no wider than 2 inches.

3. Polyethylene Pipe. Ensure that polyethylene pipe couplings are corrugated to match the pipe corrugations and that their width is not less than one half the nominal pipe diameter. Install a gasket in all pipe joints; joints between new sections of pipe and joints between new and existing sections of pipe. Except, the end section joint, and where the pipe is manufactured with a locking joint such that the joint seals watertight, a gasket is not required. Use flexible watertight gaskets (ASTM D 1056 2B3) as specified in Subsection 705-2.05.

Furnish all bolted connections on coupling bands with cutwashers placed between the nut and the angle bracket or use nuts with integral washers.

Take up any pipe that is out of alignment, unduly settled, or damaged and re-lay or replace it.

603-3.04 CULVERT MARKER POSTS. Culvert marker posts shall be installed on the approach side of storm drain outfalls 30 inches and smaller, field inlets not in paved parking lots, all end sections to cross culverts, or as directed by the Engineer. Forty two inches of post shall remain above the ground after driving.

SECTION 605
UNDERDRAINS

605-1.01 DESCRIPTION. Construct underdrains and blind drains, underdrain outlets, cleanouts, and marker posts.

605-2.01 MATERIALS. Use materials that conform to the following:

Porous Backfill Material	Subsection 703-2.10
Perforated Concrete Pipe	Subsection 706-2.03
Perforated PVC Pipe	Subsection 706-2.06
Perforated Corrugated Polyethylene Pipe	Subsection 706-2.07
Corrugated Steel Pipe	Subsection 707-2.01
Bituminous Coated Corrugated Steel Pipe	Subsection 707-2.02
Corrugated Aluminum Pipe	Subsection 707-2.03
Gray Iron Casting	Subsection 719-2.02
Marker Post	Subsection 730-2.05

CONSTRUCTION REQUIREMENTS

605-3.01 PIPE INSTALLATION. Excavate trenches to the dimensions and grade required by the Plans or as directed. Place and compact a 3-inch minimum bedding layer of porous backfill material in the bottom of the trench for its full width and length.

Use coupling bands for 6 inch, 8 inch, and 10 inch diameter corrugated underdrain that are 2 piece, 7 inch minimum width and corrugated to match the corrugations of the pipe.

Place perforated pipe with the perforations down. Join pipe end sections securely with the appropriate coupling fittings or bands. Plug or cap up-grade ends of subdrain pipe to prevent entry of soil materials.

After the pipe installation has been inspected and approved, place porous backfill material to a height of 12 inches above the top of pipe. Place and compact the remainder of the porous backfill material as specified in Section 204, to the required height. Fill trench above the porous backfill with specified material.

605-3.02 UNDERDRAIN OUTLETS. Excavate trenches for underdrain outlets to the width and depth shown on the Plans. Lay pipe in the trench with ends firmly joined. Backfill the trench after inspection and approval of the pipe installation.

605-3.03 BLIND DRAINS. Excavate trenches for blind drains to the width and depth shown on the Plans. Fill the trench with specified backfill materials to the depths required by the Plans. Compact all backfill material.

SECTION 610

DITCH LINING

610-1.01 DESCRIPTION. Construct ditch lining at the locations on the Plans or as staked.

610-2.01 MATERIALS. Use stones that are sound and durable, are no larger than 8 inches in greatest dimension, and not more than 50% by weight passing a 3-inch sieve as determined by WAQTC FOP for AASHTO T 27/T 11.

610-3.01 CONSTRUCTION REQUIREMENTS. Excavate to the dimensions shown on the Plans. Place and spread ditch lining materials so that the finished face is reasonably uniform and conforms with the lines and slope shown on the Plans or as directed.

SECTION 611

RIPRAP

611-1.01 DESCRIPTION. Construct riprap bank and slope protection

611-2.01 MATERIALS. Evenly graded stones that are hard, angular, and have no more than 50% wear at 500 revolutions as determined by AASHTO T 96. Apparent specific gravity will be determined by WAQTC FOP for AASHTO T85. 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:

1. Class I 0-50% weighing up to 25 pounds
 0-10% weighing more than 50 pounds

2. Class II 50-100% weighing 200 pounds or more
 0-15% weighing up to 25 pounds
 0-10% weighing more than 400 pounds

3. Class III 50-100% weighing 700 pounds or more
 0-15% weighing up to 25 pounds
 0-10% weighing more than 1400 pounds

4. Class IV 50-100% weighing 2000 pounds or more
 0-15% weighing up to 400 pounds
 0-10% weighing more than 5400 pounds

611-3.01 CONSTRUCTION REQUIREMENTS. 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.

SECTION 618

SEEDING

618-1.01 DESCRIPTION. Establish a perennial stand of grass or other specified living vegetative cover, by clearing, applying topsoil, soil stabilization material(s), and seeding the area(s) shown in the Plans, including new and disturbed area(s), and other area(s) identified by the Engineer. Track the soil and apply seed, mulch, fertilizer, and water. Provide a living ground cover on slopes as soon as possible. Maintain the cover for the term of the Contract.

618-2.01 MATERIALS. Use materials that conform to the Special Provisions and the following:

Seed	Section 724
Fertilizer (20-20-10)	Section 725
Water	Subsection 712-2.01
Soil Stabilization Material	Section 727 (Stabilization Material)
Topsoil	Section 726

CONSTRUCTION REQUIREMENTS

618-3.01 SURFACE PREPARATION. Clear all areas to be seeded of stones 4 inches in diameter and larger and of all weeds, plant growth, sticks, stumps, and other debris or irregularities that might interfere with the seeding operation, growth of grass, or subsequent maintenance of the grass-covered areas.

Make areas to be seeded reasonably free of ruts, holes, and humps.

When specified, apply topsoil according to Section 620.

Roughen the surface to be seeded by grooving the soil in a uniform pattern that is perpendicular to the fall of the slope. Use one or more of the following grooving methods prior to the application of seed:

1. Manual raking with landscaping rakes;
2. Mechanical track walking with track equipment; or
3. Mechanical raking with a scarifying slope board. Form one inch wide grooves spaced no more than six inches apart.

You may round the top and bottom of slopes to facilitate tracking or raking and to create a pleasant appearance, but you may not disrupt drainage flow lines.

618-3.02 SEEDING SEASONS. Seed and fertilize during the local growing season.

Do not seed during windy conditions or when climatic conditions or ground conditions would hinder placement or proper growth.

Seed disturbed areas that require seeding within fourteen days of the permanent cessation of ground-disturbing activities in that area.

Seed between May 15 and August 15, or obtain written approval from the Engineer to seed at a different date.

618-3.03 APPLICATION. Apply seed mix, fertilizer, and mulch (if required) at the rate specified in the Special Provisions. If no seed mix, seed mix application rate, or fertilizer rate are specified in the special provisions, use the recommendations of the Alaska Department of Natural Resources (ADNR) and the Revegetation Manual for Alaska.

Do not seed areas of bedrock, plant beds, and areas indicated on the plans as “no seeding”.

Water and fertilizer required for application are subsidiary to the Seeding bid item.

Apply seed and stabilization material in one application when using the hydraulic method. Apply fertilizer with the hydraulic method. Include the fertilizer with the seed and stabilization material or apply separately.

Do not remove required tags from seed bags.

Upon the Engineer’s approval, Nortran Tufted Hairgrass may be used as a substitute for Slender Wheatgrass (Wainwright) if Slender Wheatgrass (Wainwright) is commercially unavailable. If this substitution is made, apply at the same application rate.

Use any of the following methods:

1. Hydraulic Method.

- a. Furnish and place a slurry made of seed, fertilizer, water, and other components as required by the Special Provisions.
- b. 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 with the pump unit located on the roadbed. Provide enough hose to reach areas not practical to seed from the nozzle unit situated on the roadbed.
- c. If mulch material is required, it may be added to the water slurry in the hydraulic seeder after adding the proportionate amounts of seed and fertilizer. Add seed to the slurry mixture no more than 30 minutes before application.
- d. Mix the slurry and apply it evenly.

2. Dry Methods.

- a. Use mechanical spreaders, seed drills, landscape seeders, aircraft, cultipacker seeders, fertilizer spreaders, or other approved mechanical spreading equipment when seed and fertilizer are to be applied in dry form.
- b. Spread fertilizer separately at the specified rate.

618-3.04 MAINTENANCE AND WATERING. Protect seeded areas against traffic by approved warning signs or barricades. Repair surfaces gullied or otherwise damaged following seeding. Maintain seeded areas in a satisfactory condition until final acceptance of work.

Maintenance includes but is not limited to:

1. Protecting seeded areas against traffic by approved warning signs or barricades and against erosion.
2. Repairing surfaces gullied or otherwise damaged following seeding. Fill erosion gullies 4 inches deep and greater filling the gully to surrounding grade including the portions less than 4 inches deep. Apply and prepare the stabilization material for seeding. Seed repaired area(s). Refer to Subsections 618-3.01 & 3.03.

3. Reseeding areas not showing evidence of satisfactory growth within 3 weeks of seeding and after repairs are complete. Reseed bare patches of soil more than 10 square feet in area. Contact ADNR for advice or corrective measures, when seeded areas are not showing evidence of satisfactory growth.
4. Watering seeded areas for growth of vegetative cover. If in the opinion of the Engineer, too little or too much water is being applied, adjust the amount of water as directed.

Contact ADNR for advice or corrective measures, when seeded areas are not showing evidence of satisfactory growth. You are responsible for retracking, reseeding, refertilizing and remulching areas that do not show satisfactory growth, and those actions are subsidiary.

618-3.05 ACCEPTANCE. The Engineer will perform a visual inspection of seeding to determine final stabilization. During the visual inspection each station and each side of the road will be considered a separate area. The Engineer will accept seeding that has become a vegetative mat with 70% cover density in the inspection area.

Reseed areas that are not accepted.

618-3.06 PERIOD OF ESTABLISHMENT. For each area accepted, the establishment period extends one complete growing season following the date of acceptance. Employ all possible means to preserve/maintain the new vegetative mat in a healthy and vigorous condition to ensure successful establishment. Maintain the vegetative mat, according to Subsection 618-3.04, to not less than the requirements for acceptance, Subsection 618-3.05.

SECTION 619
SOIL STABILIZATION

619-1.01 DESCRIPTION. Furnish, install, and maintain materials to stabilize the soil. Control erosion, sediment, and pollution.

619-1.02 RELATED SECTIONS, REFERENCE ORGANIZATIONS, AND STANDARD DOCUMENTS.

- | | |
|--|-------------|
| 1. Seeding | Section 618 |
| Topsoil | Section 620 |
| Planting Trees and Shrubs | Section 621 |
| Silt Fence | Section 633 |
| Erosion, Sediment, and Pollution Control | Section 641 |
| Soil Stabilization Material | Section 727 |
2. United States Composting Council (USCC):
- Testing Methods for the Examination of Compost and Composting (TMECC)
 - Seal of Testing Assurance Program (STA) documents
3. Erosion Control Technology Council (ECTC)
- Hydraulic Erosion Control Products (HECPs) Specification Chart
Table 1, Performance Chart for Standard HECPs
 - Rolled Erosion Control Products (RECPs) Specification Chart
Table 1, Rolled Erosion Control - Temporary
Table 2, Rolled Erosion Control - Permanent
4. National Transportation Product Evaluation Program (NTPEP)
- Testing and Evaluation of Products Materials and/or Devices

619-1.03 SUBMITTALS. Submit stabilization and erosion, sediment and pollution control performance testing results with certifications for each material, Section 619-2.01 Materials.

- 1) Test compost, all applications, no more than 30 days before installation.
- 2) At a minimum, certificate will include the name of the manufacturer, product name, style number or similar, chemical composition of the material, the fibers, netting, yarn and similar and the weed free status of the material.
- 3) Organic materials shall be accompanied with all applicable health certificates and permits.
- 4) Furnish a Material Safety Data Sheet (MSDS) that demonstrates the product is not harmful to plants, animals, and aquatic life.

619-2.01 MATERIALS. Select stabilization materials, individually or a combination of, matched to the project applications/conditions (sheet flow, concentrated flow, slope, length of slope, access, etc.) providing performance and functional longevity meeting the most restrictive requirements of the Construction General Permit (CGP), the approved Stormwater Pollution Prevention Plan (SWPPP) and Section 641 Erosion, Sediment and Pollution Control.

- | | |
|---|---------------------|
| 1) Mulch | Subsection 727-2.01 |
| • Dry Erosion Control, Stabilization Products | |
| • Hydraulic Erosion Control Products (HECPs) | |
| 2) Matting | Subsection 727-2.02 |

- Rolled Erosion Control Products (RECPs)
- 3) Sediment Retention Fiber Rolls (SRFRs) Subsection 727-2.03
 - Filter Socks
 - Compost Socks
 - Coir Logs
 - 4) Compost Subsection 727-2.04
 - 5) Tackifier Subsection 727-2.05
 - 6) Soil Binders (Polyacrylamide (PAM)) Subsection 727-2.06
 - 7) Geotextile-Encased Check Dams and Sediment Barriers Subsection 727-2.07
 - 8) Sandbag Subsection 727-2.08
 - 9) Manufactured Inlet Protection System Subsection 727-2.09
 - 10) Clear Plastic Covering Subsection 727-2.10
 - 11) Staples Subsection 727-2.11
 - 12) Other stabilization materials submitted to and approved by the Engineer.

Include on the packaging the manufacturer's name, the content, the air dry-weight and the guaranteed chemical analysis of the contents. Ship and deliver to the site in the original, unopened containers.

CONSTRUCTION REQUIREMENTS

619-3.01 GENERAL. Stabilization may include individual or a combination of materials, including but not limited to temporary seeding, mulch, tackifier, staples, matting, stabilizing emulsions, soil binders, dustless sweeping, dust palliatives, and others.

1. Material Storage and Protection. Store materials elevated off the ground and covered protecting them from construction and or damage from the environment including but not limited to:
 - Precipitation
 - Extended ultraviolet radiant including sunlight
 - Chemicals that are strong acids or other
 - Flames and welding sparks
 - Excess temperatures
 - Other environmental conditions that may damage the materials
2. Fabrication.
 - a. Sandbags. Sand bags shall measure 15 inches by 30 inches. Place approximately 1.0 cubic foot of select Material, Type B, in each sandbag sack. Close the open end of the sandbag as recommended by the fabric manufacturer.

619-3.02 SURFACE PREPARATION. Clear all areas to be stabilized of stones 4 inches in diameter and larger and of weeds, plant growth, sticks, stumps, and other debris or irregularities that might interfere with the stabilization operation, growth of cover (where vegetative cover is part of the stabilization operation) or subsequent maintenance of the vegetative-covered area(s).

Smooth the surface of the area(s) to be stabilized; make the areas reasonably free of ruts, holes, and humps; trackwalk if required by the manufacturer; apply the stabilization material to each area.

If specified, apply topsoil to the area to be stabilized before application of the stabilizing material. Section 618 and 620.

619-3.03 APPLICATION. Apply stabilization material, including rate of application, according to the specifications. If not specified, apply according to the manufacturer's requirements. Where manufacturer requirements conflict with the specification, except where the Engineer directs otherwise, apply the material according to the requirements of the manufacturer.

If seeding is specified, except where seed is included in the stabilization material, complete the application of stabilization materials within 24 hours after seed is placed.

Do not use vehicles or equipment which cause rutting or displacement of the subgrade or topsoil.

1. Temporary Seeding. Annual Ryegrass per Subsection 724-2.02, Table 724-1. Apply at a rate of 1/2 lb/1000 SF, minimum, on level ground to a maximum of 1-1/2 lb/1000 SF, maximum, on sloping ground and highly erodible soils. Prepare surface and place seed as noted under Subsection 619-3.02 Surface Preparation and Section 618 Seeding. Confirm application of temporary seeding with the Engineer.
2. Tacking Agents - Tackifiers. Apply tacking agents according to the manufacturer's installation instructions matched to the application providing functional longevity, erosion control effectiveness, and vegetative establishment.
3. Soil Binders. Apply soil binders according to the manufacturer's installation instructions.
 - a. Using Polyacrylamide (PAM) and PAM with Short-Term Mulch:
Apply PAM on bare soils.

Apply PAM and PAM with short-term mulch only where sediment control is in place and complete.

Do not apply PAM and PAM with short-term mulch on saturated ground during rainfall.
 - b. Using Moderate-Term Mulch:
Apply moderate-term mulch according to manufacturer's installation instructions. If the curing period to achieve maximum performance is greater than the time period before precipitation is predicted, or the soil is saturated, do not apply the moderate-term mulch except as approved by the Engineer.
 - c. Using Long-Term Mulch:
Apply long-term mulch according to the manufacturer's installation instructions.
4. Erosion Control Blankets (ECBs). Select blankets, as specified by the manufacturer, to match the slope; and installed according to the manufacturer's instructions rolled out on well prepared soils to assure intimate contact and anchored with staples, stakes and or anchor trenches. Temporary erosion control blankets with 60 percent or greater open area may be installed prior to seeding. Place blankets with less than 60 percent open area immediately after the seeding operation.

Staple matting/ECBs as recommended by the manufacturer for the application.
5. Compost Blankets. Construct compost blankets according to AASHTO R 52-10 and as specified. Use coarse compost and place over bare soil a blanket of 2 inch minimum thickness, except as otherwise specified. Apply material either by hand spreading and or pneumatically. Compost will have no free water visible or produce dust when handled. Place compost before seeding or mix seed with compost.
6. Check Dams. Place check dams as soon as possible and practicable or when and where if directed by the Engineer. Place the check dams perpendicular to channels and construct of a height sufficient to maximize detention while keeping the water in the channel. Place and install check dams according to the Plans and anchor to maintain in effective position.
 - a. Sandbag. Place the initial row in tight contact with the ditchline for the length of the dam. Place each following row centered across the joint between the bags of the lift/row below.
7. Stabilized Construction Entrance. Temporary stabilized construction entrance shall be constructed according to the Plans, prior to beginning any clearing, grubbing, earthwork, or excavation.

When the stabilized entrance no longer prevents track out of sediment or debris, the Contractor shall either rehabilitate the existing entrance to original condition, or construct a new entrance.

When the Plans require a tire wash in conjunction with the stabilized entrance, the Contractor shall include details for the tire wash and the method for containing and treating the sediment-laden runoff as part of the SWPPP. All vehicles leaving the site shall stop and wash sediment from their tires.

8. Sediment Control Barriers. Sediment control barriers shall be installed according to the Plans or manufacturer's recommendations in the areas of clearing, grubbing, earthwork, or drainage prior to starting those activities.
 - a. Sandbag. Place the initial row in tight contact with the surface perpendicular to the slope. Place each following row centered across the joint between the bags of the lift/row below.
 - b. Sediment Retention Fiber Rolls.
 - c. Silt Fence.
 - d. Compost Berm. Construct compost berms according to AASHTO R 51-10. Use coarse compost.
9. Turf Reinforcement Mats. According to manufacturers installation instructions.

619-3.04 MAINTENANCE. Maintain stabilized areas in a satisfactory condition for the term of the Contract, including warranty obligations. Inspect as required by the CGP, approved SWPPP, and Section 641 Erosion, Sediment and Pollution Control and correct any deficiencies immediately. Remove and dispose of temporary measures, including trapped sediment and contaminants, off project at approved locations. Materials manufactured as degradable may be left in place when approved by the Engineer.

Maintenance includes but is not limited to:

1. Protecting stabilized areas against traffic by approved warning signs or barricades.
2. Repairing surfaces gullied or otherwise damaged following application of stabilization material(s).

Where seeding is included as a part of the soil stabilization:

3. Reseeding, as required by Section 618 Seeding. Reapply the stabilization materials correcting the problems of the initial application.
4. Watering, where vegetative growth is part of the soil stabilization, according to Section 618 Seeding.

The Engineer will perform inspection of the stabilization as required in the CGP, Section 641, and the SWPPP. Make repairs as required by same and as directed.

SECTION 620

TOPSOIL

620-1.01 DESCRIPTION. Furnish and spread topsoil where shown on the Plans.

620-2.01 MATERIALS. Use materials that conform to the following:

Topsoil Section 726

620-3.01 PLACING. Spread the topsoil evenly on the designated areas to the depth (after settlement) shown on the Plans. Do not place when the ground or topsoil is frozen, excessively wet, or in a condition detrimental to the work. Keep the roadway surfaces clean of topsoil during hauling and spreading operations.

620-3.02 MAINTENANCE AND REPAIR. Maintain the areas covered by topsoil until subsequent seeding or landscaping is accomplished. Complete any repairs or topsoil replacement, including damage or loss resulting from winter shutdown, without extra compensation.

SECTION 630

GEOTEXTILE FOR EMBANKMENT SEPARATION AND STABILIZATION

630-1.01 DESCRIPTION. Prepare surfaces and furnish and place geotextiles for embankment separation and/or stabilization as shown in the Plans.

630-2.01 MATERIALS. Use materials that conform to the following:

Geotextiles and Sewing Thread Subsection 729-2.01

630-3.01 CONSTRUCTION.

1. Surface Preparation. Prepare surface by removal of stumps, brush, boulders, and sharp objects. Fill holes and large ruts with material shown on the Plans or as approved.
2. Geotextile Placement. Unroll geotextile directly onto the prepared surface. Stretch geotextile to remove any creases or wrinkles. Do not expose geotextiles to the elements for longer than 5 days after removal of protective covering.
 - a. Separation. Lay geotextile for embankment separation parallel to roadway centerline. On horizontal curves, place in segment lengths not exceeding those listed in Table 630-1, with butt ends cut to match and sewn or overlapped. On tangents, straighten the geotextile and sew or overlap butt ends.
 - b. Stabilization. Lay geotextile for embankment stabilization perpendicular to the roadway centerline. Join segments by sewing or an approved bonding or attachment process.

**TABLE 630-1
GEOTEXTILE PLACEMENT ON CURVES**

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

3. Joining. Join geotextile for embankment separation by sewing or overlapping. Join geotextile for stabilization by sewing. Use other attachment methods, if approved.
 - a. Sew seams with a Butterfly or J-Seam. Use a double-thread chain stitch (lock stitch) Bring adjacent sections of geotextile together and fold so that the stitching penetrates four layers of geotextile for the full seam length. Make the stitching line 1-1/4 inches (\pm 1/4 inch) from the folded edge of the seam and at least 1/2 inch from the free edge of the geotextile. Illustrations showing correct stitch formation and seam configurations are provided in Figure 1.2 (page 21) of the FHWA publication, *Geosynthetic Design & Construction Guidelines*, FHWA-HI-95-038, May 1995.
 - b. Overlapped sections must overlap a minimum of 3 feet.
4. Material Placing and Spreading. During placing and spreading, maintain a minimum depth of 12 inches of cover material at all times between the fabric and the wheels or tracks of the construction equipment.

Spread the material in the direction of the fabric overlap. Maintain proper overlap and fabric continuity. If sewn or bonded seams are used, place the cover material and spread in only one direction for the entire length of the geotextile. On weak subgrades spread the cover material simultaneously with dumping to minimize the potential of a localized subgrade failure.

Compact using a smooth drum roller. Do not allow construction equipment to make sudden stops, starts, or turns on the cover material.

5. Geotextile Repair.

- a. Separation. 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.
- b. Stabilization. Sew or bond according to Subsection 630-3.01.3.

SECTION 631

GEOTEXTILE FOR SUBSURFACE DRAINAGE AND EROSION CONTROL

631-1.01 DESCRIPTION. Prepare surfaces and furnish and place geotextiles for subsurface drainage and erosion control as shown in the Plans.

631-2.01 MATERIALS. Use materials that conform to the following, for the class specified in the bid schedule:

Geotextiles and Sewing Thread Subsection 729-2.02

631-3.01 CONSTRUCTION.

1. Surface Preparation. Prepare surface by removing stumps, brush, boulders, and sharp objects. Fill holes and large ruts with material shown on the Plans or as approved.
2. Geotextile Placement. Unroll geotextile directly onto the prepared surface. Stretch geotextile to remove any creases or wrinkles. Do not expose geotextiles to the elements for longer than 5 days after removal of protective covering.
 - a. Subsurface Drainage. In trenches, after placing the drain aggregate, fold the geotextile over the top of the aggregate 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. Anchor the terminal ends of the geotextile using key trenches or aprons at the crest and toe of slope, as shown on the Plans. Other temporary or permanent anchoring methods may be used, subject to approval.
3. Joining. Join geotextile by sewing or overlapping. Joining by bonding or other attachment methods may be used, subject to approval.
 - a. Sew seams with a Butterfly or J-Seam. Use a double thread chain stitch (lock stitch). Bring adjacent sections of geotextile together and fold so that the stitching penetrates four layers of geotextile for the full seam length. Make the stitching line 1-1/4 inches ($\pm 1/4$ inch) from the folded edge of the seam and at least 1/2 inch from the free edge of the geotextile. Illustrations showing correct stitch formation and seam configurations are provided in Figure 1.2 (page 21) of the FHWA publication, *Geosynthetic Design & Construction Guidelines*, FHWA-HI-95-038, May 1995.
 - b. Overlapped sections must overlap a minimum of 3 feet. 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.
4. Material Placing and Spreading. Following placement of the geotextile on the prepared surface, place cover material of the type shown on the Plans. Use methods for placing cover material 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 631-1.

TABLE 631-1

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) of 4 inches minimum thickness.

**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 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.

5. Geotextile Repair. 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.

SECTION 633

SILT FENCE

633-1.01 DESCRIPTION. Furnish, place, maintain, and remove temporary silt fence as shown in the Plans or as directed.

633-2.01 MATERIALS. Use materials that conform to the following:

Geotextile	Subsection 729-2.04
Posts	Wood, steel, or approved synthetic material.

633-3.01 CONSTRUCTION.

1. Post Installation. Place posts a maximum of 8 feet apart and drive a minimum of 18 inches into the ground.
2. Geotextile Placement. Install geotextile on posts in a vertical position and support by a wire mesh fence or self-support system. Set at the height specified in the Contract. Secure the bottom 18 inches of the geotextile on the upslope side of the fence as shown on the Plans. Backfill trench with tamped soil. Join adjacent sections of geotextile only at posts with a minimum of 6 inches overlap.

633-3.02 MAINTENANCE. Maintain the integrity of the fence as long as it is necessary to contain sediment runoff. Inspect daily and correct any deficiencies immediately. Remove and dispose of fence when adequate vegetative growth insures no further erosion of the slopes. Cut off the fabric at ground level and remove the wire and posts. When thickness of trapped sediment is in excess of 4 inches above the ground, either remove sediment from the site or spread sediment uphill of the fence and seed all exposed soil immediately, following the requirements of Section 618.

SECTION 634

GEOGRID SOIL REINFORCEMENT

634-1.01 DESCRIPTION. Furnish and install geogrid material at locations shown on the Plans.

634-2.01 MATERIALS. Use materials that conform to the following:

Geogrid Subsection 729-2.05

CONSTRUCTION REQUIREMENTS

634-3.01 WEATHER LIMITATIONS. Do not expose geogrid to the elements for longer than 14 days after removal of protective covering.

634-3.02 SURFACE PREPARATION.

1. Soft Ground (CBR 1-3). Prepare surface by removal of stumps, brush, boulders, and sharp objects. Fill holes and large ruts with material shown on the Plans or as approved.
2. Firm Ground (CBR >3). Compact and finish subgrade or subbase prior to placement of the geogrid.

634-3.03 GEOGRID PLACEMENT. Unroll geogrid directly onto the prepared surface.

1. Soft Ground. Overlap geogrid panels a minimum of 24 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.
2. Firm Ground. Overlap geogrid panels at all joints a minimum of 12 inches, in the direction that fill will be placed. Tie panels together securely with manufacturer-recommended pins or bars. Hand-tension geogrid and stake to the ground at the edges, overlaps, and in the center of each roll, at 30 foot intervals.

634-3.04 PLACING AND SPREADING COVER MATERIAL. Do not operate equipment on the unprotected geogrid. Spread fill material in the direction of the fabric overlap.

1. Soft Ground. Back dump material onto the geogrid. Spread material ahead with a low ground pressure dozer to the depth permitted.
2. Firm Ground. Maintain a minimum depth of 6 inches of cover material at all times between the fabric and the wheels or tracks of the construction equipment.

Compact using a smooth drum roller. Do not allow construction equipment to make sudden stops, starts, or turns on the cover material.

634-3.05 GEOGRID REPAIR. 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.

SECTION 636

GABIONS

636-1.01 DESCRIPTION. Construct wire gabion bank protection at locations shown on the Plans.

636-2.01 MATERIALS. Use materials that conform to the following:

Wire	Subsection 712-2.13
Gabion Backfill	Subsection 703-2.11

636-3.01 CONSTRUCTION REQUIREMENTS. 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 Section 204 for all excavation and backfill for gabions.

SECTION 640

MOBILIZATION AND DEMOBILIZATION

640-1.01 DESCRIPTION. Perform work and operations necessary to

1. move personnel, equipment, supplies, and incidentals to the project site;
2. establish offices, buildings, and other facilities, except as provided under Section 644;
3. perform other work and operations and pay costs incurred, before beginning construction;
4. complete similar demobilization activities; and
5. furnish required submittals such as as-builts, certificates, payrolls, civil rights reports, and equipment warranties.
6. Comply with the Alaska Department of Labor and Workforce Development (DOLWD) requirements for Worker Meals and Lodging, or Per Diem; as described in their July 25, 2005 memo WHPL #197 (A2) and the State Laborer's and Mechanic's Minimum Rates of Pay (current issue). On Federal-aid projects, PL 109-59, 119 STAT. 1233, Sec. 1409(c) also applies.

Ensure subcontractors comply with the Federal and State DOLWD requirements.

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.

640-2.01 MATERIALS. None.

640-3.01 CONSTRUCTION REQUIREMENTS. None.

640-4.01 EARNED VALUE.

1. When you earn 4% of the original contract amount from other Work elements indicated on the approved Schedule of Values, 40% of the amount indicated for the mobilization and demobilization element on the approved Schedule of Values, or 4% of the original contract amount, whichever is less, will be paid.
2. When you earn a total of 8% of the original contract amount from other Work elements indicated on the approved Schedule of Values, an additional 40% of the amount shown on the approved Schedule of Values for mobilization and demobilization, or an additional 4% of the original contract amount, whichever is less, will be paid.
3. The remaining balance of the amount indicated for the mobilization and demobilization element shown on the approved Schedule of Values will be paid after all submittals, including all closeout submittals, required under the Contract are received and approved.

SECTION 641

EROSION, SEDIMENT, AND POLLUTION CONTROL

641-1.01 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 Alaska Pollution Discharge Elimination System (APDES) Construction General Permit (CGP). The state APDES program is administered by the Department of Environmental Conservation (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.

641-1.02 DEFINITIONS. These definitions apply only to Section 641.

ACTIVE TREATMENT SYSTEM (ATS) OPERATOR. See CGP Appendix C.

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 GENERAL PERMIT FOR EXCAVATION, DEWATERING (Excavation Dewatering Permit). The permit authorizing excavation dewatering discharges from Construction Activities.

ALASKA MULTI-SECTOR GENERAL PERMIT (MSGP). The permit authorizing stormwater discharges associated with Industrial Activity.

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

BEST MANAGEMENT PRACTICES (BMPS). See CGP Appendix C.

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

CONSTRUCTION ACTIVITY. Ground disturbing activity by the contractor, subcontractor or utility company; that may result in erosion, sedimentation, or a discharge of pollutants into stormwater. See CGP Appendix C.

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

U.S. ARMY CORPS OF ENGINEERS PERMIT (COE PERMIT). A COE permit for construction in waters of the U.S. 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). See CGP Appendix C.

ELECTRONIC NOTICE OF TERMINATION (ENOT). See CGP Appendix C.

ENVIRONMENTAL PROTECTION AGENCY (EPA). The 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. See CGP, Appendix C, "Stabilization."

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.

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 Appendix C.

OPERATOR(S). The party(s) responsible to obtain CGP permit coverage. CGP, Appendix C.

1. Contractor – the Contractor is an Operator inside and outside the Project Zone.
2. Department – the Department is an Operator inside the Project Zone.

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. See CGP Appendix C and Section 641-1.04.

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. See CGP Appendix C.

STORM WATER POLLUTION PREVENTION PLAN TWO (SWPPP2). The Contractor's plan for compliance with both the CGP and MSGP construction activities outside the Project Zone.

SUPERINTENDENT. The Contractor's duly authorized representative with authority and responsibility for the overall operation of the Project, and Contractor furnished sites and facilities.

SWPPP AMENDMENT. A modification to the SWPPP. CGP Part 5.0.

SWPPP MANAGER. The Contractor's Qualified Person with authority and responsibility. CGP Appendix C.

SWPPP PREPARER. The Contractor's Qualified Person with authority and responsibility. CGP Appendix C.

TEMPORARY STABILIZATION. See CGP Appendix C. See "Stabilization."

641-1.02.01 REFERENCE. A complete list of websites and documents referenced herein can be found at the DOT&PF Statewide Design and Engineering Services Stormwater webpage.

DEC Permit information can be found at the DEC Division of Water webpage. SWPPP preparation documents can be found at the DOT&PF Design and Engineering Services Stormwater webpage. Construction forms are found at the DOT&PF Design and Engineering Services Construction Forms webpage.

641-1.03 PLAN AND PERMIT SUBMITTALS.

For plans listed in Subsection 108-1.03.5 (SWPPP, HMCP, and SPCC), use the Contractor submission and Department review deadlines identified in this Subsection.

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.

1. Storm Water Pollution Prevention Plan. Submit an electronic copy and one hard copy of the SWPPP to the Engineer for approval. Deliver these documents to the Engineer at least 21 days before beginning Construction Activity. Organize the SWPPP and related documents for submittal according to the requirements of Subsection 641-2.01.2.

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 one hard copy of the revised SWPPP to the Engineer for approval.

After the SWPPP is approved and certified by the Department using Form 25D-109, the Contractor must certify the approved SWPPP using Form 25D-111. See Subsection 641-1.03.4 for further SWPPP submittal requirements.

2. Hazardous Material Control Plan. The HMCP Template can be found at the DOT&PF Construction Forms webpage. The HMCP submittal and review timeline, and signature requirements are the same as the SWPPP.
3. Spill Prevention, Control and Countermeasure Plan. When a SPCC Plan is required under Subsection 641-2.03, submit an electronic copy and one hard copy 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.
4. 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. For Construction Activities outside the Project Zone, the Contractor must use a SWPPP2. Department approval is not needed for a SWPPP2.

After the Department certifies the SWPPP and prior to beginning Construction Activity, submit an eNOI with the required fee to DEC for coverage under the 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 641-3.01.1 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 one hard copy and 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.

5. DEC SWPPP Review. When CGP Part 2.1.3 or 2.1.4, requires DEC SWPPP review:
 - a. Transmit a copy of the Department-approved SWPPP to DEC using delivery receipt confirmation;
 - b. Transmit a copy of the delivery receipt confirmation to the Engineer within seven (7) days of receiving the confirmation; and
 - c. Retain a copy of delivery receipt confirmation in the SWPPP.

6. Local Government SWPPP Review. When local government or the CGP Part 2.1.4, requires local government review:
 - a. Transmit a copy of the Department-approved SWPPP and other information as required to local government, with the required fee. Use delivery receipt confirmation;
 - b. Transmit a copy of the delivery receipt confirmation to the Engineer within seven days of receiving the confirmation;
 - c. Transmit a copy of any comments by the local government to the Engineer within seven days of receipt;
 - d. 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;
 - e. Include a copy of local government SWPPP review letter in the SWPPP; and
 - f. File a notification with local government that the project is ending.

7. 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 are found in the CGP Part 2.7.1. The Contractor must submit an eNOT instead of an eNOI modification when the operator has changed. The new operator must file an eNOI to obtain permit coverage.

641-1.04 PERSONNEL QUALIFICATIONS. Provide documentation in the SWPPP that the individuals serving in these positions meet the personnel qualifications. The Department accepts the following certificates as equivalent to AK-CESCL: CPESC, Certified Professional in Erosion and Sediment Control or CISEC, Certified Inspector in Sediment and Erosion Control, which are found in the CGP Appendix C and repeated below.

Table 641-1.04 Personnel Qualifications

Personnel Title	Required Qualifications
SWPPP Preparer	Current certification as a Certified Professional in Erosion and Sediment Control (CPESC); OR 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. OR

	Professional Engineer registered in the State of Alaska with current certification as AK-CESCL.
Superintendent	Current AK-CESCL or substitute training from CGP Appendix C Qualified Person Table 4
SWPPP Manager	Current AK-CESCL or substitute training from CGP Appendix C Qualified Person Table 4
Active Treatment System Operator	Current AK-CESCL or substitute training from CGP Appendix C Qualified Person Table 4. ATS operator should possess a recognized certification, or professional standing, or who by extensive knowledge, training, and experience has successfully demonstrated the ability to meet the ATS requirement.

641-1.05 SIGNATURE/CERTIFICATION REQUIREMENTS AND DELEGATIONS.

1. eNOI and eNOT. The eNOI, eNOT, and eNOI Modifications 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.
2. 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, eNOI Modifications, and eNOT.

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

3. 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.
4. Signatures and Initials. Certify or initial on the CGP documents and SWPPP forms, wherever a signature or initial is required.

641-1.06 RESPONSIBILITY FOR STORM WATER PERMIT COVERAGE.

1. The Department and the Contractor are jointly responsible for permitting and permit compliance within the Project Zone.
2. The Contractor is responsible for permitting and permit compliance for all construction support activity in the Project Zone and 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. The Contractor shall be responsible for protection, care, and upkeep of all work, and all associated off-site zones. Subsection 107-1.02 describes the requirement to obtain permits, and to provide permit documents to the Engineer.
3. The Contractor is responsible for obtaining an Excavation Dewatering Permit (AKG002000) if construction activities are within 1,500 feet of a DEC-identified contaminated site or groundwater plume.
4. An entity that owns or operates, a commercial plant (as defined in Subsection 108-1.01.4) or material source or disposal site outside the Project Zone, is responsible for permitting and permit compliance. The Contractor has sole responsibility to verify that the entity has appropriate permit coverage. Subsection 107-1.02 describes the requirement to obtain permits, and to provide permit documents to the Engineer.
5. The Department is not responsible for permitting or permit compliance, and is not liable for fines resulting from noncompliance with permit conditions:
 - a. For areas outside the Project Zone;
 - b. For Construction Activity and Support Activities outside the Project Zone; and
 - c. For commercial plants, commercial material sources, and commercial disposal sites.

641-1.07 UTILITY. (Reserved for Regions)

641-2.01 STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS.

1. SWPPP Preparer and Pre-Construction Site Visit.

Use a SWPPP Preparer to develop the SWPPP in accordance with the CGP, DEC and Department SWPPP templates. See Subsection 641-1.02.01 for guidance and templates. 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.

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.

2. Developing the SWPPP.

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

Develop the SWPPP with sections and appendices, according to the DEC CGP SWPPP template and DOT&PF SWPPP template. Include information required by the Contract and described in the CGP Part 5.0. Use SWPPP forms found at the DOT&PF Construction Forms website.

Compile the SWPPP in three ring binders with tabbed and labeled dividers for each appendix. One electronic copy of the SWPPP must be submitted as a single PDF file.

3. SWPPP Considerations and Contents.

a. 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 and document permit compliance according to a SWPPP2.

b. 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:

- (1) Over which each operator has operational control, and;
- (2) Where the Department and Contractor are co-operators.

c. For work outside the Project Zone the SWPPP must identify the entity that has stormwater permit coverage, the operator, and the areas that are:

- (1) Dedicated to the project and where the Department is not an operator; and
- (2) Not dedicated to the project, but used for the project.

d. The SWPPP must meet all CGP requirements. Utilize the DEC CGP SWPPP Template in conjunction with the DOT&PF SWPPP Template to develop the SWPPP.

e. Comply with the CGP Part 1.4.3 Authorized Non-Storm Water Discharges.

f. If the project discharges to a Tier III, Outstanding Natural Resource Water, comply with CGP Part 2.1.6. Submittal deadlines apply prior to filing an eNOI and beginning construction activities. As noted, none have been designated in the state of Alaska as of the issuance of the 2021 CGP.

g. 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. The Contractor is responsible for monitoring and reporting outside the Project Zone.

h. Describe the sequence and timing of activities that disturb soils and BMP implementation and removal. Phase earth disturbing activities to minimize unstabilized areas, and to achieve temporary or final stabilization. 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.

- i. Delineate the site according to CGP Part 4.2.1.
 - j. Minimize the amount of soil exposed and preserve natural topsoil on site, unless infeasible according to the CGP Part 4.2.2.
 - k. Describe methods and time limits, to initiate temporary or final soil stabilization. Comply with stabilization requirements in the CGP Part 4.5.
 - l. If construction will cease during winter months, describe all requirements for winter shutdown according to the CGP Part 4.12.
 - m. Plans for ATS must meet with the requirements in the CGP Part 2.1.5 and 4.6.
 - n. Design all temporary BMPs to accommodate a two year 24-hour storm event. All installed control measures must be described and documented in the SWPPP, according to the CGP Part 5.3.6. All installed BMPs must include a citation from a published BMP Manual, publication, or manufacturers specification used as a source, or include a statement "No BMP Manual was used for this design." If using out of state BMPs follow the instructions in the SWPPP Guide, found at the DOT&PF Stormwater webpage.
 - o. 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. Include all the elements described in the CGP Part 5.3.5, and DEC CGP SWPPP Template Section 5.0.
 - p. Identify the inspection frequency in the SWPPP according to the CGP Part 6.1.
 - q. Linear Project Inspections, described in CGP Part 6.5, are not applicable to this contract.
 - r. 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.
 - s. 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 641-3.03 for more information.
4. Recording Personnel and Contact Information in the SWPPP.
Identify the SWPPP Manager as the Storm Water 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:
- a. Identify that the SWPPP Manager does not have authority to sign inspection reports (unless the SWPPP Manager is also the designated project Superintendent).
 - b. 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 and date of 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 and Form 25D-127.

641-2.02 HAZARDOUS MATERIAL CONTROL PLAN (HMCP) REQUIREMENTS.

Prepare the HMCP using the Department template for the 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.

641-2.03 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:

1. Oil or petroleum products from a spill may reach navigable waters (as defined in 40 CFR 112); and
2. 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.

641-2.04 RESPONSIBILITY AND AUTHORITY OF THE SUPERINTENDENT AND SWPPP MANAGER.

The Superintendent shall certify the SWPPP, inspection reports, and other reports required by the CGP, except the eNOI and eNOT. The Superintendent may not delegate the task or responsibility of signing and certifying these documents.

The Superintendent may assign certain duties to the SWPPP Manager.

1. Ensuring Contractor's and subcontractor's compliance with the SWPPP and CGP;
2. Ensuring the control of erosion, sedimentation, or discharge of pollutants;
3. Directing and overseeing installation, maintenance, and removal of BMPs;
4. Performing inspections; and
5. Updating the SWPPP including adding amendments and forms.

When Bid Item 641.0007.____ is part of the Contract, the SWPPP Manager must be a different person than the Superintendent and must be available at all times to administer SWPPP requirements, and be physically present within the Project Zone or the project office, when construction activities are occurring.

The Superintendent and SWPPP Manager shall be knowledgeable in the requirements of Section 641, the SWPPP, CGP, BMPs, HMCP, SPCC Plan, environmental permits, environmental 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.

641-2.05 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 seed mixture specified in the contract or as directed by the Engineer.

Use soil stabilization material as specified in Section 727.

Use silt fences as specified in Section 729.

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 certified products manufactured in another state, country, or territory. Non-certified straw or straw products manufactured in another state, country, or territory shall not be used. Grass, legumes, or any other herbaceous plants produced as hay, shall not be substituted for straw or straw products.

641-3.01 CONSTRUCTION REQUIREMENTS.

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

1. Before Construction

The following actions must be completed before Construction Activity begins:

- a. The SWPPP Preparer must visit the project, the visit must be documented in the SWPPP using Form 25D-106, and the SWPPP must be developed or amended with findings from the visit.
- b. The SWPPP must be approved by the Engineer on Form 25D-109.
- c. The Contractor must be authorized to begin work by the Engineer.
- d. The Project must have an eNOI for the Department and for the Contractor.
- e. The Department approved SWPPP must be submitted to DEC and Local Government per CGP Part 2.1.2, Part 2.1.4, and Part 2.4.1.
- f. The Contractor has transmitted to the Engineer an electronic copy and at least one hardcopy of the approved SWPPP.
- g. The Delegation of Authority forms 25D-108 and 25D-107 for both the Contractor and Engineer are signed.
- h. Main entrance signage must meet requirements of CGP Part 5.10.2.
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.
- i. Track precipitation according to CGP Part 7.3.9. Submit the method to track precipitation to the Engineer for approval.

2. During Construction.

- a. Delineate the site according to the CGP Part 4.2.1.
- b. Install required BMPs according to the SWPPP prior to the initiation of ground disturbance.
- c. Document subcontractors. Provide a copy of the SWPPP and the CGP to all subcontractors and utility companies before they begin soil disturbing activities, and verify they understand and comply with SWPPP and CGP and:
 - (1) Document all subcontractors and utility companies that may work on the site, according to the CGP Part 5.3.1, and SWPPP Section 1.2.
 - (2) Require subcontractors and utility companies to sign the SWPPP Subcontractor Certification (Form 25D-105). Include in the signed Form in the SWPPP Appendix E.
 - (3) Inform subcontractors and utility companies in a timely manner of SWPPP amendments that affect them. Coordinate with subcontractors and utility companies to protect BMPs, including temporary and final stabilization from damage.

- (4) Notify the Engineer immediately if the actions of any utility company or subcontractor do not comply with the SWPPP and the CGP.
- d. Provide ongoing training to all employees, subcontractors and utility companies, in according to the CGP Part 4.14. Training must:
 - (1) Be given no less than once a month during construction activity;
 - (2) Be documented in the SWPPP Training Log using Form 25D-125. Include the training record in the SWPPP Appendix I.
- e. Protection and Restoration. Comply with Subsection 107-1.11.
- f. Good housekeeping measures to comply with the SWPPP and CGP 4.8.
- g. Control measures. Comply with the SWPPP and CGP Part 5.3.6 including:
 - (1) Maintain BMPs.
 - (2) Comply with requirements of the HMCP and SPCC Plan, if applicable and all local, state and federal regulations that pertain to the handling, storage, containment, cleanup, and disposal of petroleum products or other hazardous materials.
 - (3) Keep the SWPPP and HMCP current (refer to Subsection 641-2.01.3, SWPPP Considerations and Contents).

3. Winter Construction

If winter construction activity occurs, the project must have appropriate BMPs in place CGP Part 4.12.2. Inspections can be reduced to once per month if the project meets the requirements in the CGP Part 6.2.4.

4. Storm Water Discharge 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.

A permit non-compliance is considered any type of pollutant, such as turbidity or petroleum that enters storm water runoff and flows into a receiving water body, MS4, or wetland that is connected to waters of the U.S.

- a. Immediately report the incident to the Engineer verbally;
- b. Report to DEC verbally within 24 hours after the permittee becomes aware of the incident, and;
- c. Report to DEC in writing 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:
 - (1) A description of the noncompliance and its causes;
 - (2) The exact dates and times of noncompliance;
 - (3) If not yet corrected the anticipated time the project will be brought back into compliance, and;
 - (4) The corrective action taken or planned to reduce, eliminate and prevent reoccurrence.
- d. Notify the Engineer immediately if there is incident of noncompliance with COE Permits. The Engineer will notify the COE.

5. 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.

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

- (3) 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.
 - c. Use the HMCP and SPCC Plan (if available) for contact information to report spills to regulatory agencies.
 - d. Implement measures to prevent the reoccurrence of and to respond to such releases.
 - e. Prior to disposal of contaminated material, submit a Contaminated Media Transport and Treatment Disposal Approval Form to DEC Spill Prevention and Response. Dispose as approved by DEC.
 - 6. Corrective Action and Maintenance of BMPs.

Implement maintenance as required by the CGP Part 4.13 and Part 8.0, SWPPP, and manufacturer's specifications, whichever is more restrictive.

 - a. Implement corrective action to comply with the CGP Part 8.0 and the SWPPP.
 - b. Corrective action deadlines and documentation:
 - (1) Corrective actions must be completed according to CGP Part 8.2.
 - (2) Document corrective actions in the Corrective Action Log (25D-112) according to the SWPPP, CGP Part 8.3 and Part 5.9.2.

If a different BMP is installed to correct the condition leading to the corrective action a SWPPP Amendment must be completed.
 - (3) If a corrective action is not completed according to the CGP 8.2, document the conditions in the Corrective Action Log, notify the Engineer, and implement the corrective action as soon as possible.

The Engineer may assign a new complete-by date using a Delayed Action Item Report, Form 25D-113 (DAIR Form), if the contractor is unable to complete the corrective action within the required timeframe. The DAIR Form can only be authorized and completed by the Engineer.
7. Stabilization.
 - a. All Soil Stabilization requirements must be met in accordance with CGP Part 4.5 and the SWPPP.
 - b. 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.
 - c. Apply temporary seed and stabilization measures after preparing the surface to reduce erosion potential and to facilitate germination and growth of vegetative cover according to Section 618.
 - d. Apply permanent seed and stabilization measures after land-disturbing activity has permanently ceased. Comply with the CGP, SWPPP, and the contract Sections 618, 724, and 727.
 - e. Incorporate final or temporary stabilization immediately after installing culverts or drainage structures to satisfy CGP Part 4.5, the SWPPP and the Engineer. Stabilize under any bridges, and in areas upstream and downstream of culverts, drainages and areas disturbed by related construction activities after installation, or before deactivating stream bypass or diversion.
 - f. 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 SWPPP and CGP, Part 4.12.

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

 - (1) Where temporary stabilization activities are precluded by snow cover or frozen ground conditions prior to the anticipated date of fall freeze up, stabilization measures must be initiated as soon as practicable following the actual spring thaw.
 - (2) When winter construction activity is authorized by the Engineer and conducted according to the contract.
8. Ending CGP Coverage.
 - a. The Engineer will determine the date that all the following conditions for ending CGP coverage have been met within the Project Zone:
 - (1) Land disturbing activities have ceased;

- (2) Final Stabilization has been achieved on all portions of the Project Zone, according to the CGP 4.5.2 (including at Department furnished material sources, disposal sites, staging areas, equipment areas, etc.), and;
- (3) Temporary BMPs have been removed.
- b. After the Engineer has determined the conditions have been met for submitting an NOT in accordance to CGP Part 10.2, the Department will:
 - (1) Send written notice to the Contractor with the date that the conditions were met;
 - (2) Submit an eNOT to DEC within 30 days, and;
 - (3) Provide a copy of the eNOT and DEC's acknowledgement letter to the Contractor.
- c. 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.
- d. 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. Insert the eNOT and DEC acknowledgement letter in SWPPP Appendix Q.
- e. The Contractor is responsible for coordinating local government inspections of work and ending permit coverage with local government. See Subsection 641-1.03.6 for more information.

9. Ending BMP Maintenance in the Project Zone.

The Contractor is responsible for continuing inspections, BMP maintenance and SWPPP updates until permit coverage is ended.

10. Transmit final SWPPP.

Transmit one electronic copy of the final SWPPP, including all SWPPP documents, to the Engineer, when the Contractor's eNOT is filed, or within 30 days of the Department's eNOT being filed, whichever is sooner.

641-3.02 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 if applicable 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 according to the CGP Part 9.4.

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.

641-3.03 SWPPP INSPECTIONS, AMENDMENTS, REPORTS, AND LOGS.

Perform inspections, prepare Inspection Reports, and prepare SWPPP Amendments in compliance with the SWPPP and the CGP using Department forms found at the DOT&PF Construction Forms website.

1. Inspection during Construction.

Conduct Inspections according to the schedule and requirements of the SWPPP and CGP Part 6.0. When the project is on a 14 calendar day inspection frequency, conduct Post-Storm Event Inspections within 24 hours of the end of a storm event, as required, in addition to the 14 day predetermined inspection cycle.

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:

- a. One of the inspectors is not on site, access is only by air, and weather delayed or canceled flights;
- b. One of the inspectors is sick;
- c. 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;
- d. 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 in SWPPP Appendix K.

2. Inspection Reports.

Use only the Department 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 in the Inspection Report; do not leave any fields blank.

Refer to the DOT&PF Construction Forms webpage for instruction to complete Form 25D-100.

The Superintendent or SWPPP Manager must review and correct all errors within three days of the date of inspection.

Inspection Reports must be signed by the person described in the CGP Appendix A, Part 1.12 or by a duly authorized representative of that person. Only the Superintendent can certify the Inspection Form.

Insert a Complete-by-Date for each corrective action listed that complies CGP Part 8.2.

Provide a copy of the completed, unsigned Inspection Report to the Engineer by the end of the next business day following the 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. The signed and certified Inspection Report must be provided to the Engineer on the same day the Superintendent signed the form.

The Engineer will sign and certify the Inspection Report and will return the original to the Contractor within three working days if compliant with the CGP and SWPPP.

If the Inspection Report is not compliant with the CGP or SWPPP 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.

When a correction is required to an Inspection Report that was already certified by both the Superintendent and Engineer, follow directions given below:

If subsequent corrections are required for a certified Inspection Report 25D-100, document the corrections in an addendum 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 updated Inspection Report and addendum memo. File the corresponding Inspection Report and memo in the SWPPP Appendix K and update the amendment log. The issuance of an addendum 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.

3. Items and Areas to Inspect.

Conduct inspections of all areas required by the CGP Part 6.4 and SWPPP.

4. 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 in accordance to the CGP Part 6.2.1. At actively staffed sites, inspect within two business days of the end of a storm event that results in a discharge from the site.

5. Winter Shutdown Inspection.

Conduct winter shutdown inspection 14 calendar days after the anticipated fall freeze up date and conditions under the CGP Parts 4.12, 6.2.3, and the SWPPP are met. The Engineer may approve suspension of inspections and waive requirements for updating the Grading and Stabilization Activities Log and Daily Record of Rainfall Form during Winter Shutdown.

Inspections must resume on a regular frequency or reduced inspection frequency identified in the SWPPP, at least 21 days before anticipated spring thaw CGP Part 6.2.3. Resume updating the Daily Record of Rainfall Form at the start of the 21-day spring thaw inspection.

6. 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 if approved by the Project Engineer.

7. SWPPP Amendments and SWPPP Amendment Log.

The SWPPP Amendment Log Form 25D-114 must be filled out by an individual who holds a current AK-CESCL, or equivalent certification. 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:

- a. 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;
- b. If an inspection identifies that any portion of the SWPPP is ineffective in preventing erosion, sedimentation, or the discharge of pollutants;
- c. Whenever an inspection identifies a problem that requires additional or modified BMPs or a BMP not shown in the original SWPPP is added;
- d. If the inspection frequency is modified (note beginning and ending dates);
- e. When there is a change in personnel who are named in the SWPPP, according to Subsection 641-2.01;
- f. When an inspection is not conducted jointly;
- g. When a NOI modification is filed;
- h. When a Noncompliance Report is filed with DEC.

Place all correspondence with DEC, EPA or MS4s in Appendix Q.

Amend the SWPPP 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. All SWPPP Amendments must have an amendment number, be dated, and signed.

Keep the SWPPP Amendment Log current. Prior to a scheduled inspection or submittal of an 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 in Appendix M.

8. Site Maps.

Maintain site maps in accordance with CGP Part 5.3.5 and the SWPPP template 5.0. It is acceptable to have separate site maps for BMPs and grading and stabilization activities.

9. 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.

The Corrective Action Log must document corrective actions required by the conditions listed in the CGP Part 8.0. Document the need for corrective action within 24 hours of either:

- a. Identification during an inspection, or;
- b. Discovery by the Department's or Contractor's staff, a subcontractor, or a regulatory agency inspector;
- c. If a corrective action is 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.

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 in Appendix J of the SWPPP.

10. 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 in Appendix G of the SWPPP.

11. Daily Record of Rainfall.

Use SWPPP Daily Record of Rainfall, Form 25D-115 to comply with CGP Part 7.3.9. Submit a copy to the Engineer with each completed Inspection Report. Keep the Daily Record of Rainfall current in Appendix N of the SWPPP.

12. Staff Tracking Log.

Use the SWPPP Project Staff Tracking Form 25D-127, to identify project staff that are required to be AK-CESCL certified or hold an equivalent qualification CGP Appendix C. Complete this form to document the following positions; Superintendent, SWPPP Manager, Engineer, DOT&PF Stormwater Inspector, and when positions have changed in personnel, either permanent or temporary. Update the SWPPP Project Staff Tracking Form within 24-hours of any changes in personnel, qualifications, or other staffing items related to administration of the CGP or Section 641.

641-3.04 FAILURE TO PERFORM WORK.

The Engineer has authority to suspend work and withhold monies according to Subsections 105-1.01 and 108-1.06 for the reasons listed under Subsection 108-1.06 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 Section 641.

1. 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 Section 641;
 - h. Meet requirements of the CGP, SWPPP, or other permits, laws, and regulations related to erosion, sediment, or pollution control, or;
 - i. Any other requirements established or included in the contract.
2. No additional Contract time or additional compensation will be allowed due to delays caused by the Engineer's suspension of work.

641-3.05 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.

641-4.01 METHOD OF MEASUREMENT.

Item 641(6) 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	641-1.05 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) 641-2.01.1 Name of SWPPP Preparer (2) Not Applicable (3) 641-3.03.8 Sign and Date SWPPP amendments by qualified person (4) 641-3.02 Records maintained at project and made available for review	\$750 per omission	
C	Not Applicable		
D	641-3.03.5 Failure to stabilize a Project prior to fall freeze up.	\$5,000 per Project per year	
E	641-2.01.1 Failure to conduct pre-construction inspections before Construction Activities on all projects greater than 1 acre.	\$2,000 per Project	

Code	Specification Section Number and Description	Deductible Amount in Dollars	Cumulative Deductible Amounts in Dollars
F*	641-3.03. Failure to conduct and record CGP Inspections 641-3.03.1 Personnel conducting Inspections and Frequency 641-3.03.2 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	641-3.01.4 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	641-3.01.3 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	641-3.01.3 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	641-3.04 Failure to comply with the requirements of the CGP, approved SWPPP, and Section 641, except as listed above	\$750 per occurrence for the first day of noncompliance	Additional \$750 for every day the deficiency remains uncorrected

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

- a. the Contractor has previously been notified and subsequent inspection reports repeat the same or similar error,
- b. multiple inspection reports are submitted after the submission due date and the same or similar errors are repeated on multiple overdue reports,
- c. 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.

641-5.01 BASIS OF PAYMENT. See Subsection 641-3.04 Failure to Perform Work, for additional work and payment requirements.

Item 641(6) Withholding. The Engineer may withhold an amount equal to Liquidated Damages, assessed according to Section 641, from payment due the Contractor. Liquidated Damages for violations of the Contract, CWA, CGP, or Consent Decree are determined by the Engineer according to Table 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 Section 641 are paid to the Department, and all requirements according to Subsection 103-1.05 are satisfied.

Payment will be made under:

Pay Item	Pay Unit
641(6) Withholding	Contingent Sum

SECTION 642

CONSTRUCTION SURVEYING AND MONUMENTS

642-1.01 DESCRIPTION. 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 engineering and survey practice.

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

Adjust existing monuments and monument cases to conform to the new elevations.

642-1.02 DEFINITIONS.

1. 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.
2. 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.
3. 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.
4. 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.
5. Surveyor: The Contractor's Professional Land Surveyor, currently registered in the State of Alaska.

642-2.01 MATERIALS.

1. Monument Cases: Use castings meeting AASHTO M 105, Class No. 30A. Coat castings with a bituminous damp-proof coating. Use tops that bear evenly on the frames.
1. 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 2-3/8 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 when the reader is facing north, except for centerline monuments that will be oriented to be read facing up-station.
2. Secondary Monument: A minimum 5/8 inch x 30 inches rebar with a 2-inch aluminum cap attached to the top. Permanently stamp every secondary monument with the Surveyor's registration number, the point/corner identification, and the year set.
4. Digital Measuring Instrument: Nu-metrics, Nitestar DMI (www.ae-traffic.com)

CONSTRUCTION REQUIREMENTS

642-3.01 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 your 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, must 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 2 benchmarks per mile 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. Store the field books in the Engineer's Project Office during periods of non-use.

Perform the following:

1. Staking necessary to delineate clearing and/or grubbing limits.
2. 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.
3. Slope staking.
4. 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.
5. Bridge staking.
6. Setting finishing stakes.
7. Measurement of pay quantities that require measurement.
8. Staking of right-of-way and material source limits.
9. Staking, referencing and other actions required to preserve or restore land monuments and property corners.
5. Other surveying and staking necessary to complete the project.
6. Before work on the Project starts, stake and reference the existing centerline on both sides of the roadway alignment. Stake the existing centerline on tangents at 100 foot, and 50 foot intervals on

curves from the beginning and ending of super-elevation changes when the roadway is no longer at normal crown. Stake sign locations at proper offset. Stakes shall be a minimum of 1 inch x 2 inch x 2 feet and be offset 4 to 8 feet from the shoulder on both sides of the roadway. Extend lath stakes a minimum of 2 feet above ground. Show the offset distance to centerline and the station from the beginning of the project. Maintain staking until the final roadway striping is completed. Staking accuracy work requires an electronic distance measuring instrument (DMI) be installed in the Contractor's vehicle. Calibrate the DMI to roadway alignments as stationed in the Plans before beginning work. Record the calibration and staking information in the field book.

Install a reference sign every 500 feet. These reference signs shall meet the following requirements:

- a. mounted with the base a minimum of 5 feet above the shoulder,
- b. located a minimum of 10 feet from the edge of shoulder,
- c. marked with the station from the beginning of the project, in 6 inch high permanent black lettering with a letter proportion height to width ration of 1:0.6 and a stroke width to height ratio of 1:6, on an orange background.

When the Department has not established the project centerline points but the survey control points were established as a part of the Department's Preconstruction surveys (as detailed on the project Survey Control Sheet) recover these points and use them as the basis for establishing the project centerline. Verify the position of these points and establish new points where required to replace missing points, before clearing, grubbing, or excavation.

Notify the Engineer immediately if a Department-established reference point is discovered to be in error or a reset point is not in harmonious 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 surveying, 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.

642-3.02 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 Department will supply following:

1. Construction Plans and Specifications
2. Design Cross Sections, if any
3. State of Alaska Land Survey Monument Record forms
4. Department's *Construction Surveying Requirements* (one copy)
5. Design centerline grades, unless Item 642(2), Office Engineering is used

Perform the following:

1. Furnish hardbound field books (Level, Cross-Section, Slope Stake, etc.). Use "Rite-in-the-Rain" or similar weather resistant books. Field books become the property of the Department upon completion of the work.
2. 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.
3. Update the index of the appropriate book at the end of each day's work.
4. Reduce, check, and adjust level notes.

5. 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.
6. Enter the grade data, shoulder width and/or ditch distance, stationing, slope, etc., in the slope stake books.
7. Maintain the position and identifying marks of slope stakes and reference points until used for their intended purpose.
8. Correct errors by drawing a line through them and writing the correct entry directly above. Erasures are not allowed.
9. Return field books or copies of the field books to the Project office at the end of each work day or as directed.
10. Provide copies of grade sheets and temporary bench mark elevations to the Engineer 48 hours before beginning work on unclassified excavation or embankment.
11. Ensure that survey crews comply with approved traffic control plans. Coordinate crews activities with the Worksite Traffic Supervisor.
12. Keep a daily survey Party Chief diary, and give a copy of the diary to the Engineer each day. The diary shall contain the following information:
 - a. Date
 - b. Weather
 - c. Crew members' names and duties
 - d. Type and location of work performed
 - e. Hours worked
 - f. Type of equipment used (brand) and date equipment was double centered or "peg" test was performed
 - g. Signature of person in responsible charge
13. Submit the survey field notes for the specific area, relating to monument referencing, before beginning clearing, grubbing, or excavation.

642-3.03 MONUMENTS. Install primary and secondary monuments, as called for in the Plans, at the positions determined by the Department. Reference property markers/corners, monuments, or accessories that may be disturbed or buried during construction. Prepare and record Monument Record Forms in the appropriate Recorder's Office before disturbing monuments. Monument Record Forms may be obtained from the Engineer. Reestablish 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 lost or obliterated. 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 subsection 642-2.01. 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.

Replacing monuments not shown on the Plans will be considered additional work and paid by 642(3), Three Person Survey Party. Those monuments found that are not shown on the Plans will be recognized by the Department when the Surveyor provides timely 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.

The Surveyor must complete and stamp a State of Alaska Land Survey Monument Record form for each primary and secondary monument removed, installed, relocated, or replaced. Provide the required survey information on the form in accordance with 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.

642-3.04 OFFICE ENGINEERING. Calculate finish grades for the roadway as specified according to Plans and/or Specifications. Use information available in the field, on as-builts, or as provided by the Engineer. Perform the work by, or under the responsible charge of, a person registered in the State of Alaska as a Professional Land Surveyor or a Professional Engineer.

642-3.05 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. Begin and end this traverse at different Department-provided control points. Tie into the traverse the primary and secondary monuments placed or replaced and undisturbed Department-provided control points. Do not run the final traverse more than 2.5 miles without a tie to a Department-provided monument/control point. Meet the requirements of a secondary monument for traverse points established during this work. Have the Surveyor sign and stamp a letter that lists each monument and its coordinates and certify that the monuments are each located within 0.2 feet 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.

SECTION 650

ARMOR ROCK

650-1.01 DESCRIPTION. Furnish and stockpile armor rock materials in various gradations to designated stockpile locations on-site, as shown on the Plans.

MATERIALS

650-2.01 ROCK QUALITY. Rock shall be rough, angular, dense, sound and durable. Rounded rock will not be accepted for use on this project. Laboratory tests and visual geologic examinations shall be made to determine acceptability of materials. Rock shall be composed of hard, strong, durable materials that will not flake or deteriorate upon exposure to the action of water or atmosphere; shall not contain cracks, joints, faults, seams, laminations, planes of weakness, or bands of minerals or deleterious materials which would result in breakage during or after placement in the future breakwater; and shall be free of expansive or other materials which would cause accelerated deterioration by exposure to project conditions. Materials shall meet the following test requirements for quality:

1. **Bulk Specific Gravity Range** - All stone shall have a minimum bulk specific gravity, saturated surface dry (SSD), of 2.85 based upon water having a unit weight of 62.4 pounds per cubic foot. The method of test for bulk specific gravity (SSD) shall be ASTM D 6473.
2. **Unit Weight and Absorption** - The stone shall have an absorption value less than 2.5 percent unless other tests and service records show that the stone is satisfactory. The method of test for unit weight and absorption shall be ASTM D 6473, except the unit weight shall be calculated in accordance with Note No. 5 using bulk specific gravity, saturated surface dry.
3. **Petrographic Examination** - Stone shall be evaluated in accordance with ASTM C 295/C 295M. The procedure for examination shall include provisions appropriate for the examination of large stone in section 11 and the procedures required by ASTM D 4992, section 10 Petrographic Examination. The petrographic examination shall be used to identify micro fractures, seams, expansive minerals, or other defects which might cause accelerated deterioration from exposure to a harsh marine environment under freeze thaw conditions. The petrographer shall include a narrative in the report discussing the suitability of the rock for use as shore protection in a marine environment. The narrative shall address any qualities that might cause accelerated deterioration. The petrographic examination shall be done by a qualified petrographer with five or more years of experience in petrography.
4. **Resistance to Freezing and Thawing** - Stone shall have a maximum loss of 10 percent after 80 cycles when tested in accordance with ASTM D 5312/D 5312M. The sample shall consist of at least five pieces per lithologic (rock) unit. Testing shall be conducted on the largest possible rock and the test samples should be sawed so as to include at their edges as much of the surface of the material received for testing as possible. The report shall include "Before" and "After" color photographs as required in section 12.1.7 of the ASTM.
5. **Resistance of Rock to Wetting and Drying** - Stone shall have a maximum loss of 10 percent after 80 cycles when tested in accordance with ASTM D 5313/D 5313M. The sample shall consist of at least five pieces per lithologic (rock) unit. Testing shall be conducted on the largest possible rock and the test samples should be sawed so as to include at their edges as much of the surface of the material received for testing as possible. The report shall include "Before" and "After" color photographs as required in section 11.1.7 of the ASTM.
6. **Abrasion** - Durability of stone shall be verified by testing in accordance with ASTM C 535, with a maximum loss of 20% for Armor Rock when subjected to 1000 revolutions of the testing apparatus.

7. **Accelerated Expansion (Ethylene Glycol)** - Stone shall be evaluated in accordance with COE CRD-C 148-69. Stone shall not exhibit any breakage unless other tests and service records show that the stone is satisfactory.
8. **Tests** - Testing shall be performed by an independent commercial test laboratory currently validated by the United States Corps of Engineers and approved by the Contracting Officer. A current list of commercial laboratories along with the test methods they are validated to perform is available at the Engineering Research and Development Center's Materials Testing Center website:
<http://www.ercd.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/9254/Article/476661/materials-testing-center.aspx>
9. **Rock Quality Acceptance** - All rock will be accepted or rejected at the job site based on test results and visual geologic examination by the Engineer. Test results shall be furnished to the Engineer, 30 days minimum, prior to any transportation of rock. No further laboratory testing of rock will be necessary if results meet the requirements specified, and a continuous visual geologic examination of the rock by the Engineer indicates no change in rock type or quality from rock passing the laboratory tests. Rock exhibiting significant changes in type or quality will be rejected unless additional testing shows that the rock meets the specified requirements. The Contractor shall consider the duration required for performing the required testing during planning and establishing of their construction schedule

Armor Rock from the available material source at the project site has previously been tested for quality and additional rock quality testing is not required in advance of using this source, except as specified below in the event of a significant change in rock type or quality. Lab results indicated that areas within the available material source contain poor quality seams of weathered, fractured and broken rock that will not meet specification for armor rock. These areas shall not be used for the production of armor rock.

The available material source has not been evaluated for the ability to produce the rock within the sizes and gradations specified. The Contractor shall visit the site to fully assess the material source and make all such controlled drilling, blasting and productivity determinations necessary in advance of preparing the bid. Contractor shall coordinate site visits with the COTR.

650-2.02 MATERIALS – ROCK GRADATION. The rock, after processing, shall be angular and conform to the size requirements indicated below. The rock shall be blocky with the length of any piece of armor rock not being greater than 2.5 times the lesser of the breadth or the thickness. Operations including loading, placement and stockpiling shall be conducted in a manner which will prevent breakage.

1. **Class A Armor Rock** – Shall be well graded with weights of individual stones ranging from a maximum of 19,500 lbs. At least 50% of the individual stones shall weigh more than 15,500 lbs., and a minimum stone size of 11,500 lbs.
2. **Class B Armor Rock** – Shall be well graded with 100% smaller than 2,800 lbs., 50%-75% smaller than 2,300 lbs, and 0% smaller than 1,700 lbs.
3. **Class C Armor Rock** – Shall be well graded with 100% smaller than 2000 lbs., 50%-75% smaller than 1,500 lbs. and 0% smaller than 1,100 lbs.
4. **Class D Armor Rock** – Shall be well Graded with 100% smaller than 300lbs., 50%-75% smaller than 225 lbs., and 0% smaller than 160 lbs.

650-2.03 Rock Material Source There is no designated rock material source for this project. An existing available material source at the project site may provide suitable rock. The available material source is located on land owned by Goldbelt, Inc. (Contract Steven Sahlender 907-790-1440). A visual examination of the available material source revealed fractured rock zones and it has not been determined whether rock that meets the specified size can be produced efficiently. The Contractor shall carefully evaluate all potential material sources and production efficiency.

The Contractor shall obtain rock which meets all the requirements specified herein. The Contractor shall identify its proposed rock source within 14-days of contract award. The Contractor shall comply with all federal, state, and local, laws and regulations pertaining to surface mining, safety, and protection of the environment. The Contractor shall be responsible for obtaining all permits and/or easements for the proposed rock source.

Use of the available material source at the project site, on land owned by Goldbelt, Inc., must be authorized by Goldbelt, Inc. in writing and shall comply with all City and Borough of Juneau conditional use permit requirements, available from Goldbelt, Inc.

Development of a new or existing off-site material source for furnishing armor rock may require review by local, state and federal agencies. The Contractor is responsible for investigating and obtaining all necessary reviews and permits from local, state and federal agencies, and for accounting for the time required in their schedule. The Contractor is responsible for all costs and delays caused by any review process and all permit requirements.

CONSTRUCTION REQUIREMENTS

650-3.01 GENERAL. The armor rock shall be procured, sorted, transported and stockpiled at the project site. Existing armor rock stockpiled along the existing road shall be sorted and added to the appropriate class of armor rock stockpile.

650-3.02 PRODUCTION TESTING. The Contractor shall perform the following minimum rock gradation, size, and angularity tests. Samples shall be taken at the source of the materials, and at subsequent points during transport if directed. No failing tests shall count toward meeting the minimum number of representative tests. Tests shall be evenly spaced throughout production. Tests shall be by actual weighing per ASTM D5519, Test Method A. Results shall be provided to the Engineer within 24 hours, or sooner if requested.

1. **Armor Rock** – for all classes of armor rock, at least 2 representative samples shall be taken at the source material and at subsequent points during transport or stockpile. Each sample shall be approximately 50 cubic yards in volume. Tests shall consist of weighing each individual rock within the sample. The total weight of the sample shall be divided by the number of rocks in the sample to determine the average rock weight. Percent smaller by weight shall be determined by dividing the total weight of the sample into the sum of the total weight of the rocks smaller than the specified rock weight. The Engineer shall direct additional gradation testing at no cost due to unacceptable visual examination during production or stockpiling.
2. **Sizing** - The Contractor shall display at least one typical rock in each armor rock class, within easy sight of the quarry loading area and at the stockpile site, to ensure proper sizing. The weight shall be clearly marked on each rock.

650-3.03 SALVAGED ARMOR ROCK. All existing stockpiled armor rock shall be, sorted and tested in accordance with the requirements of Subsections 650-2.02 and 650-3.02. No rock quality analysis is required for salvaged armor rock. Any rock that does not meet the technical specifications for armor rock is considered incidental surplus rock and shall be placed in the incidental surplus stockpile on-site. Excavation of the existing armor rock shall be performed in a manner that causes

minimal disturbance to the underlying embankment. Care shall be taken to prevent deleterious materials from mixing with and/or contaminating the stockpiled material during excavation. Contractor shall not use a means of excavation that will cause damage to the armor rock material.

Salvaged material shall be stockpiled as part of the appropriate class of procured armor rock on-site. The stockpiled material shall be protected from mixing with other construction materials being used for the project. Material shall be handled in a manner that prevents segregation and does not cause damage to the salvaged stone.

650-3.05 ARMOR ROCK STOCKPILE. Armor rock shall be placed in distinct stockpiles at the general locations shown on the plans or in a similar stockpile arrangement approved by the Engineer. The distinct armor rock stockpiles shall be arranged to provide future access to each stockpile without moving stockpile materials to obtain such access. Equipment corridors between stockpiles shall be a minimum of 25 feet wide.

Incidental surplus rock material produced from the on-site available material source and not meeting the gradation requirements for armor rock, shall remain on-site in a stockpile location shown on the plans for future project use. Some incidental surplus rock material may be stored at the available material source location within the R.O.W.. Stockpiled materials located at the available material source shall not block future access to the material source.

All stockpiled material locations shall be located on R.O.W or easements obtained for the project.

Handling Equipment. Individual stones shall be handled in a way to prevent damage. Handling equipment shall be appropriately sized to lift and place stones individually without damage to the stone. Stones damaged during handling shall be re-sorted and stockpiled with the appropriate armor rock class.

DIVISION 700 – MATERIALS

SECTION 701

HYDRAULIC CEMENT AND SUPPLEMENTARY CEMENTITIOUS MATERIALS

701-1.01 GENERAL. Meet the following general requirements for all cementitious materials furnished:

Before using, retest Portland cement stored longer than 3 months in bags or 6 months in bulk for compressive strength, time of setting, and loss on ignition according to AASHTO M 85. Store separately different types or brands of cementitious materials, or cementitious materials from different mills.

Protect cementitious materials from dampness during shipment and storage. Do not use partially set cement or cement which contains caked lumps. Do not use cement salvaged from discarded or used bags.

701-2.01 PORTLAND CEMENT. Meet AASHTO M 85, Type I, II, or III including the low-alkali cement requirement shown in Table 2.

701-2.02 BLENDED HYDRAULIC CEMENT. Meet AASHTO M 240, Type IP, or Type IS. Report the weight of pozzolan and ground granulated blast furnace slag as percent of weight of the total cementitious material. Do not vary the pozzolan and ground granulated blast furnace slag constituent content from the certified value more than ± 5 percent by weight of the total cementitious material. Limit pozzolan in Type IP to fly ash. Meet the replacement limits in Table 701-1

**TABLE 701-1
BLENDED HYDRAULIC CEMENT LIMITS**

Cement Type	Constituent	Percent of Total Cementitious Material by Weight
		Maximum
Type IP	Fly Ash	35%
Type IS	Slag cement	40%

701-2.03 GROUT. Non-shrink, non-corrosive, non-metallic, cement-based grout meeting ASTM C 1107, except develop a 28-day compressive strength of at least 9,000 psi when tested according to AASHTO T 106 or ASTM C 109.

701-2.04 FLY ASH. Meet AASHTO M 295, Class C or Class F, including optional chemical requirements as set forth in Table 2.

701-2.05 GROUND GRANULATED BLAST-FURNACE SLAG. Meet AASHTO M 302, Grade 100 or Grade 120.

701-2.06 SILICA FUME. Meet AASHTO M 307.

701-2.07 DS GROUT. Use drilled shaft (DS) grout conforming to the following requirements:

1. Portland Cement Type I or Type II cement meeting the requirements of Subsection 701-2.01.

2. Fine Aggregate: Use fine aggregate meeting Subsection 703-2.01, except 100 percent passing the No. 4 sieve.
3. Potable Water: Use water meeting the requirements of Subsection 712-2.01.
4. Proportioning: Mix grout in proportions using at least 564 lbs/yd³ of Portland cement, fine aggregate, and with enough water to produce a flowable mixture. Do not exceed 67 gal/yd³ of water.

Thoroughly mix DS grout to a uniform consistency before injecting into soil surrounding drilled shaft casing and filling CSL tubes.

701-2.08 POST-TENSION GROUT. Use pre-packaged thixotropic grout formulated specifically for bonded post-tensioned concrete structures in aggressive exposures.

Ship grout in weather proof packages, plainly marked with the name, weight, and volume of the grout, together with the lot number, date of manufacture, mixing instructions, and the name and address of the manufacturer.

Protect grout against dampness. Do not use grout that has become partially set or which contains lumps of caked grout. Do not use grout salvaged from discarded or used bags. Do not use grout with a total time from manufacture to usage in excess of 6 months unless the manufacturer tests and certifies the product meets the requirements in Table 701-2.

Batch grout using the entire contents of each bag in accordance with all of the manufacturer's written recommendations and instructions.

1. Materials. Use grout that conforms to the following requirements:
 - a. Portland Cement. Type I or Type II cement meeting the requirements of Subsection 701-2.01.
 - b. Potable Water. Use water meeting the requirements of Subsection 712-2.01.
 - c. Fly Ash. Class C or Class F fly ash meeting the requirements of Subsection 711-2.03. Limit fly ash content to a maximum of 20% by weight of Portland cement.
 - d. Ground Granulated Blast Furnace Slag. Grade 120 slag conforming to Subsection 701-2.05. Limit blast furnace slag content to a maximum of 40% of the weight of Portland cement.
 - e. Silica Fume. Silica fume conforming to Subsection 701-2.06. Limit silica fume content to a maximum of 15% of the weight of Portland cement.
 - f. Set Control and Water-Reducing Admixtures. Type D, Type F, and Type G admixtures conforming to AASHTO M 194. Limit Type F and Type G admixtures to 45 oz. per 100 pounds of Portland cement.
 - g. Air Entraining Admixtures. Do not use grout with air entraining admixtures.
 - h. Expansion Causing Admixtures. Do not use grout with expansive cement or expansion causing admixtures that contain aluminum powder or components that produce hydrogen, carbon dioxide or oxygen gas.
 - i. Corrosion Inhibitor Admixtures. Do not use grout with corrosion inhibitor admixtures.
 - j. Pumping Aid Admixtures. Do not use pumping aid admixtures.

2. Physical Properties. Use grout that satisfies the requirements in Table 701-2.

**TABLE 701-2
POST TENSION GROUT**

Property	Requirements	Test Method
Total Chloride Ions	Max. 0.08% by weight of cementitious materials	ASTM C 1152
Setting Time	Min. 3 hours Max. 12 hours	ASTM C 953
Strength	Min 3000 psi after 7 days Min 5000 psi after 28 days	ASTM C 942
Permeability @ 28 days	Max. 2500 Coulombs at 30 V after 6 hours	ASTM C 1202
Volume Change	Maximum 0.0% after 24 hours Maximum +0.2% after 28 days	ASTM C 1090 (modified)*
Expansion	≤ 2.0 % for up to 3 hours	ASTM C 940
Fluidity	a) Immediately after mixing: Min. 9 sec. Max. 20 sec. b) 30 minutes after mixing: Max. 30 sec.	ASTM C 939 (modified)**
Wick Induced Bleed	Max 0.0%	ASTM C 940 (modified)***
Wet Density	Report maximum and minimum obtained test value in pounds per cubic foot	ASTM C 185

* Modify ASTM C1090 to include verification at both 24 hours and 28 days.

** Modify the ASTM C 939 test by filling the flow cone to the top instead of to the standard level. The efflux time is the time to fill a one liter container placed directly under the flow cone.

*** Modify ASTM C940 to conform with the wick induced bleed test as follows:

- (a) Use a wick made of a 20-inch length of ASTM A416 seven-wire 1/2 inch diameter strand. Wrap the strand with 2-inch wide duct or electrical tape at each end prior to cutting to avoid splaying of the wires when it is cut. Degrease (with acetone or hexane solvent) and wire brush to remove any surface rust on the strand before temperature conditioning.
- (b) Condition the dry ingredients, mixing water, prestressing strand and test apparatus overnight at 65° F to 75° F.
- (c) Mix the conditioned dry ingredients with the conditioned mixing water and place 800 ml of the resulting grout into the 1,000 ml graduate cylinder. Measure and record the level of the top of the grout.
- (d) Completely insert the strand into the graduated cylinder. Center and fasten the strand so it remains essentially parallel to the vertical axis of the cylinder. Measure and record the level of the top of the grout.
- (e) Store the mixed grout at the temperature range listed above in (b).
- (f) Measure the level of the bleed water every 15 minutes for the first hour and hourly for two successive readings thereafter.
- (g) Calculate the bleed water, if any, at the end of the three hour test period and the resulting expansion per the procedures outlined in ASTM C940, with the quantity of bleed water expressed as a percent of the initial grout volume. Note if the bleed water remains above or below the top of the original grout height. Note if any bleed water is absorbed into the specimen during the test.

701-2.09 CERTIFICATION. Furnish 5 copies of a Certified Test Report from the manufacturer or an independent testing laboratory containing a list of dimensional, chemical, metallurgical, electrical, physical, and other required test results of the specified material certifying that the product or assembly has passed all specified tests. Include the following:

1. the project name and number;

2. the manufacturer's name;
3. the name of the product or assembly;
4. a complete description of the material;
5. country of origin;
6. the lot, heat, or batch number that identifies the material;
7. all required test results for the specified material from the same lot, heat, or batch defined in Subsection 701-2.09.6;
8. a statement, signed by a person having legal authority to act for the manufacturer or the independent testing laboratory, that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

Tag, stencil, stamp, or otherwise mark all materials or assemblies furnished under certification to the project with the lot number, heat number, batch number, or other appropriate identification, which can be readily recognized and legible, and is identical to the accompanying Certified Test Report.

SECTION 703

AGGREGATES

703-2.01 FINE AGGREGATE FOR CONCRETE. Meet AASHTO M 6, Class A, except as follows:

Delete paragraph 8.2 of AASHTO M 6.

Delete the following methods of sampling and testing:

AASHTO T 11	Amount of Material Finer than No. 200 Sieve
AASHTO T 27	Sieve Analysis
AASHTO T 103	Soundness (freezing and thawing)

And substitute the following:

WAQTC FOP for AASHTO T 27/T 11	Sieve Analysis of Fine and Coarse Aggregates and Material Finer Than No. 200 Sieve in Mineral Aggregates by Washing
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Add the following: Meet AASHTO T 104 using sodium sulfate solution.

In AASHTO M 6, Section 7.1, table entitled “Deleterious Substances Limits”, change the maximum percent of material by mass finer than No. 200 Sieve in a. (concrete subject to surface abrasion), from 2.0 to 3.0.

703-2.02 COARSE AGGREGATE FOR CONCRETE. AASHTO M 80, class B, except as follows:

Delete the following methods of sampling and testing:

AASHTO T 11	Amount of Material Finer than No. 200 Sieve
AASHTO T 27	Sieve Analysis

And substitute the following:

WAQTC FOP for AASHTO T 27/T 11	Sieve Analysis of Fine and Coarse Aggregates and Material Finer Than No. 200 Sieve in Mineral Aggregates by Washing
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Add the following: Meet AASHTO T 104 using sodium sulfate solution.

703-2.03 AGGREGATE FOR BASE AND SURFACE COURSE. Crushed stone or crushed gravel, consisting of sound, tough, durable pebbles or rock fragments of uniform quality. Free from clay balls, vegetable matter, or other deleterious matters. Meet the following requirements:

TABLE 703-1

PROPERTY	BASE COURSE	SURFACE COURSE	TEST METHOD
L.A. Wear, %	50, max.	45, max.	AASHTO T 96
Degradation Value	45, min.	45, min.	ATM 313
Fracture, %	70, min.	70, min.	WAQTC FOP for AASHTO TP 61
Liquid Limit	---	35, max.	WAQTC FOP for AASHTO T 89
Plastic Index	6, max.	10, max.	WAQTC FOP for AASHTO T 90
Sodium Sulfate Loss, %	9, max. (5 cycles)	9, max. (5 cycles)	AASHTO T 104

Meet the following gradations, as determined by WAQTC FOP for AASHTO T 27/T 11:

TABLE 703-2

AGGREGATE FOR BASE AND SURFACE COURSE

Percent Passing By Weight

SIEVE	GRADATION			
	BASE COURSE		SURFACE COURSE	
	C-1	D-1	E-1	F-1
1-1/2 in.	100			
1 in.	70-100	100	100	100
3/4 in.	60-90	70-100	70-100	85-100
3/8 in.	45-75	50-79	50-85	60-100
No. 4	30-60	35-58	35-65	50-85
No. 8	22-52	20-47	23-50	40-70
No. 30	10-33	10-26	13-31	
No. 50	6-23	6-19	10-26	25-45
No. 200	0-6	0-6	8-15	8-20

703-2.04 AGGREGATE FOR HOT MIX ASPHALT PAVEMENT. Process and crush aggregate that is free from clay balls, organic matter, other deleterious material, and not coated with dirt or other finely divided mineral matter. Aggregate used must consist of sound, tough, durable rock of uniform quality.

Remove all natural fines passing a No. 4 sieve before crushing aggregates for Types IV, V, and R mixtures.

Coarse Aggregate (retained on the No. 4 sieve). Meet the following requirements:

L.A. Wear, %	AASHTO T 96	45, max.
Degradation Value	ATM 313	30, min.
Sodium Sulfate Loss, %	AASHTO T 104	9, max. (5 cycles)
Fracture, %	WAQTC FOP for AASHTO TP 61	80, min. (single face)
Flat - Elongated Pieces, %	ATM 306	8, max.
Nordic Abrasion, %	ATM 312	8.0, max.
Absorption, %	AASHTO T 85	2.0, max.

Fine Aggregate (passing the No. 4 sieve). Meet the quality requirements of AASHTO M 29, including S1.1, Sulfate Soundness.

Blended Aggregate. Blend the aggregate fractions to meet the grading requirements of Table 703-3, as determined by WAQTC FOP for AASHTO T 27/T 11. Ensure that the fraction actually retained between any two consecutive sieves larger than the No. 100 sieve is not less than 2% of the total.

Aggregate for Type II, Class A, mix shall not contain more than 10% natural fines (blend sand and mineral filler) added to the crushed aggregate. Aggregate for Types IV, V, and R mixes will not blend back natural sand; shall be non-plastic as determined by WAQTC FOP for AASHTO T 90; shall have a minimum uncompacted void content (Fine Aggregate Angularity) determined by AASHTO T 304, Method A, of 45%.

**TABLE 703-3
BROAD BAND GRADATIONS FOR HOT MIX ASPHALT AGGREGATE**

Percent Passing by Weight

SIEVE	GRADATION					
	Type I	Type II	Type III	Type IV	Type V	Type R
1 in.	100	-	-	-	-	-
3/4 in.	80-90	100	-	-	100	100
1/2 in.	60-84	75-90	100	100	65-90	70-100
3/8 in.	48-78	60-84	80-90	80-95	55-80	50-70
No. 4	28-63	33-70	44-81	55-70	40-60	30-42
No. 8	14-55	19-56	26-70	35-50	< 45	20-32
No. 16	9-44	10-44	16-59	20-40	< 35	15-25
No. 30	6-34	7-34	9-49	15-30	< 25	10-20
No. 50	5-24	5-24	6-36	10-24	< 20	7-15
No. 100	4-16	4-16	4-22	5-15	< 12	5-12
No. 200	3-8	3-8	3-8	4-8	3-8	4-10

Notes:

1. No tolerance is allowed beyond the Broad Band Limits of No. 200 Sieve
2. For Type R, the mix design gradation JMD shall provide a minimum of 8% difference passing the No.4 and No.8 sieve.

703-2.05 AGGREGATE FOR COVER COAT AND SURFACE TREATMENT. Crushed stone or crushed gravel, consisting of sound, tough, durable pebbles or rock fragments of uniform quality. Free from clay balls, vegetable matter, or other deleterious matters, and with no adherent films or coatings of dirt, clay, dust or other deleterious matter that could impede adherence of the bituminous material. Wash the aggregate if necessary. Meet the following requirements:

L.A. Wear,%	AASHTO T 96	45, max.
Degradation Value	ATM 313	50, min.
Sodium Sulfate loss,%	AASHTO T 104	9, max. (5 cycles)
Fracture,%	WAQTC FOP for AASHTO TP 61	90, min. (single face)

At least 15 days before beginning work, submit a representative 30-pound sample of the aggregate and 1-quart sample of the bituminous 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.

Cover Coat Material. Meet the gradation requirements of Table 703-4, as determined by WAQTC FOP for AASHTO T 27/T 11.

**TABLE 703-4
REQUIREMENTS FOR GRADING OF COVER COAT MATERIAL**

Percent Passing By Weight

SIEVE	TYPE 2 COVER	TYPE 3 COVER AGGREGATE		
	AGGREGATE	Grading A	Grading B	Grading C
1/2 in.	--	--	--	100
3/8 in.	100	100	100	90-100
No. 4	85-100	85-100	60-100	10-30
No. 8	--	0-25	0-10	0-8
No. 50	0-20	--	--	--
No. 200	0-1	0-1	0-1	0-1

Surface Treatment Material. Meet the gradation requirements of Table 703-5, as determined by WAQTC FOP for AASHTO T 27/T 11.

**TABLE 703-5
REQUIREMENTS FOR GRADING OF AGGREGATE FOR ASPHALT SURFACE TREATMENT**

SIEVE	GRADING						
	Percent Passing by Weight						
	A	B	C	D	E	F	G
1-1/2 in.	100	--	--	--	--	--	--
1 in.	90-100	100	--	--	--	--	--
3/4 in.	--	90-100	100	--	--	--	--
1/2 in.	0-15	20-55	90-100	100	100	--	--
3/8 in.	--	0-15	40-75	90-100	90-100	100	100
No. 4	--	--	0-15	0-10	10-30	75-100	85-100
No. 8	--	--	0-5	0-5	0-8	0-10	60-100
No. 200	0-1	0-1	0-1	0-1	0-1	0-1	0-10

703-2.06 MINERAL FILLER. Meet AASHTO M 17.

703-2.07 SELECTED MATERIAL. Meet the following requirements for the type specified. Obtain the Engineer's approval for the intended purpose, prior to use on the project.

1. Type A. Aggregate containing no muck, frozen material, roots, sod or other deleterious matter and with a plasticity index not greater than 6 as tested by WAQTC FOPs for AASHTO T 89 and T 90. Meet the following gradation as tested by WAQTC FOP for AASHTO T 27/T 11:

Sieve	Percent Passing by Weight
No. 4	20-55%
No. 200	0-6%, determined on the minus 3-inch portion of the sample

2. Type B. Aggregate containing no muck, frozen material, roots, sod or other deleterious matter and with a plasticity index not greater than 6 as tested by WAQTC FOPs for AASHTO T 89 and T 90. Meet the following gradation as tested by WAQTC FOP for AASHTO T 27/T 11:

Sieve	Percent Passing by Weight
No. 200	0-10% determined on the minus 3-inch portion of the sample

3. Type C. Earth, sand, gravel, rock, or combinations thereof containing no muck, peat, frozen material, roots, sod, or other deleterious matter and is compactable under the provisions of Subsections 203-3.04 or 203-3.05.

703-2.08 FILTER BLANKET. Meet AASHTO M 80, Class A. Meet the following gradation: AASHTO M 43, size No. 467.

703-2.09 SUBBASE. Hard, durable particles or fragments of stone or gravel. Do not use materials that break up when alternately frozen and thawed or wetted and dried. Do not include muck, frozen material, roots, sod, or other deleterious matter. Meet the following requirements:

L.A. Wear,%	AASHTO T 96	50 max.
Liquid Limit	WAQTC FOP for AASHTO T 89	25 max.
Plasticity Index	WAQTC FOP for AASHTO T 90	6 max.
Degradation	ATM 313	40 min.

Meet the grading requirements of Table 703-6 (WAQTC FOP for AASHTO T 27/T 11).

Grading C and Grading D: Crushed aggregate with at least 50% by weight of the particles retained on the No. 4 sieve having at least one fractured face as tested by WAQTC FOP for AASHTO TP 61.

**TABLE 703-6
REQUIREMENTS FOR GRADING FOR SUBBASE**
Percent Passing by Weight

SIEVE	GRADING				
	A	B	C	D	E
4 in.	100	--	--	--	--
2 in.	85-100	100	--	--	--
1 in.	--	--	100	--	--
3/4 in.	--	--	--	100	--
No. 4	20-55	20-55	40-75	45-80	--
No. 16	--	--	20-43	23-50	--
No. 200 *	10 Max.	0-6	4-10	4-12	0-6

* Gradation shall be determined on that portion passing the 3-inch screen.

703-2.10 POROUS BACKFILL MATERIAL. Gravel consisting of crushed or naturally occurring granular material containing not more than 1% clay lumps or other readily decomposed material (AASHTO T 112). Meet the grading requirements of Table 703-7 (WAQTC FOP for AASHTO T 27/T 11).

**TABLE 703-7
REQUIREMENTS FOR GRADING FOR POROUS BACKFILL MATERIAL**

SIEVE	PERCENT PASSING BY WEIGHT
3 in.	100
1 in.	0-10
No. 200	0-5

703-2.11 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).

703-2.12 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 WAQTC FOPs for AASHTO T 89 and T 90. Meet the grading requirements of Table 703-8 as determined by WAQTC FOP for AASHTO T 27/T 11:

**TABLE 703-8
REQUIREMENTS FOR GRADING FOR SAND BLANKET MATERIAL**

SIEVE	PERCENT PASSING BY WEIGHT
3/8 in.	100
No. 4	95-100
No. 200	0-6

703-2.13 STRUCTURAL FILL. Aggregate containing no muck, frozen material, roots, sod or other deleterious matter and with a plasticity index not greater than 6 as tested by WAQTC FOPs for AASHTO T 89 and T 90. Meet the following gradation as tested by WAQTC FOP for AASHTO T 27/T 11:

**TABLE 703-9
REQUIREMENTS FOR GRADING FOR STRUCTURAL FILL MATERIAL**

SIEVE	PERCENT PASSING BY WEIGHT
3 in.	100
3/4 in.	75-100
No. 4	35-65
No. 50	0-30
No. 200	0-6

703-2.14 AGGREGATE FOR ABRASIVE FINISH. Crushed silica sand, oven dried, and stored in moisture-proof bags. Free from clay balls, vegetative matter, or other deleterious matters (AASHTO T 112). Not coated with dirt or other finely divided mineral matter. Meet the grading requirements of Table 703-10 (WAQTC FOP for AASHTO T 27/T 11).

**TABLE 703-10
REQUIREMENTS FOR AGGREGATE FOR ABRASIVE FINISH**

SIEVE	PERCENT PASSING BY WEIGHT
No. 12	100
No. 50	0-5

703-2.15 CRUSHED GLASS. Up to 10% by weight crushed glass (cullet) smaller than 3/8-inch may be uniformly blended with natural soil-aggregate material prior to project delivery and placement. Glass cullet must be free of soil, paper, plastic, metals, organic material and other deleterious and hazardous substances. No more than 2.0% debris should be present as determined by Section X3 of AASHTO M318.

Eligible glass products from which glass cullet might be produced include: food and beverage container glass; plain ceramic or china dinnerware; or building window glass.

Prohibited glass products include: automobile windshields or other glass from automobiles; light bulbs of any type; porcelain products; laboratory glass; television, computer or other cathode ray monitor tubes.

Provide documentation certifying that the glass cullet:

1. Showing the origin of the glass products,
2. Does not contain prohibited materials,
3. Meets debris content requirement.

Uniformly blend glass cullet and natural soil-aggregate and meet the following gradation requirements for the type specified:

TABLE 703-13

Type (Section)	Section/Table
Selected material (203-3.03)	Section 703-2.07
Base course (301)	Table 703-2
Subbase (304)	Table 703-8

For the natural soil-aggregate used in the blend, meet quality requirements as shown in Table 703-1, Section 703-2.07, or Section 703-2.09 for the type specified.

SECTION 705
JOINT MATERIALS

705-2.01 JOINT FILLERS. Meet AASHTO M 213.

705-2.02 JOINT SEALER.

Silicone Joint Sealer	ASTM D 5893
Hot Pour Joint Sealer (Asphalt)	AASHTO M 324, Type IV
Hot Applied Joint Sealer (Concrete)	AASHTO M 282
Hot Pour Joint Sealant (Concrete, Fuel-Resistant)	ASTM D 3581

705-2.03 BRIDGE SEALS.

1. Preformed Strip Seals and Compression Seals. Use preformed seals constructed with only virgin natural polyisoprene (natural rubber) as the raw polymer in the elastomeric compound. Do not use polychloroprene (neoprene). Use steel extrusions meeting ASTM A 709 Grade 36. Galvanize steel extrusions in accordance with Subsection 716-2.07. Use preformed material meeting the following requirements of ASTM D 2000:

M4AA 514 A13B13C12F17

Use a lubricant-adhesive for installing preformed strip seals and compression seals meeting ASTM D4070.

- a. Certification. Furnish 5 copies of a Certified Test Report from the manufacturer or an independent testing laboratory containing a list of dimensional, chemical, metallurgical, electrical, physical, and other required test results of the specified material certifying that the product or assembly has passed all specified tests. Include the following:
 - (1) the project name and number;
 - (2) the manufacturer's name;
 - (3) the name of the product or assembly;
 - (4) a complete description of the material;
 - (5) country of origin;
 - (6) the lot, heat, or batch number that identifies the material;
 - (7) all required test results for the specified material from the same lot, heat, or batch defined in Subsection 705-2.03.1.a.(6);
 - (8) a statement, signed by a person having legal authority to act for the manufacturer or the independent testing laboratory, that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

Tag, stencil, stamp, or otherwise mark all materials or assemblies furnished under certification to the project with the lot number, heat number, batch number, or other appropriate identification, which can be readily recognized and legible, and is identical to the accompanying Certified Test Report.

2. Silicone Expansion Joint Seals. Use materials that conform to the following:

- a. Silicone Joint Sealants.

- (1) Horizontal Joints. Use formed-in-place sealant composed of 100 percent silicone that is self-leveling, cold applied, and two-part formulation meeting the requirements in Table 705-1.

(2) Vertical Joints. Use formed-in-place sealant composed of 100 percent silicone meeting the requirements of ASTM D 5893, Type NS (Non-Sag). Do not use acid cure sealants. Ensure the silicone sealant is compatible with the surface to which it is applied.

b. Bond Breaking Backing Material. Use closed-cell expanded polyethylene foam backer rod meeting the requirements of ASTM D 5249.

**TABLE 705-1
SELF-LEVELING SEALANT REQUIREMENTS**

PROPERTY	REQUIREMENTS	TEST METHOD
Extrusion Rate	Min, 50 mL/minute	ASTM C 1183 (type S)
Specific Gravity	Min. 1.25 Max. 1.35	ASTM D 1475
Joint Elongation	Min. 600%	ASTM D 5329 (modified)*
Joint Modulus (at 100% elongation)	Min. 3 psi Max. 12 psi	ASTM D 5329 (modified)*

* Modify the ASTM D5329 test by using a pull rate of 2 inches per minute and a joint size of 1/2 inch x 1/2 inch x 2 inch.

705-2.04 JOINT MORTAR. Use a mixture of one part Portland cement and two parts approved sand with water as necessary to obtain the required consistency. Use mortar within 30 minutes after its preparation.

705-2.05 FLEXIBLE WATERTIGHT GASKETS.

1. Ring gaskets for rigid pipe and precast manhole sections meeting AASHTO M 198.
2. Ring gaskets for flexible metal pipe meeting ASTM C 443. Continuous flat gaskets for flexible metal pipe meeting ASTM D 1056, Grade 2B3. Use gaskets with a thickness 1/2 inch greater than the nominal depth of the corrugation for bands with projections or flat bands and 3/8 inch for corrugated bands.

705-2.06 EXPANDED POLYETHYLENE. Use closed-cell expanded polyethylene with a density of at least 2.1 lb/ft³ as determined by ASTM D3575 and with a minimum compressive stress of 9 psi at 25% deflection as determined by ASTM D3575.

705-2.07 High Molecular Weight Methacrylate (HMWM) Resin. Meet the following:

Viscosity, min.:	25 cps (Brookfield RVT w/UL adapter, 50 rpm at 75 °F (CA Test 434)
Density:	8.5 to 8.75 lb/gal at 75 °F (ASTM D 1475)
Flash Point, min.:	200 °F PMCC (Pinsky-Martens CC)
Vapor Pressure, max.:	0.04 in. Hg at 75 °F (ASTM D 323)
Tg (DSC), min.:	135 °F (ASTM D 3418)
Gel Time, min.:	60 minutes

Use a promoter/initiator system for the HMWM resin consisting of a metal dryer and peroxide.

SECTION 706

CONCRETE AND PLASTIC PIPE

706-2.01 NON-REINFORCED CONCRETE PIPE. Meet AASHTO M 86.

706-2.02 REINFORCED CONCRETE PIPE. Meet the following:

Round Pipe	AASHTO M 170, "Wall B"
Elliptical Pipe	AASHTO M 207

706-2.03 PERFORATED CONCRETE PIPE. Meet AASHTO M 175.

706-2.04 DRAIN TILE. Meet AASHTO M 178. When specified, provide integral spacer lugs in the pipe spigot to provide for an annular opening and self-centering feature.

706-2.05 PVC PIPE FOR WATER AND SANITARY SEWER SYSTEMS. Use Polyvinyl Chloride (PVC) pipe systems manufactured from a compound that meets ASTM 1784 with a cell classification of 12454B. Ensure the entire pipe system is made of materials with a 150 psi rated working pressure. Use pipe with push on type joints and an exterior size compatible with ductile iron fittings. Meet the following:

PVC Pipe	ANSI/AWWA	C 900 or C905
PVC Fittings	ANSI/AWWA	C 907
Rubber Gasket	ASTM	F477
Joints	ASTM	D3139

706-2.06 PLASTIC PIPE. Semi-rigid, smooth-wall pipe meeting the following:

Polyethylene (PE)	AASHTO M 294, Type S or Type D
Polyvinyl Chloride (PVC)	AASHTO M 264 or M 278
Acrylonitrile-Butadiene-Styrene (ABS)	AASHTO M 264

706-2.07 GALVANIZED STEEL WATER CONDUIT. Meet the following:

Galvanized Pipe	ASTM A 53 or ASTM A 120, galvanized per AASHTO M 111
Galvanized Fittings	ASTM A 234 galvanized per AASHTO M 232

706-2.08 HDPE PIPE FOR WATER AND SANITARY SEWER SYSTEMS. Use high density polyethylene (HDPE) pipe and fittings manufactured from a PE 3408 resin that meets ASTM D3350 with a cell classification of 345464C. Ensure the entire system is made of materials with a 150 psi rated working pressure, except material two inch or less in diameter shall have a 200 psi rated working pressure. Join all pipe and fittings by either butt fusion or flanges as per manufacturers recommendation. No mechanical joints are allowed. Meet the following:

HDPE Pipe 2" or less	ASTM	D2737
HDPE Pipe over 2"	ASTM	F714
Butt Fusion Fittings	ASTM	D3261
Flanged joints	ASTM	D3261

When HDPE pipe is used in arctic applications:

1. Protect by using a thaw wire, control system, and power supply designed by an Electrical Engineer, and meeting the requirements of Section 616; except use heating cable consisting of 10 AWG nickel-plated copper bus wires in a self-regulated polymeric core, with a continuous exposure capability of 150°F;
2. Surround with a minimum of three inch thick polyurethane insulation; and
3. Provide an outer surfacing of 24 gauge galvanized steel or 16 gauge aluminum.

SECTION 707

METAL PIPE

707-2.01 CORRUGATED STEEL PIPE, PIPE ARCHES, AND UNDERDRAINS. Meet AASHTO M 36 for conduits and coupling bands including special sections such as elbows and flared end sections. Meet the specified sectional dimensions and gages. Furnish shop-formed elliptical pipe where specified. Fabricate pipe using one of the following:

1. Zinc-coated steel meeting AASHTO M 218
2. Aluminum-coated steel meeting AASHTO M 274
3. Aluminum-zinc alloy coated steel meeting AASHTO M 289

707-2.02 BITUMINOUS COATED CORRUGATED STEEL PIPE, PIPE ARCHES, AND UNDERDRAINS. Meet AASHTO M 190 for conduits and coupling bands. Meet the specified sectional dimensions, gages, and type of bituminous coating. Fully coat coupling bands with bituminous material. Furnish shop-formed elliptical pipe where specified.

Use the same gage of steel for special sections, such as elbows and flared end sections, as the conduit to which they are joined. Meet the requirements of AASHTO M 190. Use the type of coating and invert paving specified.

Meet the specified minimum size of perforations after coating.

707-2.03 CORRUGATED ALUMINUM ALLOY CULVERT PIPE AND UNDERDRAINS. Meet AASHTO M 196.

707-2.04 STRUCTURAL PLATE CULVERTS. Meet the following:

Steel or iron plates	AASHTO M 167
Aluminum alloy	AASHTO M 219

707-2.05 DUCTILE IRON PIPE FOR WATER AND SANITARY SEWER. Use ductile iron pipe and fittings that are bituminous coated, cement mortar lined, have push on type joints, and a 150 psi working pressure. Meet the following:

Cement mortar lining	ANSI/AWWA	C104
Loose Polyethylene Encasement	ANSI/AWWA	C105 (8 mil when required)
Ductile Iron Fittings	ANSI/AWWA	C110 or C153, and C104
SBR Rubber Gaskets	ANSI/AWWA	C111 (Push on or mech. joint)
Threaded Flange Joints	ANSI/AWWA	C115
Ductile Iron Pipe	ANSI/AWWA	C150 and C151 and C104

707-2.06 SERVICE PIPE. Meet the following:

1. Copper Pipe. Cold drawn, seamless, annealed Type "K" with flare fittings meeting ASTM B 88.
2. Steel Pipe. Standard weight, Grade B, galvanized, welded or seamless pipe meeting ASTM A 53.

707-2.07 GALVANIZED STEEL WATER CONDUIT. Meet the following:

Galvanized Pipe	ASTM A 53 or ASTM A 120, galvanized per AASHTO M 111
Galvanized Fittings	ASTM A 234 galvanized per AASHTO M 232

SECTION 708

PAINTS

708-1.01 GENERAL REQUIREMENTS. Ship paint in strong, substantial containers, plainly marked with the name, weight, and volume of the paint content, together with the color formula, batch number, and the name and address of the manufacturer.

Store materials in a closed weather proof, dry shelter at all times.

Have the paint manufacturer furnish samples of the actual batches of paint supplied for the project for independent laboratory testing of chemical composition.

Use reduction and clean up thinners approved by the coating manufacturer. Measure and document all thinner reduction with records provided to the Engineer. Ship all thinners in their manufacturer's original containers.

708-2.01 PAINT FOR STEEL STRUCTURES.

1. Prime Coat. A single component, moisture cure, polyurethane (SC-MC-U) using zinc dust pigment, meeting the following:

zinc powder	78% by weight, min.
volume of solids	60% min.
zinc in dry film	83% minimum, by weight (ASTM D 521)
weight per gallon	23 pounds, min.
VOCs	3.75 pounds per gallon, max.

2. Intermediate Coat. A single component, moisture cure, polyurethane (SC-MC-U). Pigment color must contrast with the prime coat and the top coat. Meet the following:

micaceous iron oxide (MIO)	3.3 pounds per gallon, min. (ASTM D 5532, Type I)
volume of solids	60% min.
weight per gallon	12.5 pounds min.
VOCs	3.75 pounds per gallon, max.

3. Top Coat. A single component, moisture cure, aliphatic polyurethane (SC-MC-ALIP-U). Pigment color FSS FED-STD-595B, color number 26492. Evaluate the color match as a general match under a daylight source using ASTM D 1729. Meet the following:

micaceous iron oxide (MIO)	3.3 pounds per gallon, min. (ASTM D 5532, Type I)
Volume of solids	60% min.
Weight per gallon	12 pounds min.
VOCs	3.75 pounds per gallon, max.

All coatings must pass the following tests:

Corrosion Resistance, ASTM B 117, Salt Spray Test. Minimum of 5000 hours with less than 1/16 inch creep from scribe. Use 1/8 inch minimum thickness ASTM A 36 steel panels, having SSPC-SP 10 Near White Blast with 1 to 2 mils angular profile.

Accelerated Weathering, ASTM G 53. Minimum 400 hours QUV B bulb with no chalking, cracking, or gloss loss greater than 20%.

Forward Impact, ASTM D 2794. Minimum 150 in-lb impact.

Abrasion Resistance, ASTM D 4060. Less than 90 mg loss on CS-17 wheel, 1 kg/load, 1000 cycles.

Moisture Resistance, ASTM D 4585. Minimum 1000 hours at 100 °F with no change in appearance.

Flexibility, ASTM D 522, Cylindrical Mandrel Bend Test. Bend around 1/2 inch diameter mandrel with no cracking.

Adhesion, ASTM D 4541. Minimum 500 psi on a certified pull test.

Cyclic Weathering, ASTM D 5894. Minimum 5000 hours, 15 cycles with less than 1/16 inch creep from scribe. Use 1/8 inch minimum thickness ASTM A 36 steel panels, having SSPC-SP 10 Near White Blast with 1 to 2 mils angular profile.

708-2.02 PAINT FOR TIMBER. Meet FSS TT-P-19D(1), Paint, Latex (Acrylic Emulsion, Exterior).

708-2.03 PAINT FOR TRAFFIC MARKINGS. Use one of the following:

1. AASHTO M 248, Type F (Alkyd Resin), or
2. FSS TT-P-19D(1) Paint, Latex (Acrylic Emulsion, Exterior), or
3. The current State of Alaska DOT&PF maintenance specification for pavement marking paint.

708-2.04 PAINT FOR CONCRETE. Meet FSS TT-P-19D(1), Paint, Latex (Acrylic Emulsion, Exterior).

SECTION 709

REINFORCING STEEL AND WIRE ROPE

709-2.01 REINFORCING STEEL.

1. Reinforcing Steel Bars. Furnish deformed reinforcing steel bars of the type, grade, and size as specified. For steel reinforcing bars used in bridge structures, use bars meeting ASTM A 706, Grade 60. For all other structures, use bars meeting AASHTO M 31, Grade 60.
2. Headed Reinforcing Steel Bars. Furnish headed reinforcing steel bars meeting the requirements of ASTM A 970, Class HA. Use reinforcing steel meeting Section 709-2.01.1 unless otherwise noted.
3. Epoxy-Coated Reinforcing Steel Bars. Furnish epoxy-coated steel bars meeting the requirements of ASTM 775. Coat epoxy-coated reinforcing steel in an epoxy coating applicator plant certified in accordance with the Concrete Reinforcing Steel Institute (CRSI) Voluntary Certification Program. Use reinforcing steel meeting Section 709-2.01.1 unless otherwise noted.
4. Steel Wire. Furnish plain steel wire of the size specified that meets the requirements of AASHTO M 32.
5. Steel Bar Mats. Furnish deformed steel bar mats of the type, grade, size, and spacing as specified. Unless otherwise noted, furnish steel bar mats meeting the requirements of AASHTO M 54, Grade 60.
6. Steel Welded Wire Fabric. Furnish plain steel welded wire fabric of the size and spacing specified that meets the requirements of AASHTO M 55.
7. Epoxy-Coating Patch Material. Furnish epoxy-coating patch material meeting the requirements of ASTM D 3963.
8. Certification. Furnish 5 copies of a Certified Test Report from the manufacturer or an independent testing laboratory containing a list of dimensional, chemical, metallurgical, electrical, physical, and other required test results of the specified material certifying that the product or assembly has passed all specified tests. Include the following:
 - a. the project name and number;
 - b. the manufacturer's name;
 - c. the name of the product or assembly;
 - d. a complete description of the material;
 - e. country of origin;
 - f. the lot, heat, or batch number that identifies the material;
 - g. all required test results for the specified material from the same lot, heat, or batch defined in Subsection 709-2.01.8.f; and,
 - h. a statement, signed by a person having legal authority to act for the manufacturer or the independent testing laboratory, that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

Tag, stencil, stamp, or otherwise mark all materials or assemblies furnished under certification to the project with the lot number, heat number, batch number, or other appropriate identification, which can be readily recognized and legible, and is identical to the accompanying Certified Test Report.

709-2.02 WIRE ROPE OR WIRE CABLE. Meeting AASHTO M 30, 3/4 inch Type 1, Class A.

709-2.03 BAR SUPPORTS.

1. Precast Mortar Blocks. Provide mortar blocks meeting the following:
 - a. Ensure the mortar blocks have compressive strength at least equal to the strength of the concrete in which the mortar blocks are embedded. Sample and test the mortar for compressive strength according to AASHTO T 106. Each test will be considered to represent no more than 2,500 mortar blocks made of the same mortar and cured under the same conditions.
 - b. Ensure the bearing area of the mortar block is less than 2 inches in each dimension.
 - c. Secure to the reinforcing steel with either a grooved top that will hold the bar in place or a protruding embedded wire that is tied to the reinforcing steel.
2. Metal Supports. Provide metal supports meeting at least one of the following:
 - a. Galvanized after fabrication according to AASHTO M 232 Class D,
 - b. Stainless steel meeting the requirements of ASTM A 493, Type 302, or
 - c. Plastic coated using coatings that do not react chemically with the concrete, have a minimum thickness of 3/32 inch where the support touches the form, do not crack at or above -5°F, and do not deform enough to expose the metal at or below 200°F.
3. Plastic Supports. Provide plastic supports meeting the following:
 - a. Non-porous.
 - b. Chemically inert in concrete.
 - c. Have rounded seats.
 - d. Do not deform under load during normal temperatures.
 - e. Do not shatter or crack under impact loading in cold weather.
 - f. Have at least 25 percent of their gross area perforated.

Do not use plastic supports that prevent complete concrete consolidation in and around the support or require supports less than 1 foot apart along the length of the bar.

SECTION 711

**CONCRETE CURING MATERIALS
AND ADMIXTURES**

711-2.01 CURING MATERIALS.

Burlap Cloth made from Jute or Kenaf	AASHTO M 182
Sheet Materials for Curing Concrete	AASHTO M 171
Liquid Membrane-Forming Compounds for Curing Concrete	AASHTO M 148, Type I, except do not use compounds containing linseed oil.

711-2.02 CHEMICAL ADMIXTURES.

Air-Entraining Admixtures	AASHTO M 154
Water-Reducing Admixtures	AASHTO M 194
Set-Retarding Admixtures	AASHTO M 194
Set-Accelerating Admixtures	AASHTO M 194

711-2.03 FLY ASH. Class C or Class F meeting AASHTO M 295, including optional requirements, except change:

1. Moisture content to 1% maximum.
2. Amount retained on the No. 325 sieve to 30% maximum.

711-2.04 MICROSILICA ADMIXTURE. Meet AASHTO M 307, as modified below:

Table 1 Chemical Requirements

Loss on Ignition, max., %	4.0
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Add the following:

Other compounds, total*, max., %	7.0
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* Includes aluminum, ferric, magnesium, and calcium oxides

Table 3 Physical Requirements

Add the following:

Specific Surface Area, min. (ASTM C 1069)	15 m ² /g
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SECTION 712

MISCELLANEOUS

712-2.01 WATER. Use water in mixing or curing concrete that is clean and free of oil, salt, acid, alkali, sugar, vegetable or other substances injurious to the finished product. Meet the suggested requirements of AASHTO T 26. Use mix water that contains less than 500 parts per million of chlorides as Cl or of sulphates as SO₄. Water known to be of potable quality will not require testing. Where the source of water is relatively shallow, enclose the intake to exclude silt, mud, grass, or other foreign materials.

Use water for irrigating trees, plants, and seeded areas that is free of elements harmful to plant growth.

712-2.02 CALCIUM CHLORIDE. AASHTO M 144.

712-2.03 LIMESTONE. Use limestone containing not less than 85% of calcium and magnesium carbonates. Meet the standards of the Association of Official Agricultural Chemists. Meet the following gradation for agricultural ground limestone suitable for application by a fertilizer spreader:

Sieve	Percent Passing, by Weight, Min.
No. 10	100
No. 20	90
No. 100	50

Use soluble or ground limestone in a hydraulic sprayer. Ground limestone must permit complete suspension of insoluble particles in water.

712-2.04 PRECAST CONCRETE CURBING. Portland cement concrete curb units conforming to the lengths, shapes, and other details of the Plans. Use steel reinforcement, where shown on the Plans, meeting Subsection 709-2.01.

Furnish a depressed or modified section of curb, when shown on the Plans, for driveways, crossing, closures, or for other reasons.

712-2.05 PRECAST CONCRETE MANHOLE SECTIONS. Meet AASHTO M 199, except that the absorption test will not be required. Reject units with cracks and honeycombed or patched areas in excess of 30 square inches.

712-2.06 FRAMES, GRATES, COVERS, AND LADDER RUNGS. Conform to the plan dimensions and to the following materials requirements.

Gray iron castings	AASHTO M 306 and AASHTO M 105, Class 35B.
Carbon-steel castings	AASHTO M 103. Grade is optional.
Structural steel	ASTM A 709
Galvanizing	AASHTO M 111
Malleable iron castings	ASTM A 47. Grade is optional.

712-2.07 CORRUGATED METAL UNITS. Meet AASHTO M 36. When bituminous coating is specified, meet AASHTO M 190, Type A.

712-2.08 GLASS BEADS. Meet AASHTO M 247 Type I, with a moisture resistant coating.

712-2.09 CORPORATION STOPS AND CURB STOPS. Use threaded corporation stops meeting AWWA C800. Use tapped couplings and service saddles as detailed on the Plans and per the manufacturer's recommendations.

712-210 GATE VALVES. All valves must open counter-clockwise, and have ends corresponding to the type of conduit being used.

Valves Larger than 3-inch. Iron body, fully bronze mounted, double disc, parallel seat valves, as manufactured to meet AWWA Specifications C500.

Valves 3-inch and Smaller. Meet ASTM B 62. Solid bronze, wedge disc, non-rising stem, Class 125, with threaded ends.

712-2.11 VALVE SERVICE BOXES. Furnish the specific style box, stem, and cover shown on the Plans. Inscribe cover with "water" or "W". Furnish service box of sufficient length to be adjusted an equal amount above and below the final ground surface. Dip boxes in coal tar pitch.

Furnish special wrenches, keys, or other tools needed to operate valve and to open valve box lid. Furnish a minimum of one of each type for each style and size of box and lid.

Boxes for Valves Larger than 3-inch. Cast iron, not less than 5-1/4 inch shaft, with extension stem adjustable for elevation.

Boxes for Valves, 3-inch and Smaller. Cast iron, not less than 4-1/4 inch shaft, with screw type extension stem.

712-2.12 HYDRANTS. Meet AWWA Specifications C-502, "Dry-Barrel Fire Hydrants". Equip hydrants with 5-inch main valve openings and 6-inch standard mechanical joint hub ends for connection to the auxiliary gate valve. Equip hydrants with an auxiliary gate valve and valve box as shown on the standard details. Use mechanical joints for all connections. Furnish the following types of hose connections, as indicated on the drawings and bid schedule:

Single Pumper Hydrants. Two 2-1/2 inch hose connections and one 4-1/2 inch pumper connection.

Double Pumper Hydrants. One 2-1/2 inch hose connection and two 4-1/2 inch pumper connections.

Furnish hydrants in lengths indicated on the drawings. Furnish hydrants with working parts made of bronze or non-corrodible metal. Paint and coat to meet the cited AWWA Specifications.

712-2.13 GABIONS.

Wire Mesh: Use 11 gage minimum wire, except that the selvedge may be heavier. Meet or exceed ASTM A 641 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.

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.

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 selvages have approximately the same strength as the body of the mesh.

712-2.14 PREFORMED PAVEMENT MARKING TAPE.

1. General Requirements:

- a. ReflectORIZED plastic pavement markings and legends. Furnish a pliant polymer or homogenous preformed ribbon, 60 mils thick and of specified width, containing glass spheres uniformly distributed throughout the entire cross section. Furnish type that is designed to be inlaid on hot asphalt pavement or attached to existing bituminous pavement with a precoated pressure adhesive or liquid contact cement as herein specified.
- b. Use legends and symbols meeting the applicable shapes and sizes in the Alaska Traffic Manual and the Plans.
- c. Ensure that the plastic marker will mold itself to pavement contours, breaks, faults, etc. at normal pavement temperatures and fuse with itself and with previously applied markings of the same composition under normal conditions of use.

2. Composition Requirements: Furnish marker with the following materials uniformly distributed throughout its cross-sectional area, and with a reflective layer of beads bonded to the top surface:

<u>Material</u>	<u>(Composition by Weight, min.)</u>
Resins & Plasticizers	20%
Pigments	30%
Graded Glass Beads	25%

3. Physical Requirements:

- a. Tensile Strength. Minimum tensile strength of 100 psi when tested according to ASTM D 638.
- b. Plastic Pull Test. A test specimen made by cutting two 1-inch by 3-inch pieces of the plastic and attaching a 1-inch by 1-inch area at the end of each piece to the other, must support a dead weight of 4 pounds for not less than 5 minutes at a temperature between 70 °F and 80 °F.
- c. Pigmentation. Select and blend the pigments to provide a marking film which includes titanium dioxide for white markers and medium chrome yellow for yellow markers meeting standard highway colors through the expected life of the film.
- d. Glass Beads. Colorless glass with a minimum index of refraction of 1.50 when tested using the liquid oil immersion method. Use beads of size and quality to meet the performance requirements for the plastic.
- e. Skid Resistance. Meet a minimum skid resistance value of 40 BPN for the surface of the plastic using ASTM E 303.

- f. Reflectance. Meet the following initial minimum reflectance values for white and yellow films at 0.2° and 0.5° observation angles and 86.0° entrance angle using FSS FED-STD-370. Use a test distance of 50 feet and a 2-foot x 2.5-foot rectangular sample. Express specific luminance (SL) as millicandelas per ft² per foot candle.

Use an angular aperture of both the photoreceptor and light projector of 6 minutes of arc. Use the geometric center of the sample as the reference center and the reference axis perpendicular to the test sample.

Observation Angle	White		Yellow	
	0.2°	0.5°	0.2°	0.5°
Specific Luminance	550	380	410	250

- g. Reflectivity Retention Tests. Meet the following test requirements:

- (1) Taber Abraser Simulation Test. Using a taber abraser with an H-18 wheel and a 125-gram load, inspect the sample at 50, 100 and 200 cycles, under a microscope, to observe the extent and type of bead failure.

No more than 10% of the beads may be lost due to popout and the predominant mode of failure must be “wear down” of the beads.

- (2) Qualitative Test. Judge bead bond strengths under a microscope with a magnification of 5X. The beads when removed must show a portion of the polymer bead bond retained with the beads.

- h. Certification. In lieu of running the tests required by this Subsection, provide a certification from the manufacturer stating the product conforms to these requirements.

- i. Effective Performance Life. Provide a neat, durable marking that will not flow or distort due to temperature if the pavement surface remains stable.

The plastic must be weather resistant and through normal traffic wear, show no appreciable fading, lifting or shrinkage and show no significant tearing, roll back, or other signs of poor adhesion.

4. Application. Use a vendor-furnished mechanical applicator for the installation of a 4-inch wide pressure sensitive adhesive coated material. Provide the mechanical applicator on location for the duration of the installation period. Ensure that a manufacturer's representative is present during the time of the installation to provide technical assistance.

712-2.15 RAISED AND RECESSED PAVEMENT MARKERS. Use reflectors for both raised and recessed pavement markers consisting of an acrylic plastic shell filled with tightly adherent potting compound. Use shells containing one or two glass-covered prismatic reflective faces as called for on the Plans to reflect incidental light from a single or opposite directions.

- Shell. Molded Methyl Methacrylate meeting ASTM D 788, Gr. 8.
- Overall Dimensions. 4 x 2 x 3/8 inches.
- Reflective Surface. Each reflective surface must have a minimum area of 3-1/4 in² and be located on a 30-degree angle from a horizontal plane.

4. Optical Requirements. Meet the following minimum optical requirements of the reflective faces for an observation angle of 0.2 degrees, with the incident light parallel to the base of the reflector:

Horizontal Entrance Angle	Specific Intensity*		
	White	Yellow	Red
0 degrees	3	1.8	0.75
20 degrees	1.2	0.72	0.30

*Candelas per footcandle of illumination at the reflector on a plane perpendicular to the incident light.

5. Adhesive. Install pavement markers with an epoxy adhesive recommended by the marker manufacturer and approved by the Engineer.
6. Color. Match the color of the raised pavement markers to the color of the marking for which they supplement, substitute, or serve as a positioning guide.
7. Filler. Use a potting compound filler selected for strength, resilience, and adhesion.

Bond thin, smooth, untempered glass to the prismatic reflective faces to provide an extremely hard and durable abrasion resistant surface.

712-2.16 TEMPORARY RAISED PAVEMENT MARKERS FOR SHORT-TERM OPERATIONS, SEAL COATS, AND SURFACE TREATMENTS.

1. Marker. L-shaped polyurethane body with retroreflective tape on the top vertical section, with a self-adhesive base. Reflectinize both faces of the yellow marker and one face of the white marker. Make the marker body of 60 mil minimum thickness polyurethane meeting Table 712-1 with vertical leg approximately 2 inches high by 4 inches wide and base approximately 1-1/4 inch wide.

TABLE 712-1

PROPERTY	RESULT	ASTM TEST METHOD
Specific Gravity (min.)	1.19	D 792
Hardness	80A	D 2240
Tensile Strength (psi, min.)	4600	D 412
Ultimate Elongation (% min.)	330	D 412
Modulus @ 300% (psi, min.)	1000	D 412
Stiffness		
@ -20 °F (psi, min.)	1700	D 1053
@ 72 °F (psi, min.)	900	D 1053
Compression Set		
22 hrs @ 160 °F max. %	65	D 395
Taber Abrasion CS17 wheel wt loss mg/1000 cycles	3	----

2. Reflective Tape. Metalized polycarbonate microprism retroreflective material with acrylic backing or equal, a minimum 1/4-inch wide by 4 inches long. Provide the minimum optical performance shown in Table 712-2, for an observation angle of 0.2 degrees.

TABLE 712-2

Horizontal Entrance Angle	Specific Intensity *	
	White	Yellow
0 degrees	3.5	3.0
30 degrees	2.7	1.7

*Candelas per footcandle of illumination at the reflector on a plane perpendicular to the incident light.

3. Protective Cover. Where chip seals, slurry seals or tack coats are to be utilized after placement of the temporary raised pavement markers, furnish markers with a protective cover made of clear flexible polyvinyl chloride.
4. Adhesive. Pressure-sensitive material, a minimum of 1/8 inch thick and 3/4 inch wide, factory-applied to the marker base with release paper.

712-2.17 METHYL METHACRYLATE PAVEMENT MARKINGS.

1. Quality Requirements: Use a marking material formulated for the application type specified. Use a marking material manufactured from new materials and free from dirt and other foreign material. Use a methyl methacrylate based resin system for part “A”. Use benzoyl peroxide system for part “B”.

Extruded or Stenciled Application: Material formulated for extruded or direct stenciled application with factory intermix beads and anti skid aggregate, and the application of additional surface applied beads.

Submit a manufacturer certification for both the methyl methacrylate material, glass beads and anti-skid aggregate to ensure that the materials furnished conform to these Specifications.

2. Performance Properties:
 - a. No Track Time: Material must be track free after 15 minutes when applied at 40 mils (ASTM D 711).
 - b. Hardness: Shore Durometer, A-1, 80 minimum after 24 hours.
 - c. Tensile Strength: At break, minimum 125 psi (ASTM D 638).
 - d. Percent Elongation: Minimum 20% (ASTM D 638).
 - e. Water Absorption: Maximum 0.5% (ASTM D 570).
 - f. Chemical Resistance: The material must show no effect after 7-day immersion in anti-freeze, motor oil, diesel fuel, gasoline, calcium chloride, sodium chloride or transmission fluid.
 - g. Ultra-violet Light: Ultra-violet light must have no effect.
 - h. Skid Resistance: Minimum 45 units, British pendulum (ASTM E 303).
 - i. Reflectivity: 200 millicandelas, minimum initial
 - j. Viscosity: Spray Material: 5 - 12 Pa*s (ASTM D 2196 Method B, LV Model, Spindle #4 at 60 RPM).
 - k. Color: Yellow, PR-1 chart, 33538 Federal Yellow.
White, minimum daylight reflectance of 84.
3. Composition: The composition is at the discretion of the manufacturer, but must be essentially comprised of resins, reactive monomers, pigments, plasticizer, benzoyl peroxide, aggregate and glass beads. When mixed in the stated ratio, the material must cure to 99% minimum by weight and volume solids.

712-2.18 GLASS BEADS FOR METHYL METHACRYLATE PAVEMENT MARKINGS. Use the type and amount of beads specified in writing by the marking material manufacturer necessary to meet the specified

performance requirements. The written certification will note the bead coating is compatible with the marking material binder.

1. Bead Manufacturer and Type.
 - a. Swarco, Megalux-Beads or
 - b. Approved equal beads

Approved Equal Beads. Equal beads will demonstrate:

- (1) Bead coatings compatible with marking materials. Marking Material Manufacturer will certify compatibility.
- (2) Lasting retro reflectivity.

712-2.19 LOW-VISCOSITY RESIN. Meet AASHTO M 235, Type IV, Grade 1, with the following revisions:

Amend Table 1 as follows:

Replace "2.0[20]" with "0.105[1.05]" in the row labeled "Grade 1, max".

712-2.20 CONCRETE ANCHORS.

1. Anchor Bolts. Use galvanized anchor bolts meeting ASTM A 307, Grade A or ASTM F1554, Grade 36. Hot-dip galvanize anchor bolts in conformance with AASHTO M 232.
2. Coil Anchor Inserts. Use 1-inch diameter galvanized inserts with a minimum safe working load of 7,500 pounds. Hot-dip galvanize anchors according to AASHTO M 111 or AASHTO M 232.
3. Threaded Anchor Inserts. Use 1-inch diameter galvanized ferrule inserts with a minimum safe working load of 6,500 pounds. Hot-dip galvanize anchors according to AASHTO M 111 or AASHTO M 232.

712-2.21 EPOXY FOR BONDING DOWELS. Use an epoxy cartridge system appropriate for the service temperature and ambient concrete temperature at the time of installation.

Use epoxy cartridge systems that meet the requirements of the "Acceptance Criteria for Adhesive Anchors in Masonry Elements," AC58, by the International Code Council Evaluation Service (ICC-ES) including the suitability requirements for creep, in-service temperature, dampness, freezing and thawing, and seismic tests.

SECTION 715
STEEL FOR PILES

715-2.01 SCOPE. Steel used for Structural Steel Piling and Sheet Piling.

715-2.02 GENERAL REQUIREMENTS. Furnish steel piles of the dimensions, weights, cross-sections, and grades specified. Satisfy the impact test requirements of Subsection 716-2.02. Meet the following:

1. Structural Steel HP Piling. Furnish "HP" shape piles meeting ASTM A 709, Grade 50T3.
2. Structural Steel Pipe Piling. Furnish pipe piles meeting one of the following:
 - a. American Petroleum Institute (API) 5L X52 PSL2.
 - b. ASTM A 709, Grade 50T3 fabricated and monogrammed according to API 2B
 - c. ASTM A 709, Grade 50T3 fabricated according to the following:
 - (1) General. Fabricate pipe piling using coiled steel with one helical seam weld. Use skelp material that does not contain repair welds. Use skelp having a width not less than 0.8 times the outside diameter of the pipe and not greater than 3.0 times the outside diameter of the pipe. Form pipe when the steel temperature is below 400°F. Locate junctions of skelp end welds and the helical seam welds at distances greater than 1.0 times the outside diameter of the pipe from the pipe ends and at distances greater than 5.0 times the outside diameter of the pipe from other junctions of skelp end welds and helical seam welds.
 - (2) Welding. Use complete joint penetration welds produced by the automatic submerged-arc welding process, the automatic gas metal-arc welding process, or a combination of both processes. Perform welding according to Section 504.
 - (3) Welding Inspection. Perform welding inspection according to AWS D1.1. Provide visual inspection of welds on the inside surfaces and outside surfaces of the pipe.
 - (4) Non-Destructive Examination. Randomly examine 10% of the total length of helical seam welds and skelp end welds. Examine welds by performing one or more of the following tests:
 - (a) Radiographic testing according to the requirements of AWS D1.1 Section 6, Part E with Subsection 6.12.3 of AWS D1.1.
 - (b) Ultrasonic testing according to the requirements of AWS D1.1 Section 6, Part F with Subsection 6.13.3.1 of AWS D1.1.If more than 10% of the welds examined are defective, examine a second random sample of 25% of the total length of welds. If more than 10% of the welds examined in the second sample are defective, examine 100% of the total length of welds.

Repair all weld defects.
 - (5) Destructive Examination. Perform destructive examination on specimens from finished pipe of each specified outside diameter, wall thickness, steel type, and grade. Examine specimens at a frequency of at least one set of tests for each lot representing 2000 linear feet of finished pipe or once per week during each production run, whichever occurs first. Do not use specimens containing repaired welds.

- (a) Tensile Tests. Meet the specified tensile requirements for yield strength, tensile strength, and elongation. Perform tension tests according to ASTM A 307 using one base metal specimen and two weld specimens taken at 90° to the length of the weld with the weld across the center of the sample. For base metal specimen, determine and report yield point, yield strength, tensile strength, and elongation. For weld test specimens, determine and report tensile strength.

Each lot of pipe will be considered to meet the tensile requirements if the base metal test results exceed the specified yield strength, tensile strength, and elongation and the weld test results exceed the specified tensile strength result.

- (b) Bend Tests. Perform transverse side bend tests according to ASTM E 190. Each lot of pipe will be considered to meet the bend test requirements if the no cracks occur in the specimen.

- (6) Tolerances. Meet the following tolerances:

- (a) Roundness. Limit the difference between the major and minor outside diameter to 1% of the specified outside diameter of the pipe or 1/4 inch, whichever is less.

- (b) Circumference. Limit the outside circumference to 1% of the nominal outside circumference of the pipe or 1/2 inch, whichever is less.

- (c) Straightness. Do not deviation from a straight line parallel to centerline of the pile more than ±1/8 inch per 10 feet of length, but not to exceed 3/8 inch.

- (d) Length. ±1-1/2 inch per 10 feet of length.

- (7) Defects. The Engineer may reject piles containing surface defects. The depth of the surface defect will be measured as the gap between the lowest point of the defect and a prolongation of the original contour of the pipe. Use of piles containing surface defects may be authorized according to the following requirements based on the depth of the surface defect:

- (a) If the surface defect is not greater than 5% of the wall thickness in depth, the defect need not be repaired.

- (b) If the surface defect is deeper than 5%, but not greater than 7%, of the specified wall thickness, grind smooth the surface defect. Remove abrupt changes in contour, but do not reduce the thickness in the ground area more than 7% of the specified wall thickness.

- (c) If the surface defect is deeper than 7%, but not greater than 20%, of the specified wall thickness, repair the defect by welding according to Section 504.

- (d) If the surface defect is deeper than 20% of the specified wall thickness, repairs will not be permitted and the pile will be rejected.

3. Pile Tip Reinforcing. Use pile tip reinforcement conforming to the requirements of ASTM A 27 Grade 65-35 or ASTM A 148 Grade 90-60. Make each pile tip in one piece of cast steel. Weld tip reinforcing to the piles in conformance with the manufacturer's written directions.

4. Structural Steel Sheet Piling. Furnish sheet piles meeting AASHTO M 202.

715-2.03 CERTIFICATION. Furnish 5 copies of a certified test report from the manufacturer or an independent testing laboratory containing a list of dimensional, chemical, metallurgical, electrical, physical, and other required test results of the specified material certifying that the product or assembly has passed all specified tests. Include the following:

1. the project name and number;
2. the manufacturer's name;
3. the name of the product or assembly;
4. a complete description of the material;
5. country of origin;
6. the lot, heat, or batch number that identifies the material;
7. all required test results for the specified material from the same lot, heat, or batch defined in Subsection 715-2.03.6; and,
8. a statement, signed by a person having legal authority to act for the manufacturer or the independent testing laboratory, that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

For pipe manufactured to API 5L, submit an inspection certificate with test results according to API 5L 10.1.3.

715-2.04 MARKING. Tag, stencil, stamp, or otherwise mark all materials or assemblies furnished under certification to the project with the lot number, heat number, batch number, or other appropriate identification, which can be readily recognized and legible, and is identical to the accompanying certified test report.

For helical welded pipe piles, mark each pipe on the inside surface and outside surface of both ends indicating: the fabricators name, type of steel, grade of steel, steel heat number, welding process, total pipe weight or weight per lineal foot of pipe, length, nominal outside diameter, and nominal wall thickness.

SECTION 716

STRUCTURAL STEEL

716-2.01 SCOPE. Structural steel for highway bridges and other structural purposes.

716-2.02 GENERAL REQUIREMENTS. Meet the following:

1. General requirements for delivery of rolled steel plates, shapes, sheet piling, and bars for structural use ASTM A 6
2. Structural Steel ASTM A 709
3. High Strength Low-Alloy Columbium Vanadium Steels of Structural Quality ASTM A 709
4. High Strength Low-Alloy Steel with 50,000 psi minimum yield point to 4 inches thick ASTM A 709
5. High Yield Strength, Quenched and Tempered Alloy Steel Plate Suitable for Welding ASTM A 709
6. Welded and Seamless, High Strength, Low-Alloy Tubing ASTM A 618
7. Filler Metal for Applicable Arc-Welding Electrodes AWS Specifications
8. Stud Shear Connectors ASTM A 108
Gr. 1015, or 1020
9. Raised Pattern Plate. Where shown on the Plans, use plates for steel expansion joints fabricated from steel plate, with a raised pattern surface meeting the following requirements:
 - a. Use diagonal type pattern, with the intersecting diagonals at right angles to one another. Use the same material for the raised portions of the pattern as the base metal of the plate. The raised pattern must be an inherent part of the plate. The pattern must be continuous throughout the surface of the plate and the projections along any diagonal must be spaced alternately with the projections along the normal diagonals.
 - b. Use plate with projections that are self-draining and self-cleaning and provide a skid-resistant surface from all angles of approach. The projections must have flat tops and be designed not to chip, crack, split, or buckle at their intersection with the base metal.
10. Impact Test Requirements.
 - a. Meet the supplemental requirements for impact toughness testing (Charpy V-Notch) and marking under ASTM A 709, Zone 3. These supplemental requirements are mandatory for material designated on the Plans as fracture critical (F) or as main members subject to tensile stress (T).
 - b. Submit impact test reports to the Engineer.

716-2.03 HIGH TENSILE STRENGTH BOLTS. Meet the following:

High Strength Bolts for Structural Steel Joints	AASHTO M 164
Nuts for AASHTO M 164 bolts	AASHTO M 292
Hardened Steel Washers	AASHTO M 293

716-2.04 STEEL GRID FLOORS. Meet ASTM A 709, Grade 36. Unless the material is galvanized, it must have a copper content of 0.2% minimum.

Unless painting of floors is specified in the Special Provisions, open type floors must be galvanized.

716-2.05 MACHINE BOLTS. Meet ASTM A 307.

716-2.06 STEEL PIPE. Meet ASTM A 53 Grade B.

716-2.07 GALVANIZING. Hot-dip galvanize structural steel shapes, plates, bars and their products according to AASHTO M 111. Galvanize tubes and piles on inside and outside surfaces.

Hot-dip galvanize steel poles, mast arms, pedestals, and posts, according to AASHTO M 111. Submerge each component in the galvanizing kettle in one dip. Use only the dry kettle method of fluxing for high tower poles.

Hot-dip galvanize all anchor bolts, nuts, washers, tie-rods, clamps, and other miscellaneous ferrous parts in conformance with AASHTO M 232. After galvanizing, ensure that the bolt threads accept galvanized standard nuts without requiring tools or causing removal of protective coatings.

Galvanize rigid metal conduit in conformance with AASHTO M 232.

For steel bridge members, apply 10 mils zinc galvanizing by spray-metalizing process according to Steel Structures Painting Council's coating system guide SSPC-CS 23.00. Prepare surfaces before galvanizing according to Steel Structures Painting Council's surface preparation guide SSPC-SP 5, White Metal Blast Cleaning.

Repair damaged coatings according to ASTM A 780 Annex A1 or Annex A3, except as described herein. Clean the damaged area according to SSPC-SP 2, Near-White Blast Cleaning for repairs meeting Annex A1 and SSPC-SP 5, White Metal Blast Cleaning for repairs meeting Annex A3. Extend the cleaned area 1/2 inch to 3/4 inch into the undamaged section of the coating. Keep the cleaned area dry and free of rust and soiling. Within 24 hours of cleaning, coat the cleaned section with zinc to a thickness of not less than 10 mils. Taper the thickness of the repair coating to match the original coating thickness at the edges of the cleaned section. Where zinc coating is to be metallized, use zinc wire containing not less than 99.98 percent zinc.

716-2.08 CERTIFICATION. Furnish 5 copies of a Certified Test Report from the manufacturer or an independent testing laboratory containing a list of dimensional, chemical, metallurgical, electrical, physical, and other required test results of the specified material certifying that the product or assembly has passed all specified tests. Include the following:

1. the project name and number
2. the manufacturer's name
3. the name of the product or assembly
4. a complete description of the material
5. country of origin
6. the lot, heat, or batch number that identifies the material
7. all required test results for the specified material from the same lot, heat, or batch defined in Subsection 716-2.08.6
8. an affidavit, signed by a person having legal authority to act for the manufacturer or the independent testing laboratory, that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

Tag, stencil, stamp, or otherwise mark all materials or assemblies furnished under certification to the project with the lot number, heat number, batch number, or other appropriate identification, which can be readily recognized and legible, and is identical to the accompanying Certified Test Report.

SECTION 718
STEEL FORGINGS

718-2.01 SCOPE. Steel forgings from which pins, rollers, trunnions or other forged parts are to be fabricated.

718-2.02 GENERAL REQUIREMENTS. Meet the dimensions shown on the Plans and the following specifications.

1. Alloy Steel Forgings (general industrial use): AASHTO M 102, Class G.
2. Carbon Steel Forgings (general industrial use): AASHTO M 102, Class C.
3. Pins and Rollers
 - a. More than 7 inches in Diameter: Annealed carbon-steel forgings meeting AASHTO M 102, Class C.
 - b. 7 inches or Less in Diameter: Either annealed carbon-steel forgings meeting AASHTO M 102, Class C or cold finished carbon-steel shafting meeting AASHTO M 169, Grade 1016 to 1030, inclusive, with a minimum Rockwell Scale B hardness of 80. Material not meeting the specifications for hardness may be accepted provided it develops a minimum tensile strength of 66,000 psi and a minimum yield point of 33,000 psi.
4. Threads for Pins: ANSI B 1.1, Class 2A coarse thread series. Thread pin ends, having a diameter of 1-3/8 inch or more, 6 threads to the inch.

718-2.03 CERTIFICATION. Submit 5 copies of a certified mill test report covering chemical and physical tests for the material in each shipment.

SECTION 719

STEEL, GRAY-IRON AND MALLEABLE-IRON CASTINGS

719-2.01 SCOPE. Steel, gray-iron and malleable-iron castings intended for various uses as shown on the Plans.

719-2.02 GENERAL REQUIREMENTS. Meet the size and dimensions shown on the Plans, be true to pattern in form, and conform to the following specifications.

Carbon Steel Castings	AASHTO M 103, Grade 65-35
Chromium Alloy Steel Castings	AASHTO M 163, Grade CA-15
Gray-Iron Castings	AASHTO M 306 and AASHTO M 105, Class 35B
Malleable-Iron Castings	ASTM A 47, Grade 24018

SECTION 720

ELASTOMERIC PADS

720-2.01 ELASTOMERIC BEARING PADS. Elastomeric bearing pads include plain pads, consisting of elastomer only, and laminated pads with steel laminates.

1. General. Meet AASHTO M 251, with the following revisions:

4.1. *Properties of the Elastomer.* Replace the first sentence with the following: Use elastomeric compound in the construction of the bearings containing only virgin natural polyisoprene (natural rubber) as the raw polymer. Do not use neoprene. Properties and requirements elsewhere in AASHTO M 251 pertaining solely to polychloroprene (neoprene) do not apply.

Use elastomer compound classified as low temperature Grade 5 and meeting the requirements of paragraph 8.9.

Add the following paragraph:

5.5. Fabricate pads over 3/4 inch thick with alternating laminations of elastomer and metal or fabric reinforcements. The outside laminations must be metal or fabric with a minimum elastomer cover as shown on the Plans.

Table 2—Tolerances. Replace Item 6. with the following:

6. Edge cover of embedded laminates or connection members -0, 1/16 inch

A3.4.3. Replace the second sentence with the following: Condition the specimens at the specified test temperature for 96 hours.

2. Certification. Furnish 5 copies of a Certified Test Report from the manufacturer or an independent testing laboratory containing a list of dimensional, chemical, metallurgical, electrical, physical, and other required test results of the specified material certifying that the product or assembly has passed all specified tests. Include the following:

- a. the project name and number;
- b. the manufacturer's name;
- c. the name of the product or assembly;
- d. a complete description of the material;
- e. country of origin;
- f. the lot, heat, or batch number that identifies the material;
- g. all required test results for the specified material from the same lot, heat, or batch defined in Subsection 720-2.01.2.f; and
- h. a statement, signed by a person having legal authority to act for the manufacturer or the independent testing laboratory, that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

Tag, stencil, stamp, or otherwise mark all materials or assemblies furnished under certification to the project with the lot number, heat number, batch number, or other appropriate identification, which can be readily recognized and legible, and is identical to the accompanying Certified Test Report.

720-2.02 EPOXY ADHESIVE FOR ELASTOMERIC BEARING PADS. Meet AASHTO M 235, Type IV, Grade 3.

720-2.03 POLYTETRAFLUOROETHYLENE (PTFE) BEARINGS. PTFE bearing assemblies consist of elastomeric bearing pads, polytetrafluoroethylene (PTFE) surfacing, and stainless steel and steel plates.

1. Materials.

Elastomeric Bearing Pads	Subsection 720-2.01
Stainless Steel Plates	ASTM A 240, Type 304
Steel Plates	ASTM A 709, Grade 36

Use PTFE from virgin material (not reprocessed) meeting the requirements of ASTM D 4894 or D 4895, and Table 720-1.

2. Fabrication. Fabricate the PTFE sliding surface with lubricant dimples having a maximum diameter of 0.32 inch, a minimum depth of 0.08 inch and a maximum depth of one half of the PTFE sheet thickness. Distribute the dimples uniformly within the area ¼ inch from the edges of the PTFE sheet and occupying between 20 percent and 30 percent of the PTFE sheet area.

For welding of structural steel, conform to the requirements of Section 504.

**TABLE 720-1
POLYTETRAFLUOROETHYLENE (PTFE)**

TEST	REQUIREMENTS
Specific Gravity	2.13 - 2.19
Peak Melting Temperature	623°F (±2°F)
Tensile strength (Minimum)	2800 psi
Elongation (Minimum)	200%

Bond the PTFE sheet in the recess of steel plate under controlled factory conditions. Use adhesive material that is an epoxy resin conforming to the requirements of Federal Specification MMM-A-134.

Uniformly roughen the contact surfaces of PTFE sheet and steel plate to be bonded to a minimum roughness height value of 250 micro-inches.

Factory treat the side of the PTFE sheet to be bonded by the sodium naphthalene or sodium ammonia process, after the contact surface is roughened.

Fully bond the PTFE sheet in the recess. Ensure the PTFE surface is smooth and free from bubbles after completion of the bonding operation. PTFE sheets that are delaminated will be rejected.

Perimeter seal weld the stainless steel plate to the steel sole plate. Use stainless steel electrodes in accordance with the requirements of the electrode manufacturer. After the completion of the weld operation, ensure the stainless steel plate is smooth and free from waves.

Control the flatness of the bearing elements such that upon completion of the bearing assembly the PTFE/stainless steel sliding interface is in full bearing.

Provide a mating surface of the stainless steel plate with the PTFE surfacing with a surface finish of less than 8 micro inches root-mean-square (rms), determined according to ANSI Standard B46.1. Do not exceed a first movement static coefficient of friction of 0.05 for the sliding element of the production bearings, when tested without the coating of silicone grease.

Fully vulcanize elastomeric bearing pads to the steel plates under factory controlled conditions. Provide a bond with a peel-strength of at least 30 pounds per inch as determined by AASHTO M 251, appendix X2.

Prepare and paint metal surfaces, except stainless steel surfaces, of bearings exposed to the atmosphere in the completed work. Prepare and paint the surfaces according to Section 504.

After installation of the bottom portion of the bearing assembly, apply a 1/16 inch thick coating of silicone grease to the entire PTFE surface and reassemble the bearing without damage to the mating sliding surfaces. Use silicone grease conforming to Military Specification: MIL-S-8660.

At your expense and without contract extension time return damaged bearings and bearings with scratched mating surfaces to the factory for replacement or resurfacing.

Prior to proof testing, permanent die stamp all individual components on 2 of 4 sides with markings consisting of bearing number and contract number. Provide each bearing with a unique bearing number and match marks on plate edges to insure correct assembly at the job site.

3. Testing. Proof test and evaluate full sized PTFE bearings for compression and coefficient of friction in the presence of the Engineer, unless otherwise directed. Perform proof tests on samples randomly selected by the Engineer from the production bearings to be used in the work. Perform proof tests at an approved independent laboratory. If proof tests are not performed at the specified load, perform additional physical tests in the presence of the Engineer, unless otherwise directed, to demonstrate that the requirements for proof testing at the specified load are satisfied. Give the Engineer at least 7 working days notice before beginning proof testing.

Proof test one bearing per lot of production PTFE bearings. A lot is defined as 25 PTFE bearings or fraction thereof of the number of PTFE bearings shown on the Project Plans.

Clean the bearing surfaces prior to testing.

Proof test bearings after conditioning specimen for 12 hours at $75^{\circ} \pm 5^{\circ}\text{F}$.

Perform the tests with the dead load as specified in the Contract for the bearing with the test load applied for 12 hours prior to friction measurement and the following:

Arrange the tests to allow measurement of the static coefficient of friction on the first movement of the bearing.

Measure the first movement static and dynamic coefficients of friction at a sliding speed not exceeding one inch per minute and do not exceed the specified coefficient of initial static friction.

Subject the test bearings to a minimum of 100 movements of at least one inch of relative movement at a sliding speed not exceeding 12 inches per minute. After cycling, measure again the first movement static and dynamic coefficients of friction at a sliding speed not exceeding one inch per minute and do not exceed the specified coefficient of initial static friction.

The proof tested bearings are to show no visible sign of: (1) bond failure of bearing surfaces, (2) separation or lift-off of plates from each other or from PTFE surfaces, (3) other defects. When a proof tested bearing fails to comply with the Contract Documents, test each bearing in that lot for acceptance.

Proof test results are to be certified correct and signed by the testing laboratory personnel who conducted the test and interpreted the test results. Include the bearing numbers of the bearings tested on the proof test results.

Test a minimum of one pad per lot for bond strength per AASHTO Test M 251. Test specimens are to show no indication of deterioration of elastomer or loss of bond between the elastomer and steel laminates.

Protect all PTFE and stainless steel surfaces from contamination and weather damage.

4. Certification. Furnish 5 copies of a Certified Test Report from the manufacturer or an independent testing laboratory containing a list of dimensional, chemical, metallurgical, electrical, physical, and other required test results of the specified material certifying that the product or assembly has passed all specified tests. Include the following:
- a. the project name and number;
 - b. the manufacturer's name;
 - c. the name of the product or assembly;
 - d. a complete description of the material;
 - e. country of origin;
 - f. the lot, heat, or batch number that identifies the material;
 - g. all required test results for the specified material from the same lot, heat, or batch defined in Subsection 720-2.03.4.f; and,
 - h. a statement, signed by a person having legal authority to act for the manufacturer or the independent testing laboratory, that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

Tag, stencil, stamp, or otherwise mark all materials or assemblies furnished under certification to the project with the lot number, heat number, batch number, or other appropriate identification, which can be readily recognized and legible, and is identical to the accompanying Certified Test Report.

SECTION 721

PRESTRESSING STEEL AND FITTINGS

721-2.01 SCOPE. Prestressing steel and fittings used in pre-tensioned and post-tensioned concrete construction.

721-2.02 PRESTRESSING STEEL. Meet the following:

Strand	AASHTO M 203
Wire	AASHTO M 204. Do not use oil-tempered wires.
High Strength Alloy Steel Bars	AASHTO M 275

721-2.03 POST-TENSIONING SYSTEM. Use only post-tensioning systems that utilize tendons fully encapsulated in anchorages and ducts. Systems that transfer prestress force by bonding the prestress steel directly to concrete are not allowed. Use only post-tensioning systems that are approved by the Engineer and meet the following requirements:

1. Anchorage and Distribution. Secure prestressing steel at the ends by means of approved permanent type anchoring assemblies.

Use anchorage devices for post-tensioning that hold the prestressing steel at a load producing a stress of not less than 95 percent of the guaranteed ultimate tensile strength (GUTS) of the prestressing steel, when tested in an unbonded state, without exceeding the anticipated set.

Distribute the load from the anchoring assemblies to the concrete by means of approved devices or bearing plates that will effectively distribute the load to the concrete. Construct the bearing plate and wedge plate from ferrous metal. For bending stresses in the bearing plates or assemblies induced by the pull of the prestressing steel, do not exceed the yield point of the material or cause visible distortion in the bearing plate when 95 percent of the GUTS of the tendons is applied as determined by the Engineer. Do not exceed 3500 psi directly underneath the bearing plate or assembly for the final unit compressive stress on the concrete.

Galvanize the body of the anchorage assembly in accordance with AASHTO M 111. Other components of the anchorage assembly including wedges, wedge plate and local zone reinforcement need not be galvanized.

Construct anchorage assemblies with grout vents suitable for post-grouting inspection access as approved by the Engineer. Equip all anchorages with a grout cap that is vented and bolted to the anchorage.

Recess the anchoring assemblies so that the ends of the prestressing steel and all parts of the anchoring assemblies will be at least 3 inches inside of the end surface of the members, unless shown otherwise on the plans. After post-tensioning all tendons, fill the recesses with concrete conforming to the provisions for the structure and then finished flush with the abutment end diaphragm.

2. Strand Couplers. Do not use strand couplers.
3. Enclosures for Post-tensioning. Use rigid ferrous metal duct enclosures for prestressing steel that are galvanized, mortar tight, and capable of withstanding concrete pressures without deforming. Use rigid ducts with smooth inner walls that can be curved to the proper configuration without crimping or flattening and have sufficient strength to maintain their correct alignment during placing of concrete. Do not use semi-rigid ducts. Fabricate ducts with either welded or interlocked seams.

Connect sections of rigid ducts using galvanized ferrous metal couplings that are mortar tight and do not result in angle changes at the joints. Do not use split metal couplings. Use waterproof tape to seal

all connections to the duct. Connect ducts to anchoring assemblies using transition couplings that are galvanized ferrous metal or polyethylene, mortar tight, and of sufficient strength to prevent displacement of the ducts during concrete placement.

Use ducts for multi-strand tendons with a minimum diameter that provides an inside area at least 2.5 times the net area of the prestressing steel in the tendon.

Do not use ducts with diameters that exceed 0.4 times the least gross concrete thickness at the duct location.

Use duct enclosures with vents for the injection of grout after post-tensioning.

4. Grout Vents. Use vents with positive means for allowing the escapement of air, water, grout, and bleed water out of the vents, injecting grout through the vents, and sealing to prevent grout leakage from the vents. Use 3/4 inch minimum diameter standard pipe or suitable plastic pipe vents with positive shut-off designed to withstand the grouting pressure. Do not crimp or bend the vent pipe. Use metallic or plastic structural fasteners to connect the vent with the duct. Do not use plastic components that react with the concrete or enhance corrosion of the prestressing steel, or contain water-soluble chlorides. Make all vents mortar tight, taped as necessary. Make vents with sufficient length out of the concrete member to allow proper closing of the vents. Remove ends of vents at least 1 inch below the roadway surface after grouting has been completed.

Place vents at the following locations:

- a. At anchorages.
 - b. At the high points of the duct, when the vertical distance between the highest and lowest point is more than 20 inches.
 - c. At a location down flow from all high point vents where the duct is approximately one-half duct diameter lower than the crest, but not to exceed 3 feet downstream.
 - d. At the lowest point of the duct.
 - e. At major changes in the cross-section of the duct.
 - f. At other locations designated by the Engineer.
5. Grout Caps. Use grout caps that completely cover and seal all exposed ends of prestressing steel at the anchorage. Seal the cap with neoprene "O" ring seals and place a grout vent on the top of the cap. Use caps rated for a minimum pressure of 150 psi.

721-2.04 CERTIFICATION.

1. Prestressing Steel. Furnish 5 copies of a Certified Test Report from the manufacturer or an independent testing laboratory containing a list of dimensional, chemical, metallurgical, electrical, physical, and other required test results of the specified material certifying that the product or assembly has passed all specified tests. Include the following:
 - a. the project name and number;
 - b. the manufacturer's name;
 - c. the name of the product or assembly;
 - d. a complete description of the material;
 - e. country of origin;
 - f. the lot, heat, or batch number that identifies the material;
 - g. all required test results for the specified material from the same lot, heat, or batch defined in Subsection 721-2.04.1.f; and,
 - h. a statement, signed by a person having legal authority to act for the manufacturer or the independent testing laboratory, that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

Tag, stencil, stamp, or otherwise mark all materials or assemblies furnished under certification to the project with the lot number, heat number, batch number, or other appropriate identification, which can be readily recognized and legible, and is identical to the accompanying Certified Test Report.

2. Post-Tensioning Systems. Submit certified test reports to the Engineer that shows the post-tensioning system meets all the requirements specified herein. Submit the certified test reports with the shop drawing submittal. If any component of the post-tensioning system is modified or replaced, the entire system must be retested and resubmitted to the Engineer for approval.

Ensure that all components of a system are stamped with the supplier's name, trademark model number and size corresponding to catalog designation.

Submit certification stating the manufacturer's minimum guaranteed ultimate tensile strength of all prestressing steel used for this project.

Assign an individual lot number for each manufactured reel of prestressing steel to be shipped to the site. Tag each reel in such a manner that each lot can be accurately identified at the site. All unidentified prestressing steel received at the site will be rejected.

Assign and tag each lot of anchorage assemblies to be installed at the site. Tag each anchorage assembly in such a manner it can be accurately identified at the site. All unidentified anchorage assemblies received at the site will be rejected.

SECTION 722
BRIDGE RAILING

722-2.01 BRIDGE RAILING.

Steel tube rail elements	ASTM A 500, Grade B
Steel Thrie Beam elements	AASHTO M 180, Class B, Type II
Posts	ASTM A 709, Grade 36
Machine bolts, cap screws, nuts and washers	ASTM A 307
High strength bolts, nuts and washers	ASTM A 325 and Subsection 716-2.03
Anchor bolts	AASHTO M 314, Grade 105; ASTM F 1554, Grade 105; or ASTM A 449, Type 1
Shims, plates and sleeves	ASTM A 709, Grade 36
Galvanize steel portions of railing after fabrication.	Meet AASHTO M 111 or M 232, whichever is applicable.

722-2.02 CERTIFICATION. Furnish 5 copies of a certified test report from the manufacturer or an independent testing laboratory containing a list of dimensional, chemical, metallurgical, electrical, physical, and other required test results of the specified material certifying that the product or assembly has passed all specified tests. Include the following:

1. the project name and number
2. the manufacturer's name
3. the name of the product or assembly
4. a complete description of the material
5. country of origin
6. the lot, heat, or batch number that identifies the material
7. all required test results for the specified material from the same lot, heat, or batch defined in Subsection 722-2.02.6
8. a statement, signed by a person having legal authority to act for the manufacturer or the independent testing laboratory, that the test results show that the product or assembly to be incorporated into the project has been sampled and tested and the samples have passed all specified tests.

Tag, stencil, stamp, or otherwise mark all materials or assemblies furnished under certification to the project with the lot number, heat number, batch number, or other appropriate identification, which can be readily recognized and legible, and is identical to the accompanying certified test report.

SECTION 723
WATER STOPS

723-2.01 WATER STOPS.

1. Rubber water stops, either molded or extruded from plain rubber or synthetic rubber. Meet the requirements of ASTM D 2000.
2. Use water stops formed with an integral cross section. No splices are permitted in straight strips. Strips and special connection pieces must be free from all porosity. All junctions in the special connection pieces must be full molded. During the vulcanizing period securely hold the joints with suitable clamps. The material at the splices must be dense and homogeneous throughout the cross section.
3. Full mold all field splices and bevel splice faces at an angle of 45 degrees or flatter. All finished splices must have a tensile strength of not less than 50% of the unspliced material.
4. Obtain the Engineer's approval to use water stops of materials other than those specified.

SECTION 724

SEED

724-2.01 DESCRIPTION. Grass seed to provide a living vegetative cover.

724-2.02 MATERIALS. Meet applicable requirements of the State of Alaska *Seed Regulations*, 11 AAC 34, Article 1 and Article 4.

Furnish “certified seed” or 4 signed copies of a report certifying that each lot of seed has been tested by an approved laboratory within 9 months of date of application. Include: name and address of laboratory, date of test, lot number for each kind of seed, and results of test as to name, percentages of purity and germination, and percentage of weed content for each kind of seed furnished. Meet or exceed the percentages of sproutable seed specified in Table 724-1.

**TABLE 724-1
SEED REQUIREMENTS**

SPECIES	SPROUTABLE SEED*, %, MIN.
Arctared Red Fescue	78
Egan American Sloughgrass	67
Norcoast Bering Hairgrass	71
Nortran Tufted Hairgrass	71
Wainwright Slender Wheatgrass	88
Alyeska Polargrass	71
Bluejoint	71
Tilesy Sagebrush	71
Tundra Glaucous Bluegrass	76
Gruening Alpine Bluegrass	72
Nugget Kentucky Bluegrass	76
Beach Wildrye	70
Annual Ryegrass	76
Perennial Ryegrass	76

* Sproutable Seed is the mathematical product of Germination and Purity.

SECTION 725

FERTILIZER

725-2.01 DESCRIPTION. Standard commercial fertilizer supplied separately or in mixtures, and furnished in moisture proof containers. Mark each container with the weight and with the manufacturer's guaranteed analysis of the contents showing the percentage for each ingredient contained therein.

725-2.02 MATERIALS. Furnish a mixture of chemical ingredients providing the total available nitrogen, phosphoric acid, and potassium required by the soil analysis or as specified in the Special Provisions. Tolerances of the chemical ingredients are plus or minus 2%.

No cyanamid compounds or hydrated lime are permitted in mixed fertilizers.

SECTION 726

TOPSOIL

726-2.01 TOPSOIL. Furnish topsoil that is representative of the existing, natural organic blanket of the project area. Perform a quality test, as defined by ATM 203, on the soil to determine the organic content of the soil. Supply the results to the Engineer.

Soil with an organic content of 5 percent or more may be reused and spread on the finished slopes where topsoil is noted on the plans. Remove roots, stumps, unnatural material, and rocks greater than 3 inch in diameter from the organic material before it is graded onto the finished slope.

Soil with an organic content of less than 5 percent cannot be used as topsoil for the project. In this case furnish topsoil consisting of a natural friable surface soil without admixtures of undesirable subsoil, refuse or foreign materials having an organic content of 5 percent or more, as determined by ATM 203. The material shall be reasonably free from roots, clods, hard clay, rocks greater than 3 inches in diameter, noxious weeds, tall grass, brush, sticks, stubble or other litter, and shall be free draining and nontoxic. Notify the Engineer of the topsoil source location at least 30 calendar days before delivery of topsoil to the project from the identified location. The Engineer will inspect the topsoil and its sources before approval will be granted for its use.

**TABLE 726-1
LIMESTONE REQUIREMENTS**

Soil pH	Limestone, tons/acre
Above 6.0	0
5.0-6.0	1.5
Below 5.0	3.0

SECTION 727

SOIL STABILIZATION MATERIAL

727-2.00 GENERAL. Free of noxious weeds, seeds, chemical printing ink, germination and growth inhibitors, herbicide residue, chlorine bleach, (except where specified: rock, metal, plastics) and other deleterious materials and not harmful to plants, animals and aquatic life. Wood cellulose "paper" fiber, wood chips, sawdust, and hay are not permitted as stabilization materials.

727-2.01 MULCH. Flexible blanket/covering, temporary degradable (bio/photo) form of erosion control. Use one of the following:

Dry Erosion Control, Stabilization Products. Hand applied or spread with mulch blower equipment.

1. Straw. Use straw, in an air-dried condition, from oats, wheat, rye, or other approved grain crops that are free from noxious weeds, seeds, mold, or other materials detrimental to plant life. Straw material shall be certified weed-free straw using North American Weed Management Association (NAWMA) Standards. In-lieu of certified weed-free straw provide documentation that the material is steam or heat treated to kill seeds or provide U.S. or state's department of agriculture laboratory test reports, dated within 90 days prior to the date of application showing that there are no viable seeds in the straw.
2. Shredded Bark Mulch. Shredded bark and wood with the following characteristics:
 - a. Not containing resin, tannin, or other compounds in quantities harmful to plant life.
 - b. Maximum length of individual pieces is 2 inches with 75% passing through a 1 inch sieve.
 - c. Will form a uniform ground cover/mat, have moisture absorption, retention, and percolation properties, not be susceptible to spreading by wind or rain providing a good growth medium.
 - d. May contain up to 50% shredded wood material.
 - e. Shredded wood material aged 1 year minimum prior to use.

Hydraulic Erosion Control Products (HECPs). Applied hydraulically.

A fiber mulch matrix: biodegradable and composed of wood, straw, coconut and other fibers natural and man-made. When applied, create a continuous, porous, absorbent high water holding, flexible blanket/mat/mulch/covering making intimate contact with, and adhering to sloped soil surface; permitting water infiltration; resists erosion and promotes rapid germination and accelerated plant growth. The fibers may be thermally processed, and cross-linked with a hydro-colloidal or linear anionic tackifier (curing period 24-48 hours) or mechanically-bonded (no curing period). When agitated in slurry tanks with water the fibers will become uniformly suspended, without clumping to form homogeneous slurry.

The HECPs shall be delivered premixed by the manufacturer. The HECP will contain only the materials provided in the sealed containers from the manufacturer. No added components are permitted after the manufacturer seals the product container, before application, during application or otherwise. Submit documentation dated within 3 years of application, from an independent accredited laboratory as approved by the Engineer, showing that the product's testing performance meets the requirements for the slope(s) to be protected on the project, according to the National Transportation Product Evaluation Program (NTPEP), Erosion Control Technology Council (ECTC) and or the Texas DOT/Texas Transportation Institute (TTI) Laboratory.

If the HECP contains cotton or straw provide documentation that the material is certified weed free using NAWMA Standards. In-lieu of certified weed-free straw, provide documentation that the material is steam

or heat treated to kill seeds or provide U.S. or state's department of agriculture laboratory test reports, dated within 90 days prior to the date of application showing that there are no viable seeds in the straw.

The HECP shall contain a dye to facilitate placement and inspection of the material.

1. Wood Strand, Fiber.

A blend of angular, loose, long thin wood pieces with a high length to width ratio and that are frayed. Minimum 95% of strands between 2 inches and 10 inches, at least 50% of the length shall have a width thickness between 1/16 and 1/8 inch. No single strand shall have a width or thickness greater than 1/2 inch. Processed wood fiber with the following characteristics:

- a. Will remain in uniform suspension in water under agitation and will blend with grass seed, fertilizer and other additives to form homogeneous slurry.
- b. Will form a blotter-like uniform ground cover on application, have moisture absorption, retention and percolation properties, the ability to cover, and hold grass seed in contact with soil, and not create a hard crust upon drying providing a good growth medium.

2. Dried Peat Moss. Partially decomposed fibrous or cellular stems and leaves of any of several species of Sphagnum mosses with the following characteristics:

- a. Chopped or shredded to allow distribution through normal hydraulic type seeding equipment and capable of being suspended in water to form part of a homogeneous slurry.
- b. Free from woody substances and mineral matter such as sulfur or iron and with a pH value of between 4.0 and 6.5.
- c. Furnished in an air dry condition and containing less than 35% moisture by weight. Have a water holding capacity of not less than 800% by weight on an oven dry basis.

3. Fiber Matrix (FM) Mulch - Types.

- a. Stabilized Mulch Matrices (SMMs)
- b. Bonded Fiber Matrices (BFMs)
- c. Mechanical Bonded Fiber Matrix (MBFM)
- d. Polymer Stabilized Fiber Matrix (PSFM)
- e. Fiber Reinforced Matrices (FRMs)
 - Flexible Growth Medium (FGM)
 - Extended-Term Flexible Growth Medium (ET-FGM)

727-2.02 MATTING. Fiber mulches, mulch matrices, nets and turf reinforcement mats manufactured from wood fibers, straw, jute, coir, polyolefins, PVC, nylon and others creating dimensionally stable nets, meshes, geotextiles and blankets; creating a continuous, porous, absorbent, flexible blanket/mat/mulch/covering making intimate contact with and adhering to sloped soil surface, resisting erosion and promoting rapid germination and accelerated plant growth.

Rolled Erosion Control Products (RECPs) (Temporary Degradable and Permanent Erosion Control)

Use RECPs that bear the Quality and Date Oversight and Review (QDOR) Seal from the ECTC. Independent test results from the NTPEP, that the mulch, when tested according to ASTM 6459 Standard Test Method for Determination of Rolled Erosion Control Products (RECP), Performance in Protecting Hillslopes from Rainfall-Induced Erosion, meets the performance requirement using the Revised Universal Soil Loss Equation (RUSL).

Functional Longevity.

1. Temporary Degradable.

a. Duration.

- 1) Short-Term RECPs. (RECPs 3 - 12 months)
C_{Factor} = .15 maximum
Test Soil Type = Sandy Loam
(National Resources Conservation Service (NCRS) Soil Texture Triangle)
- 2) Moderate (Extended) -Term RECPs. (RECPs 24 months)
C_{Factor} = .05 maximum
Test Soil Type = Sandy Loam (NCRS Soil Texture Triangle)
- 3) Long-Term RECPs. (RECPs 36 months)
C_{Factor} = .01 maximum
Test Soil Type = Sandy Loam (NCRS Soil Texture Triangle)

b. Product types.

- 1) Mulch-Control Nets (MCNs). Planar woven natural fiber or extruded geosynthetic mesh used to anchor loose fiber matting/mulches.
- 2) Erosion Control Blankets (ECBs). Processed natural and/or polymer fibers, yarns or twines mechanically, structurally, or chemically bound together to form a continuous matrix with a minimum weight of 8 oz/yd² and a limiting shear stress of 0.45 lb/ft².
- 3) Netless. Fibers mechanically interlocked and/or chemically adhered together.
- 4) Single-net and Double-net. Fibers mechanically bound together by single or double netting.
- 5) Open Weave Textiles (OWTs). Fibers woven into a continuous matrix.

c. Materials.

- 1) Burlap. Standard weave with a weight of 3.5 to 10 oz/yd².
- 2) Jute Mesh Fabric. Cloth of a uniform, open, plain weave of undyed and unbleached single jute yarn. Use yarn that is loosely twisted and not varying in thickness more than one-half its normal diameter. Furnish jute mesh in rolled strips meeting the following requirements:
 - a) Width: 45 to 48 inches, ± 1 inch
 - b) 78 warp-ends per width of cloth (minimum)
 - c) 41 weft-ends per yard (minimum)
 - d) Weight: 20 ounces per linear yard, ± 5%
- 3) Woven Paper or Sisal Mesh Netting. Woven from twisted yarns available in rolls 45 to 48 inches wide. Mesh may vary from closed to open weave, ranging from 1/8 to 1/4 inch openings. Shrinkage after wetting may not exceed 20% of the surface area.
- 4) Knitted Straw Mat. Commercially manufactured ECB. Use photodegradable netting and biodegradable thread. Use straw, in an air-dried condition, from oats, wheat, rye, or other approved grain crops that are free from noxious weeds, seeds, mold, or other materials detrimental to plant life. ECB may contain coconut or fiber to reinforce the straw. Straw material shall be certified weed-free straw using NAWMA Standards. In-lieu of certified weed-free straw, provide documentation that the material is steam or heat treated to kill seeds or provide U.S.

or state's department of agriculture laboratory test reports, dated within 90 days prior to the date of application showing that there are no viable seeds in the straw.

- 5) Woven/Curled Wood blanket. Machine produced mat of curled wood shavings with a minimum of 80% 6 inch or longer fibers, with consistent thickness and the fibers evenly distributed over the entire area of the blanket. Smolder resistant without the use of chemical additives. Cover the top side of the blanket with biodegradable extruded plastic mesh.
- 6) Coconut (Coir Fiber). Machine produced mat, ECB of consistent thickness and coir fiber evenly distributed over the area of the mat. Use bio/photo degradable netting and thread.

2. Permanent.

a. Product Types and Materials.

- 1) Turf Reinforcement Mats (TRMs). A rolled erosion control product composed of non-degradable synthetic fibers, filaments, nets, wire mesh, and/or other elements, processed into a permanent, three-dimensional matrix of sufficient thickness with a minimum weight of 8 oz/yd² and a minimum limiting shear stress of 1.5 lb/ft². TRMs (may be supplemented with degradable components) shall impart immediate erosion protection, enhance vegetation establishment during and after maturation and permanent vegetation reinforcement providing long-term functionality.

727-2.03 SEDIMENT RETENTION FIBER ROLLS (SRFRs). Fiber rolls also referred to as wattles. Manufacture of photodegradable or biodegradable fabric netting without preservative treatment, evenly woven, free of crusted material, cuts, and tears. Manufacture stakes of photodegradable or biodegradable material (wood stakes, except as approved by the Engineer).

1. Filter Sock (Wattle)

- a. Fabric netting.
- b. Filled with wood fiber, straw, flax, rice, coconut fiber material.
- c. Minimum diameter 5 inches.

2. Compost Sock.

- a. Extra Heavy weight fabric netting with a minimum strand width of 5 mils.
- b. Filled with coarse compost.
- c. Minimum diameter 8 inches.

3. Coir Log.

- a. Woven wrap bristle coir twine netting.
- b. Filled with 100% coconut (coir) fiber uniformly compacted.
- c. Segments maximum length 20 foot, diameter as suited to the application and a density of 7 lbs/pcf or greater.
- d. Coir twine strength equal to 80 lb minimum weaved to a 2 inch x 2 inch opening pattern.
- e. Ties made of hemp rope by 1/4 inch diameter.

727-2.04 COMPOST. Suitable for serving as a soil amendment or an erosion control material. Sanitized, mature compost meeting local, state, and Federal quality requirements tested and certified by the U.S. Composting Council (USCC) under the Seal of Testing Assurance (STA) Program. Biosolids compost must meet the Standards for Class A biosolids outlined in 40 Code of Federal Regulations (CFR) Part 503. Additionally, meet the requirements of the AASHTO specifications:

1. Compost Blankets. Standard Practice for Compost for Erosion/Sediment Control (Compost Blankets) R 52-10.

2. Compost Filter Berms and Filter Socks. Standard Practice for Compost for Erosion/Sediment Control (Filter Berms and Filter socks) R 51-10.

727-2.05 TACKIFIER. Tackifier, viscous overspray, generally composed of dry powered vegetable gums derived from guar gum, psyllium and sodium alginase; asphaltic emulsions; petroleum distillates; co-polymer emulsions; and lignosulfonates and used to anchor soil, compost, seed, the mulch fibers to one another, and the ground. Contain no growth or germination inhibiting materials nor significantly reduce infiltration rates. Tackifier shall hydrate in water and readily blend with other slurry material. Tackifier options include:

1. Type A. Organic tackifier with certification of plant sources; or
2. Type B. Synthetic tackifier with certification confirming product is not harmful to plants, animals, or aquatic life.

727-2.06 POLYACRYLAMIDE (PAM). Use as a tie-down for soil, compost, seed and as a flocculent. Polyacrylamide (PAM) products shall meet the requirements of American National Standards Institute (ANSI)/National Sanitation Foundation International (NSF) Standard 60 for drinking water treatment, be anionic (not cationic), linear and not cross-linked with an average molecular weight greater than 5 Mg/mole, minimum 30 percent charge density; contain at least 80% active ingredients and a moisture content not exceeding 10% by weight.

Deliver PAM in a dry granular powder or liquid form.

727-2.07 GEOTEXTILE-ENCASED CHECK DAM AND SEDIMENT BARRIER. Urethane foam core encased in geotextile material (silt fence material Section 633), minimum 8 inches height by minimum base width of 16 inches by minimum 7 foot length. Overhang the geotextile 6 inch minimum each end with apron type ties by 24 inches each side of the foam core.

727-2.08 SANDBAG.

1. Sandbag Sack Fabric. Fabric shall be a nonwoven, needle punched design meeting the Minimum Average Roll Values (MARV) verified in accordance with ASTM D4759.
2. Seam Thread. Similar durability to the sandbag sack fabric.
3. Sandbag Fill Material.
 - a. Selected Material Subsection 703-2.07 Type B
4. Cinch Ties. Plastic ties or equivalent tie recommended by the sandbag manufacturer.

727-2.09 MANUFACTURED INLET PROTECTION SYSTEM.

1. Manufacturers:
 - a. Ultra Tech International – Ultra-DrainGuard
 - b. Bowhead Environmental and Safety - StreamGuard Exert II Sediment Insert
 - c. Enpac - Catch Basin Insert, Oil and Sediment or
 - d. Approved equal.

727-2.10 CLEAR PLASTIC COVERING. A clear plastic covering meeting the requirements of the National Institute of Standards and Technology (NIST) voluntary Product Standard PS 17 - 69 for polyethylene sheeting having a minimum thickness of 6 mils.

727-2.11 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 wire.

SECTION 729
GEOSYNTHETICS

729-2.01 GEOTEXTILE, SEPARATION AND STABILIZATION.

1. Separation. Meet AASHTO M 288 for Separation, except provide a minimum permittivity of 0.05 sec⁻¹
2. Stabilization. Meet AASHTO M 288 for Stabilization, except provide a minimum permittivity of 0.08 sec⁻¹

729-2.02 GEOTEXTILE, SUBSURFACE DRAINAGE AND EROSION CONTROL.

1. Subsurface Drainage. Meet AASHTO M 288 for Subsurface Drainage.
2. Erosion Control. Meet AASHTO M 288 for Permanent Erosion Control.

729-2.03 PAVING FABRIC. Meet AASHTO M 288 for Paving Fabric.

729-2.04 SILT FENCE. Meet AASHTO M 288 for Temporary Silt Fence.

729-2.05 GEOGRID. Biaxial polymer grid, specifically fabricated for use as a soil reinforcement, having high tensile strength, modulus, and stiffness in both principal directions. Use a single-layered, integrally-formed grid structure. Use either extruded or punched and drawn polypropylene or high density polyethylene. Geogrid must be UV-stabilized, chemically inert, and meet the physical requirements in Table 729-1.

Package, label, handle, and store geogrid material according to ASTM D 4873.

TABLE 729-1
GEOGRID PHYSICAL REQUIREMENTS

PROPERTY	REQUIREMENT	TEST METHOD
Average Aperture Size, MD ⁽¹⁾ XD ⁽²⁾	0.8-2.0 in. 0.8-2.0 in.	I.D Calipered Maximum Inside Dimension
Installation Damage Resistance	80% ⁽³⁾	Sample per D5818 Test per D6637
Rib Thickness, min. (Nominal)	40 mils	Rib Thickness Calipered Minimum
Tensile Strength, min. At 2% Strain At 5% Strain	MD & XD 400 lb/ft 800 lb/ft	ASTM D6637
Junction Strength, min.	90% ⁽⁴⁾	GRI GG-GG2
⁽¹⁾ MD: Machine Direction which is along roll length. ⁽²⁾ XD: Cross machine direction which is across roll width. ⁽³⁾ 80% relative to pre-installation Tensile Strength values. Perform Test install using GP or GW Class soil. ⁽⁴⁾ 90% relative to Ultimate Tensile Strength as determined by ASTM D6637		