MEMORANDUM State of Alaska

Department of Transportation and Public Facilities

TO: Distribution DATE: November 25, 2025

FROM: Matthew Hansen, P.E. TELEPHONE: 269-0602

SUBJECT: **Bridge Access Road Pavement Preservation**
Program No. 0463021 / CFHWY00830
Kenai Bridge Access Road Pathway
Program No. TA22001 / CFHWY00689
PS&E Review

Attached for final review and comment are the appropriate copies of the subject assembly. The following specific replies are requested in addition to any other comments:

Right-of-Way	Either that R/W is available for the project or an estimated date when it may be available.
Utilities	Either the utility agreements have been completed or an estimated date when they may be available.
Environmental	What permits are required for this project and an estimated date when they will be acquired.

Ordinarily, only the principal reviewers are invited to attend. Comments are limited to those submitted in writing unless there are significant omissions.

Please use the review comment form located on the Library (L:) drive at \\dot.soa.alaska.gov\shared\AVI\Admin\FORMS\FORMS\ -> Pre PS&E Review comments.doc. If you don't have access to the L: drive and still need a current version of the comment form, let me know and I will e-mail it to you.

Timesheet coding is as follows:

IRIS Project No. CFHWY00830
IRIS Activity: _ _ _P (input your own activity code in the blank spaces)
IRIS Phase: T02015
IRIS Template: TTPJ001

Bridge Access Road Pavement Preservation
Program No.: 0463021/CFHWY00830
Kenai Bridge Access Road Pathway
Program No.: TA22001/CFHWY00689

PS&E Review

PS&E REVIEW COMMENTS are due on Friday December 12, 2025. The review meeting will be held at **1:30 PM** on Thursday December 18, 2025 in the **Main Conference Room**. **Please E-mail comments, using the comment form, to Rangell Soriano (DNR) (rangell.soriano@alaska.gov) and CC Kristina Busch (kristina.busch@alaska.gov) and Matthew Hansen (matthew.hansen@alaska.gov).**

*****Electronic Copy available on the internet at the following location:**
dot.alaska.gov/creg/design/highways/PS&E_Review/CFHWY00830/

*****Meeting conference call-in number*****

Microsoft Teams:	**(907) 202-7104**
Conference ID:	**977 893 862#**

DISTRIBUTION (1 copy, MS 2525 unless otherwise noted):

* Luke Bowland, Pre-Construction Engineer

Highway Design

Sean Baski, Highway Design Group Chief
Kristina Busch, Project Manager, **(4+CD)**
Fred Park, Spec/Estimating Engineer, Highway Design
* Chris Post, Standards Manager
* Jeff Carleton, Electrical Engineer

Materials

* Mike San Angelo, Statewide Materials Eng. (MS 2538)
Mitch Miller, Central Region Materials, (MS 2526) **(2)**

Traffic, Safety, & Utilities

Cindy Ferguson, TS&U Group Chief
David Freese, Utilities Engineer **(2)**
* Anna Bosin, Traffic Safety
Ken Thomas, Traffic & Safety
Roxanne Risse, Traffic Design **(2)**

Maintenance & Operations

* Kirk Warren, Chief, Maintenance and Operations
* Burrell Nickeson, M&O Manager
Jeremy Thompson, M&O Specialist

Construction

* Joel St. Aubin, Regional Construction Engineer
Eric Desentis, Construction Group Chief
Lorett Nabong, Construction Project Manager **(3)**
* Laren Meyer, Regional Construction Office Engineer
* Athena Marinkovic, ESCP Coordinator

Quality Assurance

Mahear Aboueid, Concurrent Review Engineer
Jim Klebesadel, Lead Materials Rover

Contracts

Sharon L. Smith, Contracts Group Chief
Matthew Hansen, Review Engineer

Preliminary Design & Environmental

* Alex Read, PD&E Group Chief
* Brian Elliott, Environmental Manager
Heather Liller, Environmental Impact Analyst
Orion LeCroy, Regional Hydrologist
Elliott Smith, Hydraulics Engineer

Right-of-Way

* Melanie Arnolds, Right-of-Way Group Chief
* Bob Keiner, ROW Engineering Supervisor
* James Sowerwine, ROW, 2525
* Lorraine Kastner, Appr. & Acq Supervisor

Planning

* Ben White, Planning Group Chief
(vacant), Planning Manager, Planning
* Justin Zarr, Hwy Data Supervisor, Planning

Surveys

* Travis Test, Survey Manager

Project Control

* Jennifer Coisman, Project Control Group Chief

Bridge Design

Leslie Daugherty, Bridge Design Group Chief

* Electronic (email) Only

Additional Distribution (without Engineer's Estimate):
* Rangell Soriano, Project Manager, DNR
* Robert Ruffner, KPB Planning Director rruffner@kpb.us
* Terry Eubank, City of Kenai Manager, t.eubank@kenai.city
* Emily Haynes, FHWA emily.haynes@dot.gov

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION
AND PUBLIC FACILITIES
CENTRAL REGION

BID FORM, CONTRACT, BOND, STANDARD MODIFICATIONS
AND SPECIAL PROVISIONS FOR:

Bridge Access Road Pavement Preservation
Program No. 0463021 / CFHWY00830

Kenai Bridge Access Road Pathway
Program No. TA22001 / CFHWY00689

AS ADVERTISED: TBD
Document Fee: $100.00

To be used in conjunction with State of Alaska Standard Specifications for Highway Construction dated 2020, and the Plans for the above referenced project.

www.dot.alaska.gov - "Procurement"

TABLE OF CONTENTS

(Federal-Aid Highways)

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

INVITATION TO BID

for Construction Contract

Date TBD

Bridge Access Road Pavement Preservation
Program No. 0463021 / CFHWY00830
Kenai Bridge Access Road Pathway
Program No. TA22001 / CFHWY00689

The Department invites bidders to submit bids for furnishing all labor, equipment, and materials and performing all work for the project described below. The Department will only consider bids received **before 2:00 PM local time (per the Department's time source) on the XXth day of Month 202X.** On that date, the Department will assemble, open, and then publicly announce the timely-received bids at Anchorage, Alaska at 2:15 PM, or as soon thereafter as practicable.

Location of Project:	Kenai, Alaska
Contracting Officer:	Sean L. Holland, P.E., Regional Director
Issuing Office:	Central Region

State Funded ☐ Federal Aid ☒

Description of Work:
This federally funded project will resurface Bridge Access Road in Kenai, Alaska from Kalifornsky Beach Road to the Kenai Spur Highway. Additional improvements include digouts, addition of new layers of asphalt, guardrail, drainage, signalization, ADA improvements, lighting, signs striping, and bridge work.

Project DBE Utilization Goal: ☒ Race-Neutral

The Engineer's Estimate is between **$5,000,000** and **$10,000,000**

All work shall be completed by **June ##, 2027.**
The Department will identify interim completion dates, if any, in the Special Provisions.

The apparent successful bidder must furnish a payment bond in the amount of 100% of the contract and a performance bond in the amount of 100% of the contract as security conditioned for the full, complete and faithful performance of the contract. The apparent successful bidder must execute the said contract and bonds within **ten (10)** calendar days, or such further time as may be allowed in writing by the Contracting Officer, after receiving notification of the acceptance of their bid.

Submission of Bidding Documents

Bidders may submit bidding documents electronically via the Department's approved online bidding service, through the mail or hand delivered. For mailed or hand delivered bids and for electronically submitted bids with a paper bid guaranty, documents shall be submitted in a sealed envelope marked as follows:

Bidding Documents for Project: **Bridge Access Road Pavement Preservation** **Program No. 0463021 / CFHWY00830** **Kenai Bridge Access Road Pathway** **Program No. TA22001 / CFHWY00689**	**ATTN:** **State of Alaska** **Department of Transportation & Public Facilities** **PO Box 196900** **4111 Aviation Avenue** **Anchorage, AK 99519-6900**

It is incumbent upon the bidder to ensure its bid, any amendments, and/or withdrawal arrive, in its entirety, at the location and before the deadline stated above. A bidder sending a bid amendment or withdrawal via email must transmit its documentation to the Department at this email address: crdotpfcontracts@alaska.gov.

To be responsive, a bid must include a bid guaranty equal to 5% of the amount bid. (*When calculating the bid amount for purposes of determining the 5% value of the bid guaranty, a bidder shall include its base bid amount, plus the amount bid for alternate and supplemental bid items, if any.)*

The Department hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this Invitation, Disadvantaged Business Enterprises will be afforded full opportunity to submit bids and will not be discriminated against on the grounds of race, color, national origin, or sex in consideration for an award.

NOTICE TO BIDDERS

Bidders must have a Vendor ID or your bid may not be accepted. More information can be obtained at the following website: http://dot.alaska.gov/aashtoware/docs/AWP-Vendor-List-Guidance.pdf

The following data may assist a bidder in preparing its bid:

See attached Special Notice to Bidders for this project.

A bidder may obtain hard copy project plans and specifications for the price of **$100.00** from:
State of Alaska, Department of Transportation & Public Facilities
Plans Room
4111 Aviation Avenue
PO Box 196900
Anchorage, AK 99519-6900

Phone: (907) 269-0408

If a bidder has a question relating to design features, constructability, quantities, or other technical aspects of the project, it may direct its inquiry to the questions and answers area of the Bid Express proposal page: https://www.bidx.com/ak/lettings

A bidder requesting assistance in viewing the project site must make arrangements at least 48 hours in advance.
The point of contract for inquiries for this project is **Kristina Busch, P.E.**

Email: kristina.busch@alaska.gov Phone: (907) 269-0567

For questions relating to electronic bidding or for assistance with your Bid Express account, contact Bid Express customer support at customer.support@bidx.com or call toll free (888)352-BIDX(2439) Monday through Friday 7:00am to 8:00pm (Eastern).

A bidder may direct questions concerning bidding procedures and requirements to:
Sharon L. Smith, P.E.
Chief of Contracts
PO Box 196900
Anchorage, AK 99519-6900

Email: sharon.smith@alaska.gov Phone: (907) 269-0414

Other Information:

The Bid Calendar, Plan Holder List, Bid Results and DBE information are available on the Internet at: www.dot.alaska.gov under Procurement.

This project was designed in the US customary (USC) units. Inspection will take place in USC units. Submittals must be provided in USC units.

To report bid rigging activities call: 1-800-424-9071.

The U.S. Department of Transportation (DOT) operates the above toll-free "hotline" Monday through Friday, 8:00 a.m. to 5:00 p.m., Eastern Time. Anyone with knowledge of possible rigging, bidder collusion, or other fraudulent activities should use the "hotline" to report such activities.

The "hotline" is part of the DOT's continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

The **2020 Standard Specifications for Highway Construction** can be obtained at
http://www.dot.state.ak.us/stwddes/dcsspecs/assets/pdf/hwyspecs/sshc2020.pdf

STANDARD MODIFICATIONS
AND
SPECIAL PROVISIONS

to the

STATE OF ALASKA

DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

STANDARD SPECIFICATIONS for HIGHWAY CONSTRUCTION

2020 EDITION

KENAI: BRIDGE ACCESS ROAD

PAVEMENT PRESERVATION

PROJECT NUMBER CFHWY00830

AND

KENAI: BRIDGE ACCESS ROAD PATHWAY

PROJECT NUMBER CFHWY00689

SECTION 101
DEFINITIONS AND TERMS

101-1.03 DEFINITIONS.

ROADWAY. Replace with the following: The portion of a highway or facility including shoulders within the limits of construction. (03/01/24)PARKS-Special Provision

SECTION 102
BIDDING REQUIREMENTS AND CONDITIONS

102-1.04 EXAMINATION OF PLANS, SPECIFICATIONS, SPECIAL PROVISIONS, AND WORK SITE. Replace the second paragraph with the following: Material Reports and/or Soils Investigation Reports are not available for this project. (01/01/01)PARKS-Special Provision

SECTION 105
CONTROL OF WORK

105-1.02 PLANS AND WORKING DRAWINGS. Add the following to the first paragraph: Full size plan sheets are 11" by 17". Plans are not available in CAD digital format.

(01/01/01)PARKS-Special Provision

Add the following Subsection 105-1.011 Related Sections:

105-1.011 RELATED SECTIONS.

Section 651, Control of Work – Supplemental Requirements

C105.5-16.0128-2

105-1.15 PROJECT COMPLETION.

Replace the 1st sentence in the 3rd paragraph with the following:

When all physical work and cleanup provided for under the Contract is found to be complete, except for work specified for Period of Establishment, the Engineer will issue a letter of project completion.

CR105.6-23.0601

SECTION 106
CONTROL OF MATERIALS

106-1.01 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS.

Add the following:

PROHIBITION ON CERTAIN TELECOMMUNICATION AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT. On projects using federal funds, the Contractor shall comply with the requirements of 2 CFR 200.216, Prohibition on certain telecommunication and video surveillance services or equipment, including any future amends thereto that are applicable to the project.

By submitting a bid or by execution of the contract, the Contractor certifies that it has not entered into a contract nor extended or renewed a contract to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system produced by:

- Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- Any entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

The Contractor further certifies that it has complied with the requirements of 2 CFR 200.216 and that it will continue to do so throughout the term of the Contract.

HSM20.20-21.1231

106-1.01 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS. *Replace the fourth paragraph of 106-1.01, with the following:*

The contractor shall submit a certificate of compliance according to Subsection 106-1.05 for each item listed on the Material Certification List. The Engineer may authorize the use of articles, materials, or supplies based on a certificate of compliance Form 25D-62 Certificate of Domestic Materials Compliance. Materials incorporated into the project on the basis of a certificate of compliance may be tested or verified 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 the Subsection 105-1.11.

HSP20-7B

Replace the BUY AMERICA PROVISION with the following:

DOMESTIC MATERIALS PREFERENCE PROVISION. On projects using federal-aid funds the Contractor shall ensure all Iron and Steel Products, Manufactured Products, and Construction Materials, incorporated into the project are produced in the United States as required by 23 CFR 635.410-Buy America requirements (Iron, Steel, and Manufactured Products), and 2 CFR 184-Buy America Preferences for Infrastructure Projects (Construction Materials).

Domestic material requirements apply when articles, materials, or supplies are permanently incorporated into the work. Domestic material requirements do not apply to articles, materials, or supplies: (i) brought temporarily to the construction site and removed at or before the completion of the project, e.g., tools, construction equipment, Jersey barriers; or (ii) used by the Contractor to facilitate construction that are left in place upon completion of the work and are not required to be permanently installed as part of the contract requirements.

An article, material, or supply shall only be classified as an iron or steel product, a manufactured product, a construction material, or other material. An article, material, or supply shall not be considered to fall into multiple categories.† The classification of an article, material, or supply as falling into one of the categories listed must be made based on its status at the time it is brought to the work site for incorporation into the project. The work site is the location of the project at which the article, material, or supply will be incorporated.

† As addressed in paragraph 3) below, 23 CFR 635.410(c)(2) creates an exception to the single category requirement regarding precast concrete products (Precast Concrete) and intelligent transportation systems (ITS) and other electronic hardware systems cabinets and other enclosures.

DOMESTIC MATERIAL CATEGORIES:

1) **IRON AND STEEL PRODUCTS (23 CFR 635.410).** Defined as articles, materials, or supplies that consist wholly or predominantly of iron and steel or a combination of both. To be classified as domestic, all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

If the cost of iron and steel content of an article, material, or supply exceeds 50 percent of the total cost of all components, the iron and steel must meet the domestic materials requirements of the Iron and Steel Products of this provision. The remaining components are then exempt from any domestic procurement requirement.

The cost of iron or steel is the cost of the iron and steel mill products (such as bar, billet, slab, wire, plate, or sheet), castings, or forgings utilized in the manufacture of the product, or a good faith estimate of the cost of iron or steel components. Buy America

requirements do not apply to iron ore, pig iron, and processed, pelletized and reduced iron ore.

Iron and Steel Minimal Use:
All wholly or predominantly iron and steel, or a combination of both, products incorporated into the work, shall be manufactured in the United States. Minimal amounts of iron and steel products of foreign or unknown manufacture may be used, provided the aggregate cost of such does not exceed one tenth of one percent (0.001) of the total contract amount (established at award), or $2,500, whichever is greater. For the purposes of this paragraph, the cost is the value of the products as they are delivered to the project, including shipping.

2) **CONSTRUCTION MATERIALS (2 CFR 184).** Defined as the articles, materials, or supplies that consist of only one of the items listed. Each material has a specific standard to be considered in compliance with domestic materials requirements. The items are:

a. Non-ferrous metals. All manufacturing processes, from initial smelting or melting through final shaping, coating, and assembly, occurred in the United States.
b. Plastic and Polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiberoptic cables). All manufacturing processes, from initial combination of constituent plastic or polymer-based inputs, or, where applicable, constituent composite materials, until the item is in its final form, occurred in the United States.
c. Glass (including optic glass). All manufacturing processes, from initial batching and melting of raw materials through annealing, cooling, and cutting, occurred in the United States.
d. Fiber Optic Cable (including drop cable). All manufacturing processes, from the initial ribboning (if applicable), through buffering, fiber stranding and jacketing, occurred in the United States. All manufacturing processes also include the standards for glass and optical fiber, but not for non-ferrous metals, plastic and polymer-based products, or any others.
e. Optical Fiber. All manufacturing processes, from the initial preform fabrication stage through the completion of the draw, occurred in the United States.
f. Lumber. All manufacturing processes, from initial debarking through treatment and planning, occurred in the United States.
g. Drywall. All manufacturing processes, from initial blending of mined or synthetic gypsum plaster and additives through cutting and drying of sandwiched panels, occurred in the United States.
h. Engineered Wood. All manufacturing processes from the initial combination of constituent materials until the wood product is in its final form, occurred in the United States.

If a Construction Material contains, as minor additions, other Construction Materials, it

remains classified as a Construction Material for the purposes of this section. Minor additions of articles, materials, supplies, or binding agents to a Construction Material do not change the categorization of the construction material.

3) **MANUFACTURED PRODUCTS (23 CFR 635.410).** Defined as articles, materials, or supplies, that have been processed into a specific form and shape or combined with other articles, materials, or supplies to create a product with different properties than the individual articles, materials, or supplies. Manufactured products are acceptable under this provision if the product was manufactured in the United States. For the purposes of this provision, “manufactured in the United States” means that the final assembly of the product occurred in the United States.

For Precast Concrete and ITS and other electronic hardware systems cabinets and other enclosures that are classified as manufactured products, the components that are predominantly steel or iron or a combination of both must comply with the domestic materials requirements of the Iron and Steel Products in paragraph 1) above.

Declare all manufactured products on Form 25D-62 regardless of their exemption.

4) **OTHER MATERIALS.** Defined as articles, materials, or supplies that do not meet the definition of Iron and Steel Products, Manufactured Products, or Construction Materials. These materials do not have any requirements for domestic sourcing. This includes the following items that are specifically categorized as other (excluded) materials per BABA Section 70917(c) of the Infrastructure

Investment and Jobs Act of 2021.

1. Cement and cementitious materials;
2. Aggregates such as stone, sand, or gravel; or
3. Aggregate binding agents or additives

The Contractor shall submit a completed Non-Compliant Minimal Use & De Minimis Register, Form 25D-60, prior to award of the contract. When the Contractor becomes aware of a change from or error in a previously submitted Form 25D-60, the Contractor shall submit an updated Form 25D-60 prior to incorporating the non-compliant item on the subject federal-aid Project, (as defined by the NEPA decision).

The Contractor shall submit a completed Certificate of Domestic Materials Compliance Form 25D-62 for all materials incorporated into the project. The Department will not allow installation of, nor pay for, products that must comply with Domestic Materials requirements until the Contractor has submitted acceptable Forms 25D-60 and 25D-62.

Non-compliant Iron and Steel Products, Manufactured Products, and Construction Materials in excess of the minimal use and/or the de minimis amounts are prohibited and shall be immediately replaced at no expense to the State. Failure to comply may also subject the Contractor to default, suspension, or debarment.

The entity certifying Form 25D-62 may be the manufacturer, fabricator, vendor, or supplier; provided they have sufficient control and knowledge of the manufacturing process to accept responsibility and certify full and complete conformance with 23 CFR 635.410, 2 CFR 200.322. and 2 CFR 184. The Prime Contractor shall also certify Form 25D-62. Provide additional certifications and backup documentation to signed Form 25D-62 when required by the Engineer. False statements may result in criminal penalties prescribed under AS 36.30.687 and Title 18 US Code Section 1001 and 1020.

The United States, Mexico, Canada Agreement (USMCA) does not apply to the Domestic Materials requirements.

<u>De Minimis Waiver:</u>
Notwithstanding the domestic materials requirements outlined in this section regarding Manufactured Products and Construction Materials, US DOT has adopted a limited, non-domestic content waiver regarding articles, materials, and supplies used in the project. As applicable here, US DOT has determined that it is in the public interest to waive domestic materials requirement for Manufactured Products and Construction Materials for which:

The total value of the non-compliant products is no more than the lesser of $1,000,000 or 5% of total applicable costs for the project. In applying the waiver;

1. ‘‘Total value of the non-compliant products’’ does not include the value of those products subject to a separate Buy America waiver.
2. ‘‘Total applicable project costs’’ (as defined by the NEPA finding, determination, or decision and referenced in Form 25D-60) include the cost of materials used in the project that are subject to a domestic preference requirement, including materials that are within the scope of an existing waiver.

$$\frac{(\text{"Total value of non} - \text{compliant products" (Construction Materials} + \text{Manufactured Products))}}{(\text{"Total applicable project costs" (Iron} + \text{Steel} + \text{Manufactured Products} + \text{Construction Materials))}} \times 100$$

HSP20-7B

106-1.02 MATERIAL SOURCES.

Add the following under 5. Rights, Permits and Plan Approvals for Material Sources.

c. Provide proof to the Engineer that all material sources associated with this project have been surveyed for historical and cultural resources by a qualified surveyor and approved by the Alaska Office of History and Archaeology (OHA) or State Historic Preservation Officer (SHPO).

(01/29/21)PARKS-Special Provision

106-1.05 CERTIFICATES OF COMPLIANCE. *Replace the first four paragraphs of 106-1.05 with the following:*

A certificate of compliance must meet one of the following:

1. If by manufacturer’s certification, the certificate must include the project name and federal project number, the quantity represented, the signature of the manufacturer, and must include information that clearly demonstrates the material or assembly complies with all Contract requirements including for domestic materials preference.

2. If by Contractor’s summary sheet, the summary sheet must include the project name and federal project number, the quantity represented, the signature of the contractor, and must include

attached documentation that clearly demonstrates the material or assembly

HSP20-7B

SECTION 107
LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

107-1.02 PERMITS, LICENSES, AND TAXES.

The Department will: Add No. 3:

3. See Appendix A for all Department-secured permits.

(03/01/24)PARKS-Special Provision

The Contractor shall:

Replace No. 1. With the following:

1. Acquire all permits and licenses required to complete the project that are not acquired by the Department.

   a. Complete all draft permits. Draft permits are included in Appendix A, when there are draft permits.

C107.2-21.0701

Add No. 10:

10. Provide a wetland specialist able to conduct wetlands determinations and delineations according to the Corps of Engineers 1987 Wetland Delineation Manual, and the Regional Supplement to the Corps of Engineers Wetland Delineations Manual (Alaska Region, Version 2.0, September 2007). The wetland specialist shall conduct the determination and delineations of sites outside the project limits or not previously permitted, impacted by the Contractor's operations. These delineations will be subject to Corps of Engineers approval.

C107.5-17.1201-1

107-1.07 ARCHAEOLOGICAL OR HISTORICAL DISCOVERIES.

Replace the 1st sentence including numbers 1, 2, and 3, with:

When operation encounters historic or prehistoric artifacts, burials, remains of dwelling sites, paleontological remains, (shell heaps, land or sea mammal bones or tusks, or other items of historical significance), cease operations immediately and notify the Engineer.

C107.3-17.0515

107-1.11 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE.

Add the following:

Non-municipal Water Source. If water is required for a construction purpose from a nonmunicipal water source, 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) 269-8645.

C107.3-17.0515

Add the following:

Eagles. Eagles are protected under 16 U.S.C. 668-668c Protection of Bald and Golden Eagles, that prohibits "takes" of 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 minimum 330-feet as an undisturbed habitat buffer around nesting eagles. If topography or vegetation does not provide an adequate screen or separation, extend the buffer to 1320-feet, 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 a 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, extend the buffer up to 2640-feet. No blasting, logging and other noisy, disturbing activities should occur during the nesting period (February 1 – August 31) within the primary or secondary zones.

Do not disturb a nesting eagle. Notify the Engineer when an active eagle nest is within the primary or secondary zones.

C107.1-18.1001

SECTION 108
PROSECUTION AND PROGRESS

108-1.01 SUBCONTRACTING OF CONTRACT.

In item 1g. replace AS 45.45.101(a) with AS 45.45.010(a).

In item 2f. replace AS 45.45.101(a) with AS 45.45.010(a).

HSM20.41-22.0101

Replace Subsection 108-1.01 1h. with the following:

1h. Other required items listed in Form 25D-042 are included in the subcontracts;

Replace Subsection 108-1.01 2g. with the following:

2g. Other required items listed in Form 25D-042, are included in the lower tier subcontracts;

C108.4-20.0101

Add the following Subsection 108-1.011 Related Sections:

108-1.011 RELATED SECTIONS.

Section 652, Prosecution and Progress – Supplemental Requirements

CR108.3-012816R

108-1.03 PROSECUTION AND PROGRESS. Replace the last sentence of the first paragraph with the following: Submit the following at the Preconstruction Conference:

Replace item 1. with the following:

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 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.

(03/01/24)PARKS-Special Provision

108-1.07 FAILURE TO COMPLETE ON TIME.

Replace Table 108-1 with the following:

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

HSM20.43A-24.0701-1

SECTION 109
MEASUREMENT AND PAYMENT

109-1.01 GENERAL.

Replace the 2nd paragraph with the following:

When more than one type of material or work is specified for a pay item, the proposal line number, and the description are used to differentiate the material or work.

C109.4-20.0101

109-1.02 MEASUREMENT OF QUANTITIES. Add the following:

14. Hour. Measured items by the hour shall be full payment for the work described in the contract including labor, equipment, and operating costs of the equipment. Items to be measured by the hour will be recorded to the nearest quarter-hour by the Engineer. The measurement shall start when the required equipment & operator, surveyor, or survey party begins work at the specified location as directed by the Engineer. The measurement will stop when the required work is accomplished, when the equipment fails, when directed to stop work by the Engineer, or when the operator stops work. Times will be reconciled with the Contractor on a daily basis.

(02/23/15)PARKS-Special Provision

109-1.05 COMPENSATION FOR EXTRA WORK ON TIME AND MATERIALS BASIS.

Under Item 3. Equipment, Item a. add the following to the second paragraph:

The rental rate area adjustment factors for this project shall be as specified on the adjustment maps for the Alaska – South Region.

Provide a printed copy of the current EquipmentWatch rate sheet for each piece of equipment utilized on time and materials work.

C109.2-18.1101

109-1.08 FINAL PAYMENT. Add the following after the fifth paragraph:

On federally funded projects, if DOLWD Wage and Hour Administration notifies the Department of a pending prevailing wage investigation, and that the investigation is preventing the closing out of the project, the Contractor may place the notified amount in escrow under Wage and Hour for the exclusive purpose of satisfying unpaid prevailing wages. Upon receipt of notice from Wage and Hour that the Contractor has satisfactorily transferred the necessary funds into escrow, the Department will proceed to issue final payment.

HSM20.3-20.1130-1

SECTION 120
DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM

120-1.01 DESCRIPTION.

In the first sentence of the second paragraph, replace “8.83 percent" with “9.39 percent”.

HSM20.21A-24.0415

120-3.01 DETERMINATION OF COMPLIANCE.

2. Phase II – Award.

   a. Written DBE Commitment. Delete in its entirety and substitute the following: Complete Form 25A-326 for each DBE to be used on the project.

HSM20.21A-24.0415

SECTION 201
CLEARING AND GRUBBING

201-3.01 GENERAL.

Add the following:

Timber for Public Removal. 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. Place the stacks at locations shown in the Plans, included in Specifications or at other locations approved by the Engineer. Make locations adjacent to the nearest turnout, side street, or other approved site that does not create a traffic hazard due to lack of adequate parking for the public. Access to the site(s) shall be maintained and controlled by flaggers, in accordance with Subsection 643-3.04. The Contractor shall provide and maintain a separate firewood telephone hotline that details when and where the wood is available to the public. Special Construction signs, in accordance with Subsection 643-2.01, shall be used to advertise the firewood telephone hotline. Provide two weeks for the public to access each area of the project where timber is made available. Dispose of the timber left by the public after the two week time period.

Mechanical loading by the public is not permitted.

C201.2-14.0101

Add the following:

Perform the work necessary to preserve and/or restore land monuments and property corners from damage. Restore land monuments and/or property corners that are disturbed according to Section 642. An undisturbed area five feet in diameter may be left around existing monuments and property corners. A list of land monuments and property corners is shown on the Right of Way maps.

C201.3-13.0423

Add the following:

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 when approved by the Engineer.

C201.1-14.0101

201-3.03 GRUBBING. Add the following: The Contractor has the option to screen organic soil obtained from grubbing to meet the gradation for topsoil as specified under Section 726, or as approved by the Engineer. The screened material may be used for topsoil onsite. (05/02/11)PARKS-Special Provision

201-5.01 BASIS OF PAYMENT.

Add the following:

The work required to cut, de-limb, and stack timber for public removal is subsidiary to 201 Pay Items.

C201.2-14.0101

Add the following:

The work required to preserve and restore land monuments and property corners is subsidiary to 201 Pay Items.

C201.3-13.0423

Add the following:

Material from screening and tub grinding incorporated into the project as topsoil will be paid for as topsoil under Section 620. Screening and tub grinding operations shall be subsidiary to Section 620 items.

Material not incorporated into the project and is disposed of offsite shall be subsidiary to clearing and grubbing items.

(05/06/11)PARKS-Special Provision

SECTION 202
REMOVAL OF STRUCTURES AND OBSTRUCTIONS

202-1.01 DESCRIPTION. Replace the first sentence with the following: This work shall consist of, but not be limited to, the removal of (sign bases, concrete slabs, barrier rocks, rails, posts, signs, parking bumpers, entrance signs, ect.) structures 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.
(10/31/25)PARKS-Special Provision

Add the following Subsection 202-3.06 Salvage and Disposal of Construction and Demolition Materials:

202-3.06 SALVAGE AND DISPOSAL OF CONSTRUCTION AND DEMOLITION MATERIALS. Unless otherwise noted, remove, handle, salvage, transport, store, and dispose waste materials according to the Occupational, Safety, and Health Administration (OSHA), Environmental Protection Agency (EPA), Alaska Department of Environmental Conservation (ADEC), and other Federal, State and local government agency's statutes, rules and regulations.

Use disposal sites outside the project limits unless directed otherwise, in writing, by the Engineer. Obtain written consent from the private or public property owner for such disposal 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 disposal. Furnish a copy of such permission, waiver of claims, and permits to the Engineer before commencing work. Grade disposal areas to drain.

C202.1-20.0401

SECTION 203
EXCAVATION AND EMBANKMENT

203-3.04 COMPACTION WITH MOISTURE AND DENSITY CONTROL.

In the second paragraph delete "and ATM 214".

HSM20.5-20.1130-1

Replace Section 204 with the following:

SECTION 204
STRUCTURE EXCAVATION FOR CONDUITS AND MINOR STRUCTURES

204-1.01 DESCRIPTIONS. Excavate and backfill for conduits (pipe culverts, structural plate pipe, pipe arches, storm drains, underdrains, and electrical conduits), headwalls, manholes, inlet boxes, and other minor structures.

Dewater ground water from work areas. Construct and maintain temporary water diversion when working in waterways, and for facilities or structures with active drainage.

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

204-2.01 MATERIALS. Use materials that conform to the following:

Selected Material	Subsection 703-2.07
Porous Backfill Material	Subsection 703-2.10

1. Structure Backfill and Bedding Material.

   a. Selected Material, Type A.

      (1) Material passing the 1-inch sieve.
      (2) Material passing the 1/2-inch sieve for plastic conduits less than 8 inches in diameter.

   b. Porous Backfill Material.

      Uniform porous backfill material for underdrain conduit.

      (1) Material passing the 1-inch sieve for conduit 3-inch to 10-inch diameters.
      (2) Material passing the 2-inch-sieve for conduit 12-inch to 60-inch diameters.

2. Backfill Material: Selected Material Type C

In the roadbed structure use backfill material meeting the requirements of the roadbed structure, except use the structure backfill material and bedding as specified herein.

Use all suitable material from the project excavation for bedding, structure backfill, and backfill material before using material from another source.

204-3.01 CONSTRUCTION REQUIREMENTS. Clear and grub prior to starting excavation according to the requirements of Section 201.

Keep the work areas dewatered and divert water when working in a waterway or active

drainage, Subsection 204-3.02.

Remove and dispose, Subsection 203-3.01, of unsuitable foundation material, including rock or other unyielding material, below the designed elevation as directed, except no less than 6 inches, and replace with approved material.

Place bedding material to a minimum thickness of 4 inches, except 6-inch minimum thickness for conduit over rock or unyielding material, and below electrical conduit, unless shown otherwise in the plans.

Place the bedding material to provide uniform support for conduit with the material in the middle one-third loosely placed and not compacted. Do not shape the bedding to the curvature of the round conduits. Shape the bedding for pipe arches, horizontal ellipse, and underpass shapes with spans exceeding 12 feet. Provide a minimum shaped width one-half the span of the pipe arch and underpass shapes and one-third the span of horizontal ellipse shape. Shape the bedding to the relatively flat bottom arc or fine-grade the foundation to a slight "V" shape.

Place minor precast concrete structures, other than conduits, on the 4-inch bedding/leveling course, of uniform stiffness and thickness with even compaction throughout.

Place the structure backfill over the bedding each side of the structure to 12 inches above the structure or the ground surface if less than 12 inches, except 6 inches above electrical conduit.

Place the structure backfill and backfill material in uniform layers not more than 6 inches deep. Do not create unbalanced loading with the placement of the structure backfill materials. When placing material against concrete, place the material according to the requirements of Section 550.

Compact the materials, each layer, without ponding or jetting to meet Subsection 203-3.04. In the haunch area, each side of the conduit, compact the material by firmly tamping into place.

Outside the roadbed structure, the Engineer may visually inspect and approve the excavation, bedding, structure backfill, backfill material, and compaction.

Support and protect existing conduits or utilities, 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.

204-3.02 DEWATERING AND WATER DIVERSION. Submit a plan for work area dewatering and each waterway diversion, 14 days before related construction activities.

Do not implement the plan without written approval. Include the permit requirements in the plan.

1. Do not exceed State of Alaska water quality standards.

2. Do not divert water from dewatering into a waterway.

3. Provide an approved disposal site for work area excess water. Maintain disposal site a minimum of 100 ft from waterway.

4. Prevent turbid water from directly entering waterways.

5. Do not divert water onto the roadway.

6. In addition to other equipment required to complete the temporary water diversion and dewatering work, maintain a minimum of two trash pumps with hoses at the site during diversion construction activities. Maintain the intake to prevent fish entrapment, entrainment, or injury with the use of perforated or slotted plate and woven wire with a mesh size not greater than 3/32 inch or a profile bar and wedgewire with openings not greater than 1/16 inch. Do not exceed passive approach velocity of 0.2 fps and active approach velocity of 0.4 fps.

Rewater to minimize sediment movement downstream of the site. Prior to rewatering, slowly wet the reconstructed waterway channel; wash the fines into the bed by using pumps, or by diverting a small portion of the waterway channel flow. Capture and pump the sediment and turbid water, from the downstream end of the channel to the upstream end of the channel, until fines are washed into the streambed and water runs clear. Attain the Engineers written approval before breaching the coffer/diversion dams. Slowly breach the coffer/diversion dams and rewater the waterway channel.

204-4.01 METHOD OF MEASUREMENT. Section 109. Use neat line method as follows:

Structure Excavation:

1. Masonry Structures (except conduit). Between vertical planes, 18 inches outside the base of the masonry sections for the depth required.

2. Conduit. Between parallel vertical planes located 18 inches outside the horizontal projection of the outside diameter of the conduit and to the depth shown on the Plans.

Structure excavation only measured below the limits of other classes of excavation. Structure's in embankment section, the natural ground line as cross-sectioned is the uppermost level of computation.

204-5.01 BASIS OF PAYMENT. The Contract price includes the placing and compacting of all backfill and bedding when the materials used are obtained from excavation, any clearing and grubbing required and not paid for under some other item, formation of any

embankments made with surplus material from structure excavation, and disposal of all surplus or unsuitable excavation.

Culvert baffles, headwalls, temporary water diversion, dewatering and rewatering, and the removal of pavement are subsidiary to the conduit and minor structure Pay Items.

Additional excavation to provide for shoring, sheet piles, excavation shields or flattening the excavation slopes, is subsidiary.

SECTION 205
EXCAVATION AND FILL FOR MAJOR STRUCTURES

205-3.05 COMPACTION.

1. Compaction with Moisture and Density Control. 2nd paragraph delete: "and ATM 214".

HSM20.5-20.1130-1

SECTION 301
AGGREGATE BASE AND SURFACE COURSE

301-2.01 MATERIALS.

Add the following after the first sentence:

Recycled Asphalt Material (RAM) may be substituted for aggregate base course, inch for inch, if the following conditions are met:

1. RAM shall be crushed or processed to 100 percent by weight passing the 1.5-inch sieve and 95-100 percent by weight passing the 1-inch sieve.

2. The gradation of the extracted aggregate shall meet the following:

TABLE 301-2.01-1
EXTRACTED AGGREGATE GRADATION

Sieve	Percent Passing by Weight
1-inch	100
3/4-inch	70 – 100
3/8-inch	42 – 90
No. 4	28 – 78
No. 16	11 – 54
No. 50	5 – 34
No. 100	3 – 22
No. 200	2 - 12

3. The asphalt content shall be 2.5 – 5.0 percent by weight of the RAM.

C301.1-07.0124-1

301-3.01 PLACING.

Add the following:

Place base course material, used for the sidewalk and pathway foundations, with equipment capable of providing a specified depth and uniform surface.

C301.2-16.0621

Add No. 5 after the 5th paragraph:

5. within 50 feet of detector loops.

C301.3-15.0220

301-3.03 SHAPING AND COMPACTION.

In the second paragraph delete "and ATM 214".

HSM20.5-20.1130-2

Add the following:

If recycled asphalt material is substituted for aggregate base course, the following conditions shall be met:

1. Density acceptance will be determined by control strip method ATM 412. Use a test strip with a vibratory compactor with a minimum dynamic force of 40,000 pounds. The optimum density will be determined by the Engineer using a nuclear densometer gauge to monitor the test strip. Adequate water shall be added to aid compaction.

2. After the appropriate coverage with the vibratory compactor, a minimum of 6 passes with a pneumatic tire roller shall be completed. Tires shall be inflated to 80 psi (± 5 psi) and the roller shall have a minimum operating weight per tire of 3,000 pounds.

C301.1-07.0124-1

301-5.01 BASIS OF PAYMENT.

Add the following:

Recycled asphalt material substituted for aggregate base course will be paid for as Item 301.0001.00D1 Aggregate Base Course, at the unit price shown in the bid schedule for that Item.

C301.1-07.0124-1

Replace Section 401 with the following:

SECTION 401
HOT MIX ASPHALT PAVEMENT

401-1.01 DESCRIPTION. Construct one or more courses of plant-produced Hot Mix Asphalt (HMA) pavement on an approved surface, to the lines, grades, and depths shown on the Plans.

1. In this Section, HMA refers to Type I, II, III, and IV.

    a. Temporary Asphalt Pavement: HMA, Type II, Class B, minimum.
    b. Preleveling/Leveling Course: HMA, Type IV, Class B.

MATERIALS

401-2.01 ASPHALT BINDER. Conform to Subsection 702-2.01. If binder performance grade is not specified, use PG 52-28.

Provide test reports for each batch of asphalt binder showing conformance to the specifications in Section 702 before delivery to the project. Require that the storage tanks used for each batch be noted on the test report, the anti-strip additives required by the mix design be added during load out for delivery to the project, and a printed weight ticket for anti-strip is included with the asphalt binder weight ticket. The location where anti-strip is added may be changed with the written approval of the Engineer.

Furnish the following documents at delivery:
1. Manufacturer’s certificate of compliance (Subsection 106-1.05).
2. Conformance test reports for the batch (provide prior to delivery as noted above).
3. Batch number and storage tanks used.
4. Date and time of load out for delivery.
5. Type, grade, temperature, and quantity of asphalt binder loaded.
6. Type and percent of liquid anti-strip added.

Asphalt binder may be conditionally accepted at the source if a manufacturer's certification of compliance is provided, according to Subsection 106-1.05, and the applicable requirements of Section 702 are met.

401-2.02 LIQUID ANTI-STRIP ADDITIVE. Use anti-strip agents in the proportions determined by ATM 414 and included in the approved Job Mix Design (JMD). At least 90% of the aggregate must remain coated when tested according to ATM 414. The following minimum dose (percent) of liquid anti-strip by weight of asphalt binder is required:

TABLE 401-2.02-1
MINIMUM DOSE OF LIQUID ANTI-STRIP BY WEIGHT OF ASPHALT BINDER

Liquid Anti-strip Type	Minimum Dose by Weight of Asphalt Binder, %
Amines based	0.30
Phosphate Ester based	0.30
Organ-Silane based	0.05

401-2.03 JOINT ADHESIVE. Conform to Subsection 702-2.05.

401-2.04 JOINT SEALANT. Conform to Subsection 702-2.06.

401-2.05 WARM MIX ASPHALT. Conform to Subsection 702-2.07.

401-2.06 ASPHALT RELEASE AGENT. Conform to Subsection 702-2.08.

401-2.07 AGGREGATES. Conform to Subsection 703-2.04. Use a minimum of three stockpiles of crushed aggregate (coarse, intermediate, and fine). Place blend material, if any, in a fourth pile.

401-2.08 RECYCLED ASPHALT PAVEMENT. Recycled asphalt pavement (RAP) may be used in the production of HMA. The RAP may be from pavements removed under the Contract, or from an existing stockpile. Conform to Subsection 703-2.16

401-2.09 JOB MIX DESIGN (JMD). Provide target values for gradation that satisfy both the broad band gradation limits shown in Table 703-4 and the requirements of Table 401-1, for the Type and Class of HMA specified.

TABLE 401-1
HMA MARSHALL DESIGN REQUIREMENTS

DESIGN PARAMETER	CLASS "A"	CLASS "B"
HMA (Including Asphalt Binder)		
Stability, Pounds	1800 Min.	1200 Min.
Flow, 0.01 Inch	8 – 14	8 - 16
Voids in Total Mix (VTM), %	3.0 – 5.0	3.0 – 5.0
Compaction, Number of Blows Each Side of Test Specimen	75	50
Asphalt Binder		
Voids Filled with Asphalt (VFA), %	65 - 75	65 - 78
Asphalt Content, Min. % @ 4% VTM	5.0	5.0
Dust-Asphalt Ratio*	0.6 - 1.4	0.6 - 1.4
Voids in the Mineral Aggregate (VMA), %, Min.		
Type I	12.0	11.0
Type II	13.0	12.0
Type III, IV	14.0	13.0

DESIGN PARAMETER	CLASS "A"	CLASS "B"
Liquid Anti-Strip Additive**,%, Min.	0.30	0.30
RAP, %, Max.	15.0	25.0

*Dust-Asphalt ratio is the percent of material passing the No. 200 sieve divided by the percent of effective asphalt binder (calculated by weight).
** By Weight of Asphalt Binder

The approved Job Mix Design (JMD) will specify the Target Values (TV) for gradation, the TV for asphalt binder content, the Maximum Specific Gravity (MSG) of the HMA, the additives, and the recommended mixing temperature range.

Submit the following to the Engineer at least 15 days before the production of HMA:

1. A letter stating the location, size, and type of mixing plant. The letter shall state whether or not WMA and/or RAP will be used. The letter shall include the proposed gradation for the JMD, gradations for individual stockpiles, and the blend ratio of each aggregate stockpile.

2. Representative samples of each aggregate (coarse, intermediate, fine, blend material and mineral filler, if any) in the proposed mix design. Furnish a total of 500 pounds of material in the proportional amounts in the proposed JMD.

3. Five separate 1-gallon samples of the asphalt binder proposed for use in the HMA. Include name of product, manufacturer, test results of the applicable quality requirements of Subsection 702-2.01, manufacturer's certificate of compliance according to Subsection 106-1.05, a temperature-viscosity curve for the asphalt binder or manufacturer's recommended mixing and compaction temperatures, and current Material Safety Data Sheet.

4. One sample, minimum 1/2 pint, of the anti-strip additive proposed, including name of product, manufacturer, and manufacturer's data sheet, and current Material Safety Data Sheet.

5. Testing results per Subsection 106-1.03.1 for each aggregate type proposed for use.

6. If applicable, a letter stating the WMA technology (Subsection 702-2.07) to be used, location where additive will be introduced and manufacturer's recommended usage rate for each type of HMA. Supply a minimum of 2-pint samples for each proposed additive.

7. If applicable, representative samples of any RAP proposed for use. Furnish a minimum of 200-pound sample of proposed RAP.

The Engineer will evaluate the material and the proposed gradation using ATM 417 and the requirements of Table 401-1 for the appropriate Type and Class of HMA specified, and establish the approved JMD which will become a part of the Contract.

Anti-strip evaluation (ATM 414) of HMA mix designs that include RAP will be completed without the inclusion of the RAP.

Obtain an approved JMD prior to shipment of aggregates to an asphalt plant site or producing HMA for payment.

1. Contractor Mix Design. If a bid item for JMD appears in the contract, or if the Engineer approves a request from the Contractor to perform the JMD at no cost to the Department, provide a JMD following the requirements specified in this section. Submit the JMD to the Engineer at least 15 working days before HMA production. Submit samples to the Engineer upon request for JMD verification testing.

   All Contractor-furnished JMDs must be sealed by a professional Engineer registered in the State of Alaska. The Professional Engineer shall certify that the JMD was performed according to the specified procedures, and meets all project specifications.

2. Changes. Submit a new JMD with changes noted and new samples in the same manner as the original JMD submittal when:

   a. The results of the JMD evaluation do not achieve the requirements specified in Table 401-1
   b. The asphalt binder source is changed
   c. The source of aggregate, aggregate quality or gradation is changed
   d. The results of a Test Strip do not meet the requirements of the specification – the Engineer may require a new JMD.

Do not produce HMA for production paving and payment before the Engineer provides written approval of the JMD; the original, or a replacement JMD.

The Engineer has the option to require further verification of the JMD under 401-2.10 Process Quality Control. If a Test Strip(s) is required, do not produce HMA for production paving and payment before the Engineer provides written approval of the Test Strip construction, construction process, materials, and the JMD, Subsection 401-2.10.

Payment for HMA will not be made until the new JMD and the Test Strip, when required, is approved.

Approved changes apply only to HMA produced after the submittal of changes.

The Engineer will assess a fee for each mix design evaluation subsequent to the approved Job Mix Design, per Subsection 401-5.01.

401-2.10 PROCESS QUALITY CONTROL. Sample and test materials for quality control of the HMA according to Subsection 106-1.03. Submit to the Engineer at the "Pre-Paving Meeting," Subsection 401-3.01, the JMD and a documentation plan that provides a complete, accurate, and clear record of the sampling and testing results.

Failure to perform quality control forfeits the Contractor's right to a retest under Subsection 401-4.02

Provide copies of the documented sampling and testing results no more than 24 hours from the time taken.

Supplemental Process Quality Control:

The Engineer has the option to require supplemental process quality controls including additional sampling and testing. Include the supplemental process quality controls in the documentation plan.

When directed by the Engineer: provide “Density Profiles” and or “Test Strips”.

1. Density Profiles. Provide density profile testing, with a nuclear density gauge, of the mat and longitudinal joints. Include the frequency of the test groups, configuration of the test groups for mat density and joint density individually or combined. Indicate the number of tests in a test group intended to confirm the density of the mat and joints.

   Locations that may require testing include: all lanes on bridge decks, adjacent to longitudinal joints, areas where segregation is visible, thermal segregation potential exists, where mat density is lower than the minimum (considered segregated), and the paver starts/stops. The Engineer will identify these and other areas that require density testing.

2. Test Strips. Construct test strips (ATM 412) using the approved job mix HMA a minimum of 5 working days prior to planned production paving, except use the proposed JMD when the test strip is being constructed to help evaluate the JMD as part of the mix performance analysis. Submit a proposed test strip location to the Engineer for coordination, and approval; include in the process control documentation plan. The Engineer's approval and written authorization of the location, date, and time, is required before construction of a test strip.

   Establish roller patterns and the number of passes required to assure that proper placement and compaction is achieved. The test strip shall include no less than 300 tons and no more than 1000 tons, except as may be authorized, in writing, by the Engineer. The full complement of the paving train shall be on site to receive instructions from the Engineer as needed to complete the mix performance analysis. Make the equipment available for inspection as required by Subsection 401-3.04. Provide an onsite process control representative with authority to modify mix components as instructed by the Engineer.

   Failed Test Strip: the Engineer may direct the Contractor to remove and dispose of test strips not meeting specification requirements. Contractor, construct a new test strip or return the surface materials and grade to their original condition as directed by the Engineer.

Only after the Engineer approves the test strip may HMA be produced for production paving and payment.

Refer to Subsection 401-5.01 for payment of test strips.

CONSTRUCTION REQUIREMENTS

401-3.01 PRE-PAVING MEETING. Meet with the Engineer for a pre-paving meeting in the presence of the project superintendent and paving foreman at least (5) working days before beginning paving operations. Submit a paving plan and pavement inspection plan at the meeting. When directed, make adjustments to the plan and resubmit.

1. Paving Plan. Include the following:

   a. Sequence of operations
   b. List of equipment that will be used for production, transport, pick-up (if applicable), laydown, and compaction
   c. Summary of plant modifications (if applicable) for production of WMA
   d. Procedures to produce consistent HMA
   e. Procedures to minimize material and thermal segregation
   f. Procedures to minimize premature cooling
   g. Procedures to achieve HMA density
   h. Procedures for joint construction including corrective action for joints that do not meet surface tolerance requirements
   i. Quality control testing methods, frequencies and sample locations for gradation, asphalt binder content, and density, and
   J. Any other information or procedures necessary to provide completed HMA construction that meets the Contract Requirements

2. Pavement Inspection Plan. Include the following:

   a. Process for daily inspections
   b. Means and methods to remove and dispose of project materials

401-3.02 CONTRACTOR QUALITY CONTROL. Perform quality control (QC) of HMA materials in accordance with Subsection 106-1.03.

401-3.03 WEATHER LIMITATIONS. Place HMA on a stable/non-yielding roadbed. Do not place HMA when the base material is wet or frozen, or when weather conditions prevent proper handling or finishing of the mix. Do not place HMA when the roadway surface temperature is colder than 40° F.

401-3.04 EQUIPMENT, GENERAL. Use equipment in good working order and free of HMA buildup. Make equipment available for inspection and demonstration of operation a minimum of 24 hours before placement of production HMA and test strip HMA.

401-3.05 ASPHALT MIXING PLANT. Meet AASHTO M 156. Use an HMA plant capable of producing at least 150 tons of HMA per hour noted on posted DEC air quality permit, designed to dry aggregates, maintain consistent and accurate temperature control, and accurately proportion asphalt binder and aggregates. Calibrate the HMA plant and furnish copies of the calibration data to the Engineer at least 24 hours before HMA production.

Provide a scalping screen at the asphalt plant to prevent oversize material or debris from being incorporated into the HMA.

Provide a tap on the asphalt binder supply line just before it enters the plant (after the 3-way valve) for sampling asphalt binder. Provide aggregate and asphalt binder sampling locations meeting OSHA safety requirements.

You may use belt conveyor scales to proportion plant blends and mixtures if the scales meet the general requirements for weighing equipment and are calibrated according to the manufacturer's instructions.

If WMA is approved by the Engineer, modify the mixing plant as required by the manufacturer and WMA additive manufacturer.

401-3.06 HAULING EQUIPMENT. Haul HMA in vehicles with tight, clean, and smooth metal beds. Keep beds free of petroleum oils, solvents, or other materials that will adversely affect the mixture. Apply a thin coat of approved asphalt release agent to beds as necessary to prevent mixture adherence.

Provide hauling vehicles with covers attached and available for use. When directed, over the HMA in the hauling vehicle(s).

Do not haul HMA on barges.

401-3.07 ASPHALT PAVERS. Use self-propelled asphalt pavers with heated vibratory screed assemblies to spread and finish HMA to the specified section widths and thicknesses without introducing thermal or material segregation.

Equip the paver with a receiving hopper having sufficient capacity for a uniform spreading operation and a distribution system to place the HMA uniformly in front of screed. Use a screed assembly that produces a finished surface of the required smoothness, thickness, and texture without tearing, shoving, or displacing the HMA. Heat and vibrate screed extensions. Place auger extensions within 20 inches of the screed extensions or per written manufacturer's recommendations.

Equip the paver with a means of preventing segregation of the coarse aggregate particles from the remainder of the HMA when carried from the paver hopper back to the augers.

Equip the paver with automatic screed controls capable of operating from a reference line or a ski from either or both sides of the paver.

The use of a “Layton Box” or equivalent towed paver is allowed on bike paths, sidewalks, and driveways.

401-3.08 ROLLERS. Use both steel-wheel (static or vibratory) and pneumatic-tire rollers. Use rollers designed to compact HMA and capable of reversing without shoving or tearing the mixture. Select rollers that will not crush the aggregate or displace the HMA. Equip vibratory rollers with separate vibration and propulsion controls.

Equip the rollers with an infrared thermometer that measures and displays the surface temperature to the operator. Infrared thermometer may be hand-held or fixed to the roller.

Utilize a pneumatic roller in the complement of rollers to compact the leveling course. Use fully skirted pneumatic-tire roller having a minimum operating weight of 3000 pounds per tire.

401-3.09 RESERVED.

401-3.10 PREPARATION OF EXISTING SURFACE. Prepare existing surfaces according to the Contract. Prior to placing HMA, clean existing surfaces of loose material and uniformly coat contact surfaces of curbing, gutters, manholes and other structures with tack coat material meeting Section 402. Treat cold joint surfaces according to 401-3.17. Allow tack coat to break before placement of HMA on these surfaces. Do not apply the tack coat material until the Engineer approves the existing surface including, not limited to; the existing paved surface, the milled surface, and a prior layer of HMA pavement.

Before applying tack coat to an existing paved surface, clean and patch the surface. Remove irregularities to provide a reasonably smooth and uniform surface. Remove and replace unstable areas with HMA. Clean the edges of existing pavements, which are to be adjacent to new pavement, to permit the adhesion of asphalt materials. Clean loose material from cracks. Fill the cleaned cracks, wider than 1 inch, with HMA tamped in place. Wash and/or sweep the paved surface clean and free of loose materials.

Preparation of a milled surface:

1. Prelevel remaining ruts, pavement delaminations, and depressions having a depth greater than 1/2 inch with an approved HMA.

2. Notify the Engineer of pavement areas that appear thin or unstable. Where milling operation creates thin or unstable pavement areas, or where it breaks through existing pavement, remove thin and unstable pavement, and 2 inches of existing base material, compact and replace with an approved HMA.

401-3.11 PREPARATION OF ASPHALT. Provide a continuous supply of asphalt binder to the asphalt mixing plant at a uniform temperature, within the recommended mixing temperature range.

401-3.12 PREPARATION OF AGGREGATES. Dry the aggregate so the moisture content of the HMA, sampled at the point of acceptance for asphalt binder content, does not exceed 0.5% (by total weight of mix), as determined by ATM 407.

Heat the aggregate for the HMA to a temperature compatible with the mix requirements specified.

Adjust the burner on the dryer to avoid damage to the aggregate and to prevent the presence of unburned fuel on the aggregate. HMA containing soot or fuel is unacceptable per Subsection 105-1.11.

401-3.13 MIXING. Combine the aggregate, asphalt binder, and additives in the mixer in the amounts required by the JMD. Mix to obtain at least 98% coated particles when tested according to AASHTO T195.

For batch plants, put the dry aggregate in motion before addition of asphalt binder.

Mix the HMA within the temperature range determined by the JMD.

Upon the Engineer's request, provide daily burner charts showing start/stop times and temperatures.

401-3.14 TEMPORARY STORAGE OF HMA. Silo type storage bins may be used, provided the characteristics of the HMA remain unaltered.

Signs of visible segregation, heat loss, changes from the JMD, change in the physical characteristics of asphalt binder, lumpiness, and stiffness of the mixture, are causes for rejection.

Do not store HMA on barges.

401-3.15 PLACING AND SPREADING. Use asphalt pavers to distribute HMA, including leveling course and temporary HMA. Place the HMA upon the approved surface, spread, strike off, and adjust surface irregularities. The maximum compacted lift thickness allowed is 3 inches.

During placement, the Engineer, using an infrared camera, may evaluate the HMA surface immediately behind the paver for temperature uniformity. Contractor, immediately adjust laydown procedure to maintain a temperature differential of 25^{o} F or less. Thermal images and thermal profile data will become part of the project record and shared with the Contractor.

When multiple lifts are specified in the Contract, do not place the final lift until all lower lifts throughout that section, are placed and accepted.

Do not place HMA abutting curb and gutter until curb and gutter are installed, except as approved by the Engineer. Do not pave against new concrete curbing and gutter until the concrete has cured for at least 72 hours.

When practicable, adjust elevation of metal fixtures before paving the final lift, so they will be between 1/4 and 1/2 inch below the top surface of the final lift. Metal fixtures include, but are not limited to manholes, valve boxes, monument cases, hand holes, and drains.

When the section of roadway being paved is open to traffic, pave adjacent traffic lanes to the same elevation within 24 hours. Place approved material against the outside pavement edge when the drop off exceeds 2 inches.

Use hand tools to spread, rake, and lute the HMA in areas where irregularities or unavoidable obstacles make mechanical spreading and finishing equipment impracticable.

Place HMA over bridge deck membranes according to Section 508 and the membrane manufacturer's recommendations.

Do not mix HMA produced from different plants for testing or paving.

401-3.16 COMPACTION. Compact the HMA by rolling thoroughly and uniformly. In areas not accessible to large rollers, compact with mechanical tampers or trench rollers.

Prevent indentation in the mat. Do not leave rollers or other equipment standing on HMA that has not sufficiently cooled.

The Lower Specification Limit for density is 92.0% of the Maximum Specific Gravity (MSG) as determined by ATM 409. A mat area with density lower than 92% MSG is considered segregated and not in conformance with the requirements of the Contract. The work is unacceptable according to Subsection 105-1.11 unless, the Engineer determines that reasonably acceptable work has been produced as permitted in Subsection 105-1.03.

The MSG from the approved JMD is used for the first lot of each type of HMA. The MSG for additional lots is determined from the first sublot of each lot.

401-3.17 JOINTS. Place and compact the HMA to provide a continuous bond, texture, and smoothness between adjacent sections of the HMA.

Minimize the number of joints. Do not construct longitudinal joints in the driving lanes unless approved by the Engineer in writing at the pre-paving meeting. Offset the longitudinal joints in one layer from the joint in the layer immediately below by at least 6 inches. Align the joints of the top layer at the centerline or lane lines. Where preformed

marking tape striping is required, offset the longitudinal joint in the top layer not more than 6 inches from the edge of the stripe.

Form transverse joints by saw-cutting back on the previous run to expose the full depth of the layer or by using a removable bulkhead, or other approved method. Skew transverse joints 15 to 25 degrees.

For all joints below the top lift, uniformly coat joint surfaces with tack coat material meeting Section 402.

Uniformly coat the joint face of all top lift joints with a joint adhesive. Follow joint adhesive manufacturer's recommendations for temperatures and application method. Remove joint adhesive applied to the top of pavement surface. If infrared joint heaters are used and passing joint densities are achieved in each of the first three joint densities taken, then joint adhesive is not required.

The Lower Specification Limit for top lift longitudinal joint density is 91.0% of the MSG of the panel completing the joint. MSG will be determined according to ATM 409.

For top lift panels that have a longitudinal joint density less than 91.0% of the MSG in a sublot, seal the surface of the longitudinal joints with joint sealant within that sublot, or as directed. Apply joint sealant according to the manufacturer’s recommendations while the HMA is clean, free of moisture and prior to final traffic marking. Place the sealant at a maximum application rate of 0.15 gallons per square yard, and at least 12 inches wide centered on the longitudinal joint. After surface sealing, inlay by grinding pavement striping into the sealed HMA. Use grooving equipment that grinds a dry cut to groove the width, length, and thickness of the striping within the specified striping tolerances.

Correct improperly formed joints that result in surface irregularities according to a corrective action plan.

Complete all hot lapped joints while the mat temperature is over 230°F as measured by the Engineer, within 3 inches of the joint. Tack coat and joint adhesive are not required for hot lapped joints. Hot lapped joints will receive the full Longitudinal Joint Density Price Adjustment incentive without testing for joint density.

Top lift longitudinal joints will be evaluated for acceptance according to Subsection 401-4.03

401-3.18 SURFACE REQUIREMENTS AND TOLERANCE. The finished surface of all HMA paving must match dimensions shown in the contract for horizontal alignment and width, profile grade and elevation, crown slope, and pavement thickness. Water must drain across the pavement surface without ponding. The surface must have a uniform texture, without ridges, puddles, humps, depressions, and roller marks. The surface must not exhibit raveling, cracking, tearing, asphalt bleeding, or aggregate segregation. Leave no foreign material, uncoated aggregate, or oversize aggregate on the HMA surface.

The Engineer will test the finished surface after final rolling at selected locations using a 10-foot straightedge. The Engineer will identify pavement areas that deviate more than 3/16 inch from the straightedge, including joints, as defective work. Perform corrective work by removing and replacing, grinding, cold milling or infrared heating such areas as required. Do not surface patch. After the Contractor performs corrective work, the Engineer will retest the area.

The Engineer will use an inertial profiler to measure the top lift HMA surface in the driving lanes for surface smoothness within 21 days after paving is complete and driving lanes are delineated.

Profiler measurements will not be taken in turn lanes, ramps, lane transitions, or within 25 feet of bridge abutments and transverse joints with pre-existing pavement.

The Engineer will measure the pavement smoothness in both wheel paths of each lane. The smoothness is measured as International Roughness Index (IRI), reported as inches/mile, at 0.1-mile increments. Pavement smoothness is the average of all IRI measurements for the project.

The Engineer will identify areas requiring corrective action in accordance with Table 401-4. Perform full-width corrective action in those areas. The Engineer may waive corrective work for localized roughness for deficiencies resulting from manholes or other similar appurtenances near the wheel path.

Perform Corrective Actions according to one of the following or by a method approved by the Engineer:

1. Diamond Grinding. If the required pavement thickness is not decreased by more than 1/4-inch, grind to the required surface tolerance and cross section. Remove and dispose of all waste materials. Apply joint sealant and sand to exposed aggregates per the manufacturer’s recommendations.

2. Overlaying. Mill or sawcut the existing pavement to provide a vertical transverse joint face to match the overlay to the existing pavement. Apply tack coat on the milled surface and joint adhesive to all vertical joints and overlay the full width of the underlying pavement surface. Use the same approved HMA for overlays. Place a minimum overlay thickness of 2.0 inches.

3. Mill and Fill. Mill the existing pavement to provide a vertical transverse joint face. Apply tack coat to the milled surface and joint adhesive to all vertical joints prior to inlaying new HMA to match the existing pavement. Use the same approved HMA. Place a minimum thickness of 2.0 inches.

After completion of corrective work, the Engineer will measure the pavement surface with an inertial profiler for a smoothness price adjustment.

Price adjustments for pavement smoothness will be calculated according to Subsection 401-4.03.3.

401-3.18 SURFACE REQUIREMENTS AND TOLERANCE. The finished surface of all HMA paving must match dimensions shown in the Contract for horizontal alignment and width, profile grade and elevation, crown slope, and pavement thickness. Water must drain across the pavement surface without ponding. The surface must have a uniform texture, without ridges, puddles, humps, depressions, and roller marks. The surface must not exhibit raveling, cracking, tearing, asphalt bleeding, or aggregate segregation. Leave no foreign material, uncoated aggregate, or oversize aggregate on the HMA surface.

The Engineer will test the finished surface after final rolling at selected locations using a 10-foot straightedge. The Engineer will identify pavement areas that deviate more than 3/16-inch from the straightedge, including joints, as defective work. Perform corrective work by removing and replacing, grinding, cold milling or infrared heating such areas as required. Do not surface patch. After the Contractor performs corrective work, the Engineer will retest the area.

Perform corrective Actions according to one of the following or by a method approved by the Engineer:

1. Diamond Grinding. If the required pavement thickness is not decreased by more the 1/4-inch grind to the required surface tolerance and cross section. Remove and dispose of all waste materials. Apply joint sealant and sand to exposed aggregates per the manufacturer's recommendations.

2. Overlaying. Mill or sawcut the existing pavement to provide a vertical transverse joint face to match the overlay to the existing pavement. Apply tack coat on the mill surface and joint adhesive to all vertical joints and overlay the full width of the underlying pavement surface. Use the same approved HMA for overlays. Place a minimum overlay thickness of 2.0-inches.

3. Mill and Fill. Mill the existing pavement to provide a vertical transverse joint face. Apply tack coat to the milled surface and joint adhesive to all vertical joints prior to inlaying new HMA to match the existing pavement. Use the same approved HMA. Place a minimum thickness of 2.0-inches.

401-3.19 REPAIRING DEFECTIVE AREAS. Remove HMA that is contaminated with foreign material, is segregated (determined visually or by testing), flushing, or bleeding asphalt. Remove and dispose defective HMA for the full thickness of the course. Cut the pavement so that edges are vertical and the sides are parallel to the direction of traffic. Coat edges with a tack coat according to Section 402. Place and compact fresh HMA so that compaction, grade, and smoothness requirements are met.

401-3.20 ROADWAY MAINTENANCE. Inspect daily according to pavement inspection plan. Remove, and dispose of project materials incorrectly deposited on existing and new pavement surfaces(s) inside and outside the project area including haul routes.

The Contractor is responsible for damage caused by not removing these materials and any damage to the roadway from the removal method(s).

Repair damage to the existing roadway that results from fugitive materials or their removal.

401-3.21 ASPHALT SAFETYEDGE^{SM}. Incorporate asphalt **SAFETYEDGE^{SM}** to the dimensions shown as designated in the Plans. Construct the asphalt **SAFETYEDGE^{SM}** monolithically with the HMA. Comply with all Construction Requirements set forth in Section 401.

Utilize an approved asphalt **SAFETYEDGE^{SM}** system that is capable of providing a sloped wedge equal to the dimensions shown in the Plans. The use of a single plate strike off is not allowed. The asphalt **SAFETYEDGE^{SM}** system must be adjustable to accommodate varying paving thicknesses. All asphalt **SAFETYEDGE^{SM}** systems to be used must be approved by the Engineer.

Construct a 100-foot test section prior to work to demonstrate the edge shape and compaction.
Make adjustments as required by the Engineer to meet specification requirements.

401-4.01 METHOD OF MEASUREMENT. Section 109 and the following:

1. Hot Mix Asphalt.

   a. By weight. No deduction is made for the weight of asphalt binder or anti stripping additive or cutting back joints. When the Engineer approves the use of WMA, WMA additives will not be measured and are considered subsidiary to the HMA pay item.
   b. By the final HMA surface area.

2. Asphalt Binder. By weight, as follows:

   Method 1 will be used to determine asphalt binder quantity unless otherwise directed in writing. The procedure initially used will be the one used for the duration of the project. No payment is made for any asphalt binder more than 0.4% above the optimum asphalt binder content specified in the JMD.

   Method 1: Percent of asphalt binder for each sublot multiplied by the total HMA weight represented by that sublot. The Engineer will use either ATM 405 or ATM 406 to determine the percent of asphalt binder. The same test method used for the acceptance testing of the sublot will be used for computation of the asphalt binder quantity. In the absence of testing, the percent of asphalt binder is the target value for asphalt binder in the JMD.

Method 2: Supplier's invoices minus waste, diversion, and remnant. This procedure is an Engineer's option for projects where deliveries are made in tankers and the asphalt plant is producing HMA for one project only.

The Engineer may direct, at any time that tankers are weighed in the Engineer's presence before and after unloading. If the weight determined at the project varies more than 1% from the invoice amount, payment is based on the weight determined at the project.

Any remnant or diversion will be calculated based on tank stickings or weighing the remaining asphalt binder. The Engineer will determine the method. The weight of asphalt binder in waste HMA is calculated using the target value for asphalt binder as specified in the JMD.

3. Job Mix Design. When specified, a Contractor furnished JMD is measured as one according to the HMA class and type.

4. Temporary Pavement. By weight, without deduction for the weight of asphalt binder or anti-strip additive.

5. Leveling Course. By Lane-Station (12 foot width) or by weighing without deduction for the weight of asphalt binder or anti-strip additive.

6. HMA Price Adjustment. Calculated by quality level analysis under Subsection 401-4.03.1.

7. Longitudinal Joint Density Price Adjustment. By the linear foot of top lift longitudinal joint under Subsection 401-4.03.2.

8. Joint Adhesive. By the linear foot of longitudinal and transverse joint.

9. Pavement Smoothness Price Adjustment. Calculated from inertial profiler data using FHWA's ProVAL software under Subsection 401-4.03.3.

10. Asphalt Material Price Adjustment. Determined under Subsection 401-4.04.

11. Liquid Anti-Strip Additive. Based on the number of tons of asphalt binder containing required additive.

12. Crack Repair. From end to end of the crack repaired according to 401-3.10, measured horizontally along the centerline of the crack.

13. Prelevel for Ruts, Delaminations, and Depressions. By the surface area where prelevel is placed according to 401-3.10(1), measured according to Section 109.

14. Repair Unstable Pavement. By the surface area of pavement repaired according to 401-3.10(2), measured according to Section 109.

15. Asphalt Binder Price Adjustment. Determined under Subsection 401-4.03.4.

16. Asphalt **SAFETYEDGESM**. The additional work required to construct the asphalt **SAFETYEDGESM** and test section will not be measured for payment.

401-4.02 ACCEPTANCE SAMPLING AND TESTING.

1. Hot Mix Asphalt

   The bid quantity of each type of HMA produced and placed is divided into lots and the lots evaluated individually for acceptance.

   A lot is normally 5,000 tons. The lot is divided into sublots of 500 tons, each randomly sampled and tested for asphalt binder content, density, and gradation according to this Subsection. The lot is evaluated for price adjustment according to Subsection 401-4.03.1. Seasonal startup or a new JMD requires starting a new lot.

   If less than 8 sublots have been placed at the time a lot is terminated, the material in the shortened lot will be included as part of the prior lot. The price adjustment computed for the prior lot will include the samples from the shortened lot. Density test results from material in the shortened lot will be based on the MSG of the first sublot of the shortened lot. If there is no prior lot, and there are at least 3 sublots, the material in the shortened lot will be considered as a lot and the price adjustment will be based on the actual number of test results in the shortened lot. If there are less than 3 sublots, the HMA will be accepted for payment based on the Engineer's approval of the JMD, and placement and compaction of the HMA to the specified depth, finished surface requirements, and tolerances.

   If 8 or 9 sublots have been placed at the time a lot is terminated, they will be considered as a lot and the price adjustment will be based on the actual number of test results in the shortened lot.

   If the bid quantity is between 1,500 to 5,000 tons, the quantity is considered one lot. The lot is divided into sublots of 500 tons, each randomly sampled and tested for asphalt binder content, density, and gradation according to this Subsection.

   For bid quantity less than 1,500 tons, HMA will be accepted for payment based on the Engineer's approval of the JMD, and placement and compaction of the HMA to the specified depth, finished surface requirements, and tolerances.

   The Engineer reserves the right to perform any testing required in order to determine acceptance.

   a. Asphalt Binder Content. HMA samples shall be taken randomly by the Contractor in the presence of the Engineer from behind the paver screed before initial compaction, or will be taken randomly by the Engineer from the windrow, according

to ATM 402 or ATM 403, at the discretion of the Engineer. The location (behind the paver screed or windrow) will be determined at the pre-paving meeting. The Engineer will determine random sampling locations.

Two separate samples will be taken, one for acceptance testing and one held in reserve for retesting if requested. At the discretion of the Engineer, Asphalt binder content will be determined according to ATM 405 or ATM 406.

b. Aggregate Gradation. Aggregates tested for gradation acceptance will have the full tolerances from Table 401-2 applied.

(1). Drum Mix Plants. Samples will be taken from the combined aggregate cold feed conveyor via a diverter device, from the stopped conveyor belt or from the same location as samples for determination of asphalt binder content, at the discretion of the Engineer. Two separate samples will be taken, one for acceptance testing and one held in reserve for retesting if requested. The aggregate gradation for samples from the conveyer system will be determined according to ATM 304. For HMA samples, the gradation will be determined according to ATM 408 from the aggregate remaining after the ignition oven (ATM 406) has burned off the asphalt binder. Locate diverter devices for obtaining aggregate samples from drum mix plants on the conveyor system delivering combined aggregates into the drum. Divert aggregate from the full width of the conveyor system and maintain the diverter device to provide a representative sample of aggregate incorporated into the HMA.

(2) Batch Plants. Samples will be taken from dry batched aggregates according to ATM 301 or from the same location as samples for determination of asphalt binder content, at the discretion of the Engineer. Two separate samples will be taken, one for acceptance testing and one held in reserve for retesting if requested. The aggregate gradation for dry batch samples will be determined according to ATM 304. For HMA samples, the gradation will be determined according to ATM 408 from the aggregate remaining after the ignition oven (ATM 406) has burned off the asphalt binder.

c. Density. The Engineer will determine and mark the location(s) where the Contractor takes each core sample.

(1) Mat Cores: The location(s) for taking core samples is determined using a set of random numbers (independent of asphalt binder and aggregate sampling set of random numbers) and the Engineer's judgment. Take no mat cores within 1 foot of a joint or edge. Core samples are not taken on bridge decks.

(2) Longitudinal Joint Cores: The Engineer will mark the location(s) to take the core sample, centered on the visible surface joint, and adjacent to the mat core sample taken in the panel completing the joint.

Take core samples according to ATM 413 in the presence of the Engineer. Cut full depth core samples, centered on the marks and as noted above, from the finished HMA within 24 hours after final rolling. Neatly core drill one six-inch diameter sample at each marked location. Use a core extractor to remove the core - do not damage the core. The Engineer will immediately take possession of the samples. Backfill and compact voids left by coring with new HMA within 24 hours, and according to ATM 413. The Engineer will determine density of samples according to ATM 410.

d. Asphalt binder Content, Aggregate Gradation, and Density - Retest. When test results have failed to meet specifications, retest of acceptance test results for asphalt binder content, gradation, and density may be requested provided the quality control requirements of Subsection 401-3.02 Contractor Quality Control are met. Deliver this request in writing to the Engineer within 7 days of receipt of the final test of the lot. The Engineer will mark the sample location for the density retest within a 2-foot radius of the original core. The original test results are discarded and the retest result is used in the price adjustment calculation regardless of whether the retest result gives a higher or lower pay factor. Only one retest per sample is allowed. When gradation and asphalt binder content are determined from the same sample, a request for a retest of either gradation or asphalt binder content results in a retest of both. Both gradation and asphalt binder content retest results are used in the price adjustment calculation. Except for the first lot, retesting for gradation or asphalt binder from the first sublot of a lot will include retesting for the MSG. Retesting will be performed by a Department laboratory.

2. Asphalt Binder

The bid quantity of asphalt binder produced and placed is divided into lots and the lots evaluated individually for binder grade acceptance.

Testing will be by AASHTO accredited independent laboratories. When retesting is requested, the assigned value (ATV) will be determined using ASTM D3244. Each test will be completed by a different laboratory.

a. Acceptance Test. The lot size for asphalt binder is 200 tons. If a project has more than one lot and the remaining asphalt binder quantity is less than 150 tons, it is added to the previous lot and that total quantity will be evaluated as one lot. If the remaining asphalt binder quantity is 150 tons or greater, it is sampled, tested and evaluated as a separate lot.

If the bid quantity of asphalt binder is between 85 to 200 tons, the quantity is considered as one lot and sampled, tested, and evaluated according to this subsection. Quantities of asphalt binder less than 85 tons will be accepted based on manufacturer’s certified test reports and certification of compliance.

Sample asphalt binder at the plant from the supply line in the presence of the Engineer according to ATM 401. The Engineer will take immediate possession of

the samples. Take three samples from each lot, one for acceptance testing, one for Contractor requested retesting, and one held in reserve for referee testing if requested. Meet Subsection 702-2.01 requirements for asphalt binder quality.

b. Retest. Submit a written request, for a retest, no more than 7 days from receiving notice of the failed acceptance test. In the request, identify the retest laboratory. The Engineer will send the second sample (retest sample) to the laboratory. Provide the retest results to the Engineer. Contractor pays for the retest costs.

   If the average of the combined test results ([acceptance + retest]/2) passes the specification requirement, the average value becomes the ATV. If this ATV fails the specification requirement, the Engineer or Contractor may request the third sample (referee sample) be tested.

c. Referee Test. The Engineer will send the third sample (referee sample) to an agreed upon laboratory. The average of the combined test results ([acceptance + retest + referee]/3) equals the ATV. If the ATV fails to meet specifications, the Contractor pays for the referee test.

401-4.03 EVALUATION OF MATERIALS FOR ACCEPTANCE. The Engineer may reject material which appears to be defective based on visual inspection. If a test of rejected material is requested, a minimum of two samples are collected from the rejected material and tested. If all test results are within specification limits, payment for the material is made.

The following methods are applied to each type of HMA with Price Adjustment Pay Items in the Contract. These methods describe how price adjustments are determined based on the quality of the HMA binder longitudinal joint density and pavement smoothness.

1. HMA Price Adjustment. Acceptance test results for HMA asphalt binder content, gradation and mat density are used in HMA price adjustment. These test results for a lot are analyzed collectively and statistically by the Quality Level Analysis (QLA) method as specified in Subsection 106-1.03.3 to determine the total estimated percentage of the lot that is within specification limits. The values for percent passing the #200 sieve, asphalt binder content and density test results are reported to the nearest 0.1 percent. All other sieves used in QLA are reported to the nearest whole number.

   The HMA price adjustment is based on the lower of two pay factors. The first factor is a composite pay factor (CPF) for HMA that includes gradation and asphalt binder content. The second is the density pay factor (DPF).

   A lot containing material with less than a 1.000 pay factor is accepted at an adjusted price, provided that pay factor is at least 0.800 and there are no isolated defects identified by the Engineer. A lot containing material that fails to obtain the minimum pay factor is considered unacceptable and rejected under Subsection 105-1.11.

HMA pay factors are computed as follows:

a. All statistical Quality Level Analysis (QLA) is computed using the Engineer's Price Adjustment programs.

b. The USL and LSL are equal to the Target Value (TV) plus and minus the allowable tolerances in Table 401-2, or as shown below. The TV is the specification value shown in the approved Job Mix Design.

TABLE 401-2
HMA LOWER SPECIFICATION LIMIT (LSL) & UPPER SPECIFICATION LIMIT (USL)

Measured Characteristics	LSL	USL
3/4-inch or largest sieve size	99	100
1/2-inch sieve or first sieve retaining aggregate	TV -6	TV +6
3/8-inch sieve	TV -6	TV +6
No. 4 sieve	TV -6	TV +6
No. 8 sieve	TV -6	TV +6
No. 16 sieve	TV -5	TV +5
No. 30 sieve	TV -4	TV +4
No. 50 sieve	TV -4	TV +4
No. 100 sieve	TV -3	TV +3
No. 200 sieve*	TV -2.0	TV +2.0
Asphalt Binder Content, %	TV -0.4	TV +0.4
Mat Density, %	92.0	100.0

*LSL for the No. 200 sieve is restricted by the broadband limits in Table 703-4.

c. The percent within limits (PWL), Quality Levels and characteristic pay factors (PFs) are determined by the Engineer for each Lot in accordance with Subsection 106-1.03.3. The Composite Pay Factor (CPF) for the lot is determined from gradation and asphalt binder content (ac) acceptance test results using the following example formula:

$$CPF = \frac{[f_{3/4\ inch}\ (PF_{3/4\ inch}) + f_{1/2\ inch}\ (PF_{1/2\ inch}) + ...f_{ac}\ (PF_{ac})]}{\Sigma f}$$

Table 401-3 gives the weight factor (f) for each test property considered.

TABLE 401-3
WEIGHT FACTORS

Property	Type I Factor "f"	Type II Factor "f"	Type III Factor "f"
1-inch sieve	4	-	-
3/4-inch sieve	4	4	-
1/2-inch sieve	4	5	4
3/8-inch sieve	4	5	5
No. 4 sieve	4	4	5
No. 8 sieve	4	4	5
No. 16 sieve	4	4	5
No. 30 sieve	4	5	6
No. 50 sieve	4	5	6
No. 100 sieve	4	4	4
No. 200 sieve*	20	20	20
Asphalt Content, %	40	40	40

The Density Pay Factor (DPF) is computed using HMA mat core compaction acceptance test results.

The CPF and DPF are rounded to the nearest 0.001. The price adjustment for each individual lot is calculated as follows:

HMA Price Adjustment = [(Lowest Pay Factor)* -1.000] x (tons in lot) x (PAB)

* Lowest Pay Factor, CPF or DPF

PAB = Price Adjustment Base = $110.00 per ton.

2. Longitudinal Joint Density Price Adjustment. Longitudinal joint density price adjustment will be based on the project average of all top lift cold joint densities and determined as follows:

   a. Disincentive. Project average top lift joint density less than 91.0% MSG: Deduct $3.00 per lineal foot.

   b. Incentive. Project average top lift joint density greater than:

      92.0% MSG. Add $0.50 per lineal foot
      93.0% MSG. Add $1.00 per lineal foot
      94.0% MSG. Add $1.50 per lineal foot

3. Pavement Smoothness Price Adjustment. Pavement smoothness will be measured by the Engineer and reported as IRI (inches/mile), according to Subsection 401-3.18. Incentive for pavement smoothness shall apply only if both the project average CPF and DPF are greater than or equal to 1.000. Disincentive for pavement smoothness shall apply regardless of the project average CPF or DPF.

   The Engineer will calculate the pavement smoothness price adjustment according to Method 1 (pavement placed over graded subgrade), or Method 2 (pavement placed over existing pavement), whichever applies to the majority of the project. The SF is rounded to the nearest 0.001.

   Method 1: SPA = PAB x PQ x SF,
   where:

   SPA = Pavement Smoothness Price Adjustment

   PAB = $110.00 per ton,

   PQ = Top layer HMA quantity, tons

   SF = Smoothness Factor (Table 401-4)

TABLE 401-4
SMOOTHNESS FACTOR (SF)

IRI (in./mile)	SF
Less than 40.0	0.050
40.0 to 70.0	0.050 – (IRI – 40.0)/600.0
70.0 to 90.0	0.000
90.0 to 120.0	(90.0 – IRI)/120.0
Greater than 120.0*	-

* Corrective Work required, see Subsection 401-3.18

   Method 2: SPA = PAB x PQ x SF,

   where:

   SPA = Pavement Smoothness Price Adjustment

   PAB = $110.00 per ton,

   PQ = Top layer HMA quantity, tons

   SF = Smoothness Factor = 0.120 x RR – 0.020; SF not to exceed 0.050

   RR = Roughness Reduction = (Initial IRI – Final IRI) / Initial IRI

Initial IRI = Pre-project average IRI as measured and reported by the Engineer. The Initial IRI will either be included in the bid documents or the timeline for when the Initial IRI will be measured will be identified in the bid documents.

Final IRI = Top layer HMA average IRI as measured and reported by the Engineer according to Subsection 401-3.18.

4. Pavement Smoothness Price Adjustment. Not applicable to this project.

5. Asphalt Binder Price Adjustment. A lot quantity of asphalt binder, with a pay factor less than 1.00, is accepted or rejected per Table 401-4.03-1 Asphalt Binder Pay Factors.

TABLE 401-4.03-1
ASPHALT BINDER PAY FACTORS

Pay Factor			1.01	1.00	0.95	0.90	0.75	Reject
RTFO (Rolling Thin Film Oven)								
DSR[(a.1)]	All Grades	G*/Sinδ, kPa^{-1}	≥ 2.69	2.68–2.20	2.19–1.96	1.95–1.43	1.42–1.10	< 1.10
MSCR[(a.2)]	PG 52-40 E	$J_{NR\ 3.2}$	≤ 0.39	0.40–0.50	0.51–0.59	0.60–0.69	0.70–1.00	> 1.00
		% $Rec_{3.2}$	≥ 86.0	85.9–75.0	74.9–68.0	67.9–60.0	59.9–55.0	< 55.0
	PG 58-34 E	$J_{NR\ 3.2}$	≤ 0.19	0.20–0.25	0.26–0.29	0.30–0.39	0.40–0.50	> 0.50
		% $Rec_{3.2}$	≥ 90.0	89.9–85.0	84.9–80.0	79.9–75.0	74.9–70.0	< 70.0
	PG 64-40 E	$J_{NR\ 3.2}$	< 0.05	0.05–0.10	0.11–0.15	0.16–0.20	0.21–0.25	> 0.25
		% $Rec_{3.2}$	≥ 97.0	96.9–95.0	94.9–91.0	90.9–85.0	84.9 – 80.0	< 80.0
PAV (Pressurized Aging Vessel)								
DS[(a.3)]	PG 64-40 E & All Other Grades	G*Sinδ, kPa	≤ 4711	4712–5000	5001–5289	5290–5578	5579–5867	> 5867
	PG 52-40 E, PG 58-34 E	G*Sinδ, kPa	≤ 5700	5701–6000	6001–6300	6301–6600	6601 – 7000	> 7000
CS[(a.4 & 5)]	All Grades[(a.4)]	BBR, *S*, MPa	≤ 247	248–300	301–338	339–388	389–449	≥ 450
	All Grades[(a.5)]	BBR, *m*	≥ 0.320	0.319–0.300	0.299–0.294	0.293–0.278	0.277–0.261	< 0.261

Creep Stiffness (CS) Dynamic Shear (DS) Multiple Stress Creep Recovery (MSCR)

a. Asphalt Binder Pay Adjustment = (Lowest Pay Factor – 1.00)* x (tons in lot) x PAB x 5

*Select the lowest pay factor from:

RTFO (test the binder residue at the performance grade temperature)
(1) DS, All Grades, G*/Sinδ, kPa^{-1}

(2) MSCR: PG, Select the highest pay factor corresponding to, either $J_{NR\ 3.2}$ or % $Rec_{3.2}$ values

PAV

(3) DS, PG, G*Sinδ, kPa
(4) CS, All Grades, BBR, *S* MPa
(5) CS, All Grades, BBR, *m*

b. If three consecutive acceptance samples are out of specification, stop HMA production immediately and submit a corrective action plan to the Engineer for approval.

401-4.04 ASPHALT MATERIAL PRICE ADJUSTMENT. This subsection provides a price adjustment for asphalt material by: (1) additional compensation to the contractor or (2) a deduction from the contract amount.

1. This provision shall apply:

   a. To asphalt material meeting the criteria of Subsection 702-2.01 Asphalt Binder, and is included in items listed in the bid schedule of Sections 306, 307, 308, 318, 401 thru 405, 408, 520, 608 and 609.

   b. To cost changes in asphalt material that occur between the date of bid opening and the date on the certified bill of lading from the asphalt material refiner/producer.

   c. When there is more than a seven and one half percent (7.5%) increase or decrease in the Alaska Asphalt Material Price Index, AAMPI, from the date of bid opening to the date on the certified bill of lading from the asphalt refiner/producer.

2. Provide the certified bill of lading from the asphalt material refiner/producer.

3. The AAMPI is calculated bimonthly on the first and third Friday of each month, and will remain in effect from the day of calculation until the next bimonthly calculation. The AAMPI is posted on the Department's Statewide Materials website at and calculated according to the formula posted there. http://www.dot.state.ak.us/stwddes/desmaterials/aprice_index.shtml

4. Price adjustment will be cumulative and calculated with each progress payment. Use the AAMPI in effect on the date of the certified bill of lading from the asphalt material refiner/producer, to calculate the price adjustment for asphalt material. The Department will increase or decrease payment under this contract by the amount determined with the following asphalt material price adjustment formula:

   For an increase exceeding 7.5%, additional compensation =
   [(IPP – IB) – (0.075 x IB)] x Q

   For a decrease exceeding 7.5%, deduction from contract =

[(IB – IPP) – (0.075 x IB)] x Q

Where:

Q = Quantity of Asphalt Material incorporated into project, in tons as measured by the Engineer

IB = Index at Bid: the Bi-monthly AAMPI in effect on date of bid, in dollars per ton

IPP = Index at Pay Period: The bi-monthly AAMPI in effect on the date shown on the certified bill of lading from the asphalt refiner/producer, in dollars per ton

5. Method of measurement for determining Q (quantity) is the weight of asphalt material that meets the criteria of this subsection and is incorporated into the project. The quantity does not include aggregate, mineral filler, blotter material, thinning agents added after material qualification, or water for emulsified asphalt. The quantity for emulsified asphalts will be based on the asphalt residue material only and will be calculated using the percent residue from testing, or if not tested, from the manufacturer's certificate of compliance.

401-5.01 BASIS OF PAYMENT. The following items, unless included as individual Pay Items, are subsidiary to the Section 401 Hot Mix Asphalt Pavement related Pay Items as included in the bid schedule:

- Asphalt binder
- Liquid anti-strip additives
- Tack coat
- Crack sealing
- Crack repair
- Joint adhesive
- Surface sealing of longitudinal joints
- Surface tolerance corrections
- Repairing defective areas
- Prelevel for ruts, delaminations, and depressions
- Repair unstable pavement
- Job mix design
- Density profiles, Subsection 401-2.10 Process Quality Control
- Repair work and materials when planing equipment breaks through existing pavement – Subsection 401-3.10 Preparation of Existing Surface
- Work and materials associated with Subsection 401-3.06 Hauling Equipment
- Work and materials associated with Subsection 401-3.20 Roadway Maintenance

Test Strips: Subsection 401-2.10 Process Quality Control.

1. Approved. Test strip construction and material, approved by the Engineer in writing, as meeting the specification requirements will be paid for at the Contract unit prices for HMA and asphalt binder as included in the Bid Schedule. Price adjustments 401.0008.____, 401.0009.____, 401.0010.____ and 401.2021.____ do not apply.

2. Failed. The materials, construction of, removal and disposal of a failed test strip is at the Contractor's expense.

Pay Item 401.0008.002A. HMA Price Adjustment, Type II Class A. The sum of the price adjustments for each material lot, and for deductions and fees assessed. Deductions and fees assessed include:

- A fee of $6,000 is assessed for each mix design evaluation subsequent to the approved Job Mix Design for each type and class of HMA specified. A failed retest will result in a fee of $2,500.
- Failure to cut core samples within the specified period will result in a deduction of $100 per sample per day.
- Failure to backfill voids left by sampling within the specified period will result in a deduction of $100 per hole per day.
- If an asphalt binder referee test is requested and the ATV confirms the asphalt binder does not meet Contract requirements, a fee of $500 is assessed each test.

Pay Item 401.0008.002A. HMA Price Adjustment, Type II Class A. does not apply to the following:

- HMA contract quantity is less than 1500 tons.
- HMA leveling course and rut repair.
- Temporary HMA.
- Driveway and approach HMA.

Pay Item 401.0009.0000. Longitudinal Joint Density Price Adjustment. The total price adjustment.

Pay Item 401.0010.0001. Pavement Smoothness Price Adjustment. The total price adjustment.

Pay Item 401.0015.0000. Asphalt Material Price Adjustment.

For each Section as included in Subsection 401-4.04 Asphalt Material Price Adjustment, item 1.a, the "Asphalt Material Price Adjustment" is paid under the asphalt material Pay Item for the Section with the greatest quantity as determined by the estimate of quantities included in the Plans at the time of the bid opening.

- When more than one "Asphalt Material Price Adjustment" Pay Item is included in the Plans or bid schedule the asphalt material price adjustment, for each Section's asphalt material, is paid under the Pay Item with the greatest quantity.

- When more than one asphalt material is included in the project and only one "Asphalt Material Price Adjustment" Pay Item is included in the Plans or bid schedule, the asphalt material price adjustment, for each Section's asphalt material, is paid under the one Pay Item regardless of the quantity.

- When the Pay Item "Asphalt Material Price Adjustment," is not included, for any section, no payment will be made.

Pay Item 401.2021.0000. Asphalt Binder Price Adjustment. The sum of the price adjustments for each material lot.

PAY ITEM		
Item Number	**Item Description**	**Unit**
401.0001.00A2	HMA, Type II; Class A	Ton
401.0004.5240	Asphalt Binder, Grade PG 52-40	Ton
401.0008.002A	HMA Price Adjustment, Type II; Class A	CS
401.0009.0000	Longitudinal Joint Density Price Adjustment	CS
401.0010.0001	Pavement Smoothness Price Adjustment, Method 1	CS
401.0015.0000	Asphalt Material Price Adjustment	CS
401.2021.0000	Asphalt Binder Price Adjustment	CS

C401-25.0101

SECTION 501
CONCRETE FOR STRUCTURES

501-2.02 COMPOSITION OF MIXTURE – JOB MIX DESIGN.

Replace Table 501-4 with the following:

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

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

HSM20.23-21.1231

SECTION 508
WATERPROOFING MEMBRANE

508-1.01 DESCRIPTION. *Replace the first paragraph with the following*: Furnish and install waterproofing membrane systems on concrete bridge decks and approach slabs. Remove and dispose of waterproofing membrane systems on existing concrete bridge decks and approach slabs. The spray-applied waterproofing membrane system consists of a primer, a membrane and a tack coat.

508-3.01 CONSTRUCTION. *Replace the first paragraph in 1. General with the following*: Install the waterproofing membrane system in accordance with the manufacturer's installation procedure and the approved submittal. Use the primer and tack coat listed in the approved submittal. Do not apply primers or membranes until the end of the curing period and until concrete and grout has reached at least 80 percent of the specified 28-day compressive strength (f'_c). Apply the membrane system vertically at curb faces up to the pavement thickness shown on the Plans. Protect adjacent surfaces not to be covered with the membrane from splatter or coating. Ensure the surface of the membrane is dry when applying tack coat. Use pavement overlay material within the membrane manufacturer's temperature limitations.

Replace the first paragraph in 2. Deck Preparation with the following: Remove existing pavement and membrane systems by methods that do not damage the concrete deck. Do not use a mechanical milling machine such as a reclaimer or planer. Meet the requirements of Subsection 105-1.12. Prepare the concrete surfaces that are to receive the waterproofing membrane system as required by the manufacturer.

508-3.02 QUALITY CONTROL. *Replace the first paragraph in 2. Spray-Applied Waterproofing Membrane with the following*: Perform tensile adhesion bond testing of the waterproofing membrane system, at locations determined by the Engineer, in accordance with ASTM D7234 at least once every 2000 square feet of coated area.

508-3.03 ACCEPTANCE TESTING. *Replace the first paragraph in 1. Flood Testing with the following*: Perform flood testing of spray-applied waterproofing membrane prior to placement of tack coat or asphalt. With the written approval of the manufacturer's on-site representative, perform flood testing of sheet waterproofing membrane prior to asphalt overlay, otherwise perform flood testing after asphalt overlay.

508-3.04 MEMBRANE REPAIRS. *Replace the first paragraph in 3. Sheet Waterproofing Membrane with the following*: If flood test acceptance testing is used after placement of asphalt and breaches in the membrane system are found, repairs may be attempted with the written approval of the manufacturer's on-site representative. Patch areas where asphalt overlay is removed to the satisfaction of the Engineer.

508-5.01 BASIS OF PAYMENT. *Replace the first paragraph with the following:* The contract price includes removal and disposal of existing membrane(s) where present, furnishment and installation of waterproofing membrane system(s), quality control, and acceptance testing.

SECTION 550
COMMERCIAL CONCRETE

Replace Subsection 550-1.01 with the following:

550-1.01 DESCRIPTION. Furnish, place, finish, and cure Portland cement concrete for minor structures and incidental construction.

C550.1-21.0601

550-2.02 COMPOSITION OF MIXTURE – JOB MIX DESIGN.

Replace Table 550-1 with the following:

TABLE 550-1
COMMERCIAL CONCRETE DESIGN REQUIREMENTS

Class	B-B	B	W
Water-Cement Ratio, lbs/lbs, maximum	0.40	0.45	0.50
Total Air Content, %	5.5 – 6.5	5.5 – 6.5	4.0 – 6.5
Coarse Aggregate Gradation, AASHTO M43[a.]	No. 57 or 67	No. 57 or 67	No. 7, 8, 57, or 67
Compressive Strength, psi, minimum	5,000	4,000	3,000

a. Alternative sizes of coarse aggregate, as shown in AASHTO M 43, may be used when approved in writing.

HSM20.8-20.1130-1

Add the following to the first paragraph of 1.Submittals.

Submit the JMD on Form 25D-203.

HSM20.25-21.1231

Add the following Subsection 550-2.03 Precast Concrete Products:

550-2.03 PRECAST CONCRETE PRODUCTS. Provide precast concrete products from an ATM 520 certified plant. Submit certification for each product.

Minor and Incidental Structure Products

1. Curb and gutter
2. Manhole sections
3. Headwall
4. Modular retaining wall units
5. Noise wall panels and posts
6. Portable barriers
7. Utility structures

a. Cabinet base
   (1) Load center base/foundation
   (2) Controller base/foundation
b. Junction box
c. Similar structures

8. Water and waste water structures
   a. Catch basin
   b. Inlet box
   c. Outlet box
   d. Similar structures

Major Structure Products Section 501 Concrete for Structures

Major structure products include box culvert, mechanically stabilized earth, retaining walls, three-sided flat-topped culvert, three-sided arch culvert, and similar structures.

C550.1-21.0601

Replace Section 603 with the following:

SECTION 603
CULVERTS AND STORM DRAINS

603-1.01 DESCRIPTION. Construct or reconstruct culvert and storm drain pipe. Install culvert marker posts, and strap plastic culvert ends.

603-1.02 REFERENCES.

ASTM D3953 Standard Specification for Strapping, Flat Steel and Seals
ASTM D4675 Standard Guide for Selection and Use of Flat Strapping Materials

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
Corrugated High Density Polyethylene (HDPE) Pipe	Subsection 706-2.07
Corrugated Steel Pipe and Pipe Arches	Subsection 707-2.01
Corrugated Aluminum Pipe	Subsection 707-2.03
Galvanize	Subsection 716-2.07
Culvert Marker Posts (Flexible Delineator Posts)	Subsection 730-2.05

Item 603.0017.____, Pipe, listed in the bid schedule, furnish either Corrugated Steel Pipe (CSP), Corrugated Aluminum Pipe, Reinforced Concrete Pipe, or Corrugated Dual Wall HDPE (plastic) Pipe. Select pipe for each installation that meets or exceeds the requirements shown on the Plans for height of cover.

Steel and Plastic Pipe: match the coupling band material and end section material to the pipe material.

Separate dissimilar materials with an electrical insulating material. The insulating material must be at least 1/16 inch thick and approved by the Engineer.

Culvert marker post is 6-foot tall by 2.5 inches wide with reinforcing ribs, capable of a 9-inch minimum bending radius, and blue with no marking.

Culvert marker Strap and Seals according to ASTM D3953. .625 inch x .02 inch, dry Type 1 regular-duty (magnetic, ferritic), galvanized Finish B (hot-dipped Grade 2 moderate coating, .18 oz./ft^2 surface or .0002 inch thick minimum. Push type seals, Style III (overlap), regular duty, galvanized Finish B (hot-dipped coating) by 1.75-inch minimum length and matched to strapping width.

CONSTRUCTION REQUIREMENTS

603-3.01. GENERAL. Excavate, bed, and backfill according to the requirements of Subsections 204-2.01 and 204-3.01, and the Plans.

Dewater ground water from work areas; construct and maintain temporary water diversion when working in waterways, and for facilities or structures with active drainage according to Section 204.

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 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 centerline 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 M36.

603-3.03 JOINING PIPE. Joints shall provide circumferential and longitudinal strength to preserve the pipe alignment, prevent separation of pipe sections, and provide a watertight joint between new sections of pipe and joints between new and existing sections of pipe of similar and dissimilar materials. Include a continuous gasket (seal) in all joints. Construct the watertight joint capable of passing a laboratory hydrostatic pressure and vacuum test of at least 4 psi for 10 minutes.

1. Rigid Pipe. Use either bell and spigot or tongue and groove joints. Join pipe sections with the ends fully entered and the inner surfaces 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. Coupling bands

   e. Preformed plastic sealing compound

   Make mortar joints using an excess of mortar to form a bead around the outside of the pipe.

   For grouted joints, use molds or runners to retain the poured grout. Install rubber ring gaskets to form a flexible, watertight seal.

   When using portland cement mixtures, protect the completed joints against rapid

drying using suitable covering material.

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 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. Include a gasket each side of the gap.

   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 bands 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 not wider than 2 inches.

3. Plastic Pipe. Use push-on or mechanical joints. Ensure that the plastic pipe couplings' corrugation matches the pipe corrugation and that their width is not less than one-half the nominal pipe diameter.

Furnish all bolted connections on coupling bands with cut washers 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.

1. Marker Post. Install a culvert marker 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. Drive to maintain forty-two inches of post above the ground after driving, and

2. Marker Strap. In addition to marker posts, install marker strap around the plastic pipe ends.

   Position the strap in the valley of the first annular ring from the top end of the culvert. From the vertical centerline of the culvert, at the top, overlap the strap and extend the ends to approximately 30 degrees each side of the centerline. Place the strap loosely without twists in the valley, without compressing the pipe, and tight enough to keep the strap from moving out of the valley without deforming the pipe or pipe corrugation. Seal the strap at three locations, one at each of the ends, and one at the top of the culvert. Extend the strap ends beyond the end seals approximately 1/2-inch. Double crimp the seal, two pairs of crimps minimum each seal.

Repair the strap galvanizing where abraded and at cut ends according to ASTM A780. Prepare the surface with power tools per SSPC-SP11, hand tools per SSPC-SP2, and as required by the paint manufacturer. Apply paint, Type – paint containing zinc dust, to the prepared surfaces and allow enough time for curing as required by the manufacturer's printed instructions.

603-4.01 METHOD OF MEASUREMENT. Section 109, and as follows:

1. Culvert Pipe. The length of pipe, measured in place, along the invert.

2. Pipes for Storm Drains. The length of pipe, measured in place, along the invert, from center to center of structures. The length through the inlets, catch basins, and manholes is included in the measured length.

603-5.01 BASIS OF PAYMENT. Branch connections and elbows are subsidiary to the pipe unless included as a separate Pay Item.

Coupling bands, seals (gaskets), and other items necessary for the proper joining of the sections are subsidiary.

Culvert markers are subsidiary to the pipe.

Excavation, bedding, and backfill paid under Section 204.

PAY ITEM

Item Number	Item Description	Unit
603.2032.____	Corrugated HDPE Pipe ___	LF
603.2033.____	End Section for Corrugated HDPE Pipe ___	Each

C603-25.0201

SECTION 608
SIDEWALKS

Replace Subsection 608-1.01 with the following:

608-1.01 DESCRIPTION. Construct, or retrofit asphalt, or concrete sidewalks.

Sidewalk. Section 608 includes "sidewalks", pathways, medians, curb ramps, miscellaneous on-grade concrete, and asphalt surfaces not addressed elsewhere in the specifications.

608-2.01 MATERIALS.

1. Concrete Sidewalk

Bed Course Material	Subsection 703-2.03
Joint Fillers	Subsection 705-2.01
Joint Sealer	Subsection 705-2.02
Concrete	Section 550, Class B

2. Asphalt Pathway

Bed Course Material	Subsection 703-2.03
Asphalt Binder	Subsection 702-2.01 (Use PG 52-28 if no Grade is specified.)
Aggregate, Type II or Type III	Subsection 703-2.04

Mix Design Requirements (ATM 417):

Marshall Stability, lb., min.	1000
Percent Voids, Total Mix	2-5
Compaction, Blows/side	50

3. Detectable Warnings

Cast iron detectable warning plates with truncated dome pattern, a slip resistant surface, and with handle or flange on bottom or approved equal. Detectable warning plates shall be coated with yellow polymer-soaked finish. Detectable warnings shall be manufactured according to the 2006 U.S. DOT ADA Standards for Transportation Facilities.

CR608.1-061520R Standard Modification

608-3.01 CONCRETE SIDEWALKS.

Add the following after the ninth paragraph:
The Engineer will test the finished surface with a 10-foot straightedge. Variations of more than 1/4-inch from the edge of the straightedge across or along the sidewalk surface,

except at grade changes, are unacceptable. Portions of the sidewalk surface and pedestrian ramps less than 10 feet in width or length may be tested using a shorter straightedge.

HSM20.10-113020R

608-3.03 CURB RAMPS.

Add the following:

Measure curb ramp slopes with a 24-inch electronic level. Calibrate and operate the level according to the manufacturer's instructions.

Replace Subsection 608-4.01 with the following:

608-4.01 METHOD OF MEASUREMENT. Section 109 and as follows:

Concrete Sidewalk: By area of finished surface as included in the bid schedule. Ramps are included in the measurement unless included as a separate measured and paid item.

Curb Ramp: By each installation, complete in place, including detectable warnings, ramp runs, backing curbs, flares, and landings necessary to provide a single street-level access.

Asphalt Pathway: By weight of finished asphalt placed.

Hot mix asphalt used for matching existing surfaces, such as paved parking lots behind or adjacent to a new sidewalk/pathway, will be paid for under Item 608.2002.0000 Asphalt Pathway.

608-5.01 BASIS OF PAYMENT.

Add the following:

Asphalt Binder is subsidiary to Item 608.2002.0000 Asphalt Pathway.

Embankment and bed course materials will be furnished, placed, and paid for under Sections 203 and 301, respectively.

PAY ITEM

Item Number	Item Description	Unit
608.2002.0000	Asphalt Pathway	Ton

CR608.1-061520R

Replace Section 610 with the following:

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 crushed stones that are angular, hard, sound, and durable with at least one face resulting from fracture.

1. Angular—stones, the particles of which possess well-defined edges formed at the intersection of roughly planar faces.

2. Hardness—resistance of a material to indentation or scratching. AASHTO T96, not more than 50% wear at 500 revolutions.

3. Soundness—measure of aggregates durability when exposed to the elements, AASHTO T104.

4. Gradation—ATM 304:

    a. Maximum of 6 inches in greatest dimension
    b. Not more than 50% by weight passing a 3-inch sieve
    c. Not more than 5% passing a 1-inch sieve

5. Breadth and Width—at least 1/3 of the length

610-3.01 CONSTRUCTION REQUIREMENTS. Place and spread ditch lining materials so that the finished face is uniform. Place stones on slopes 1.5:1 and flatter.

C610-17.0601-1

Following placement of ditch lining materials, fill interstitial voids in ditch lining according to Subsection 690-3.04.

CFHWY00830

610-4.01 METHOD OF MEASUREMENT. Section 109.

610-5.01 BASIS OF PAYMENT. Excavation required below normal ditch grade is subsidiary.

C610-17.0601-1

All materials and work to fill interstitial voids are subsidiary to Section 610 Pay Items.

CFHWY00830

PAY ITEM		
Item Number	**Item Description**	**Unit**
610.0001.____	Ditch Lining	CY
610.0002.____	Ditch Lining	Ton
610.0003.____	Ditch Lining	STA

C610-17.0601-1

SECTION 611
RIPRAP

611-2.01 MATERIALS.

Replace the first paragraph with the following:

Evenly graded stones that are hard, angular, and have no more than 50 percent wear at 500 revolutions as determined by AASHTO T 96. Apparent specific gravity will be determined by ATM 308. Use stones with breadth and thickness at least 1/3 of its length. Do not use round boulders or cobbles on slopes steeper than 3:1.

C611.1-19.0201

Replace Section 615 with the following:

SECTION 615
STANDARD SIGNS

615-1.01 DESCRIPTION. Furnish and install standard signs and delineators. Remove and relocate or remove and dispose of existing signs and markers, as specified.

615-2.01 MATERIALS. Use materials that conform to the following Subsections:

Sheet Aluminum	730-2.01
High Density Overlaid Plywood	730-2.02
Retroreflective Sheeting, ASTM D4956	730-2.03
Sign Posts	730-2.04
Delineator Posts	730-2.05
Acrylic Prismatic Reflectors	730-2.06
Sign Support Fasteners	730-2.07

1. Shop Drawings. Submit shop drawings, for all signs that must meet the ASDS letter width and spacing charts for variable width legends (such as D-series and I-3 signs), and which require custom shop drawings specific to the project. Submit 4 sets of collated shop drawings prepared according to Subsection 105-1.02. Show the following on each sign drawing:

   a. Dimensions of all horizontal and vertical characters and spaces
   b. Overall dimensions
   c. Sign material and sheeting material type
   d. Panel thickness
   e. Legend and letter series
   f. Whether the sign will be framed

2. Sign Fabrication. Use ASTM D4956 Type IV retroreflective sheeting (for lettering, symbols, borders, and background) on sheet aluminum panels for all signs except the following:

   a. Orange Background Signs. Use Type IX or XI fluorescent orange reflective sheeting placed on sheet aluminum panels, except:

      (1) For temporary installations, the reflective sheeting place on aluminum, plastic, or plywood sheet panels.

      (2) For flexible signs, (Roll-Up Signs) use fluorescent reflective sheeting Type VI or better (based on durability and reflectivity, as determined by the Engineer). Roll-Up Sign – 3M Series RS 24, Reflexite Marathon Orange, or approved equal.

b. Railroad Crossbucks and Vertical Crossbuck Supports: Use white ASTM D4956 Type VIII or Type IX or XI retroreflective sheeting for background of sign and all strips.

c. Non-Illuminated Overhead Signs with White Legends on Green Backgrounds: Use ASTM D4956 Type IX or XI retroreflective sheeting for legends and background. Create the legend in one of the following ways:

(1) Cut border and legend from white ASTM D4956 Type IX or XI retroreflective sheeting and adhere them to a green ASTM D4956 Type IX background, or

(2) Cut stencil of border and legend out of green transparent acrylic film and use transparent adhesive to overlay the film on a white ASTM D4956 Type IX or XI retroreflective background.

d. Fluorescent Yellow-Green School Area Signs: Use ASTM D4956 Type VIII, Type IX or XI retroreflective sheeting for background.

Use a manufacturer-recommended clear coat on all screened signs.

Use sign layouts (including characters, symbols, corner radii, and borders) that conform to the ASDS.

3. Sign Posts and Bases. Use sign posts and bases of the types specified. The structural aspects of design and materials for sign supports must comply with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. Do not splice sign posts.

Foundation Concrete:

a. Non-structural and Non-steel-reinforced Sign Foundations. Use Class W concrete, or commercially available pre-mixed sacked concrete with a minimum compressive strength of 3,000 psi. When sacked concrete is used, acceptance will be based on manufacturer Certificates of Compliance and the compressive strength test results of the specimens prepared according to ATM 506.

b. Steel-reinforced Roadside Sign Foundations. Use Class B concrete meeting the requirements of Section 550, except:

Overhead Sign Support Foundations. Use Class A concrete meeting the requirements of Section 501.

4. Delineators. Use delineator assemblies that conform to the requirements shown on the Plans. Fabricate flexible delineators using ASTM 4956 Type III, IV, V, IX or XI retroreflective sheeting.

5. Reflective Sheeting Warranty. Supply manufacturer's warranty for reflective sheeting, including retention of fluorescent yellow-green (measured in accordance with ASTM E2301) for ten years according to the following criteria:

   a. Minimum Fluorescent Luminance Factor Y_F: 20%
   b. Minimum Total Luminance Factor Y_T: 35%

   The warranty shall stipulate that: If the sheeting fails to meet the minimum fluorescence values within the first 7 years from the date of fabrication of the sign, the manufacturer shall, at the manufacturer's expense, restore the sign surface to its original effectiveness. If the reflective sheeting fails to meet the minimum fluorescence values within the 8th through 10th year from the date of fabrication, the manufacturer shall, at the manufacturer's expense, provide enough new replacement sign sheeting to the Department to restore the sign surface to its original effectiveness.

CONSTRUCTION REQUIREMENTS.

615-3.01 GENERAL.

1. Place posts in excavated holes to the depth shown on the Alaska Standard Plans.

2. Backfill the space around the posts and foundations placed in holes to finish ground with selected earth or sand, free of rocks or deleterious material. Place backfill in layers approximately 6 to 12 inches thick and thoroughly compact it.

3. Dispose of surplus excavated material neatly along the adjacent roadway as directed.

4. Install flexible delineator posts according to the manufacturer's recommendations.

5. Attach sign panels to posts, electroliers, traffic signal standards, bridge rails, piers, and abutments using the types and sizes of fastening hardware shown on the Plans.

6. If using existing signs and mileposts that are removed and relocated, ensure they conform to the details shown on the Plans or as directed.

7. Sign Salvage:

   Notify the Engineer 5 working days prior to beginning sign salvage activities. The Engineer will physically identify those signs to salvage.

   Sign(s) identified for salvage in the Plans Sign Summary table, the sign is the property of the Agency identified, and if not identified is the property of the Contractor.

   Salvage sign includes the sign panels, posts, foundation sleeves, and hardware.

   Deliver salvaged sign(s) to the Agency maintenance facility(s) identified in the Plans Sign Summary table at the address identified herein.

Agency Salvaged Signs.

Protect all items from damage during salvaging and delivery. For each sign so designated, disconnect sign post from panel and group the panels together. Group posts together with the foundation sleeves and their hardware. Do not deliver salvaged materials until approved by the Engineer. Replace any items damaged by you at no additional cost to the Department.

Dispose of foundations from salvaged existing signs in a manner approved of by the Engineer (remove and dispose, abandoned in place, or otherwise). If abandoned in place, remove the tops of the foundations, reinforcing steel, anchor bolts, and conduits to a depth of not less than 12 inches below roadway subgrade or unimproved ground, whichever applies.

Dispose of sign salvage not wanted by the Contractor, not used in the project, and not accepted by the Local Maintenance and Operations Station, off sight and as required by Federal, State, and Municipal environmental regulations.

All signs, the sign panels, posts, hardware, foundation sleeves, and foundations at a single installation are considered as one unit.

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

   a. Surfaces exposed to weathering must be free of defects in the coating that impair serviceability or detract from general appearance or color match.

   b. Finished signs must be clean and have no chatter marks, burrs, sharp edges, loose rivets, delaminated reflective sheeting, or aluminum marks. Do not make repairs to the face sheet.

9. Install the various breakaway assemblies according to the manufacturer's written instructions. Meet MASH crashworthiness requirement for breakaway hardware, unless approved otherwise by the Engineer.

10. Secure the anchors in templates and install them according to the manufacturer's written instructions.

11. Finish the foundation according to these tolerances:

    a. Do not use more than two shims per coupling.

    b. Do not use more than three shims to plumb each post.

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

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

13. Attach a label to the back of all standard signs in the lower right corner. Make the label at least 15 square inches and show the year the sign was purchased from the manufacturer. Show the last two digits of the year in clear and bold numbers. Make the label from ASTM D4956 Type I or brighter retroreflective sheeting. Use background and legend colors meeting Table 615-1.

TABLE 615-1
DECAL COLORS

YEAR	BACKGROUND COLOR	LEGEND COLOR
XXX1	Yellow	Black
XXX2	Red	White
XXX3	Blue	White
XXX4	Green	White
XXX5	Brown	White
XXX6	Orange	Black
XXX7	Black	White
XXX8	White	Black
XXX9	Purple	White
XXX0	Strong Yellow-Green	Black
Central values and tolerance limits for each color, as referenced in the MUTCD, are available from the Federal Highway Administration, (HHS-30), 400 7th St. SW, Washington, D.C. 20590		

615-3.02 SIGN PLACEMENT AND INSTALLATION. The location and type of installation will be as shown on the Plans. Sign locations are approximate and subject to field adjustment by the Engineer.

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

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

Mount signs on mast arms level.

Bring existing signs that are to remain, into conformance with Standard Drawing S-05. Keep existing signs in service until they are no longer needed.

615-4.01 METHOD OF MEASUREMENT.

Standard Signs and Object Markers. By the total area of legend-bearing sign panel erected in place. No deductions in quantity for corner rounding will be made. Nominal dimensions for sign sizes indicated on the Plans will be used to calculate sign pay quantities. Octagons and round signs will be measured as rectangles. Only one side of each double-faced sign will be measured for payment.

Removal and Relocation. By each, complete in place.

Delineators. By each, complete in place. A single delineator consists of one post equipped with three reflectors.

Salvage Sign. By each complete sign delivered in acceptable condition.

615-5.01 BASIS OF PAYMENT. Sign posts, bases, and mounting hardware are subsidiary.

Salvage Sign. Each complete sign includes the sign panels, posts, hardware, and foundations sleeves at a single installation.

When Items 615.0002.____, 615.0003.____, or 615.0006.____ do not appear on the bid schedule, this work is subsidiary.

PAY ITEM		
Item Number	**Item Description**	**Unit**
615.0001.____	Standard Sign	SF
615.0002.____	Remove and Relocate Sign	Each
615.0003.____	Remove and Relocate Milepost	Each
615.0004.____	Delineator, Rigid	Each
615.0005.____	Delineator, Flexible	Each
615.0006.____	Salvage Sign	Each
615.0007.____	Salvage and Dispose Sign	Each

C615-24.1001

Replace Section 618 with the following:

SECTION 618
SEEDING

618-1.01 DESCRIPTION. Establish a healthy living perennial stand of grass or other vegetative living groundcover by seeding. Maintain the living cover for the term of the Contract.

618-2.01 MATERIALS. Use materials that conform to the following:

Water	Subsection 712-2.01
Seed	Section 724 (Grass Seed)
Fertilizer	Section 725
Topsoil	Section 726
Soil Stabilization	Section 619
Soil Stabilization Material	Section 727

TABLE 618-1
GRASS SEED MIX, SOIL STABILIZER, AND FERTILIZER APPLICATION RATES

Materials	Ingredients	Application Rate (per MSF[c])
Grass Seed Mix [a, b]	Nortran – Tufted Hairgrass Arctared – Red Fescue Wainwright - Slender Wheatgrass Annual Ryegrass	0.60 lbs. 0.45 lbs. 0.37 lbs. 0.08 lbs. Total = 1.50 lbs.
Soil Stabilizer·		
Slope ≤ 3:1	Mulch	46 lbs.
Slope >3:1	Mulch with tackifier	45-58 lbs.
Fertilizer	20-20-10	12 lbs.

a. Do not remove the tags from seed bags.
b. Submit an alternate seed mix when the specified seed is not commercially available. Provide a letter confirming the specified seed is not available. Include an agronomist certified seed mix design, including application rate, suited to the project site.
c. MSF = 1000 ft^2.

CONSTRUCTION REQUIREMENTS

618-3.01 SURFACE PREPARATION. Remove ruts, holes, humps and other irregularities from the surface. Clear stones four inches in diameter and larger, weeds, plant growth, sticks, stumps, and other debris that will interfere with the application of stabilization material, topsoil, the seeding operation, growth of vegetative groundcover, and subsequent maintenance of the cover.

Smooth the slopes for a uniform appearance and round the top and bottom of the slopes to facilitate tracking or raking. Do not disrupt drainage flow lines.

Evenly place stabilization material and or topsoil when specified.

Prepare the surface material by grooving the material in a uniform pattern that is perpendicular to the fall of the slope. Use one or more of the following grooving methods with associated equipment before the application of seed:

1. Manual raking with landscaping rake;

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.

618-3.02 SEEDING SEASON. Seed disturbed areas after permanent cessation of ground disturbing activities in that area, within the period specified in the Alaska Department of Environmental Conservation (ADEC) Alaska Pollutant Discharge Elimination System (APDES) Construction General Permit (CGP) for Alaska, Section 4.5 Soil Stabilization, and Section 641 Erosion, Sediment, and Pollution Control.

Do not seed during windy conditions, when climatic conditions or ground conditions would hinder placement or proper growth.

Seed between May 15 and August 15.

618-3.03 APPLICATION. Seed, seeding, reseeding includes the application of seed, fertilizer, and stabilization material.

If the seed mix, fertilizer and stabilization material are not included in the Plans or Specifications, including their application rates, use the recommendations of the ADNR and the Revegetation Manual for Alaska.

Do not seed areas of bedrock and plant beds.

Use any of the following methods:

1. Hydraulic Method

   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.

   a. Furnish and place a slurry made of seed, fertilizer, water, and other materials.

   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.

b. Spread fertilizer separately at the specified rate.

618-3.04 MAINTENANCE. Maintenance includes but is not limited to the following:

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 and or topsoil for seeding. Seed repaired area. 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 healthy growth of vegetative cover. Adjust the amount of water when directed.

618-3.05 ACCEPTANCE. The vegetative ground cover will be inspected considering each station and each side of the road a separate area. Acceptance of the ground cover requires a minimum of 75% cover density in the inspection area, gullies repaired and reseeded, and no bare patches of soil more than 10 square feet in area.

Repair/reseed areas that are not accepted.

618-3.06 PERIOD OF ESTABLISHMENT. Establishment period, for each seeded area, extends one complete growing season (May 1 to August 15) after the planting year, acceptance, and final inspection beginning from the date of Project completion, Subsection 105-1.15.

Employ all possible means to preserve/maintain the new vegetative groundcover in a healthy and vigorous condition to ensure successful establishment. Maintain the vegetative cover, according to Subsection 618-3.04, to not less than the requirements for acceptance, Subsection 618-3.05.

618-4.01 METHOD OF MEASUREMENT. Section 109 and as follows:

Seeding by the Acre. By the area of ground surface acceptably seeded and maintained.

Seeding by the Pound. By the weight of dry seed acceptably seeded and maintained.

Water for Seeding. If weighed, a conversion factor of 8.34 pounds per gallon will be used to convert weights to gallons.

MGAL equals 1000 gallons.

618-5.01 BASIS OF PAYMENT.

1. Pay Items 618.0002.0000 Seeding. Payment is for healthy established vegetative groundcover through the establishment period.

   a. The initial surface preparation, seed, fertilizer, mulch when applied hydraulically, their application, and the water for hydraulic application are subsidiary.

   b. Maintenance fill, stabilization material, topsoil, surface preparation, seed, fertilizer, mulch when applied hydraulically, and the water required for hydraulic application are subsidiary.

Except for maintenance, stabilization material is paid under Section 619 and topsoil under Section 620.

PAY ITEM

Item Number	Item Description	Unit
618.0002.0000	Seeding	LB

CR618-23.0601

Replace Section 641 with the following:

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. 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). Permit authorizing excavation dewatering discharges from Construction Activities.

ALASKA MULTI-SECTOR GENERAL PERMIT (MSGP). Permit authorizing storm water discharges associated with Industrial Activity.

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

BEST MANAGEMENT PRACTICES (BMPS). 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 storm water. CGP Appendix C.

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

U.S. ARMY CORPS OF ENGINEERS PERMIT (COE Permit). U.S. Army Corps of Engineers 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). CGP Appendix C.

ELECTRONIC NOTICE OF TERMINATION (ENOT). 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. 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 storm water discharge permit issued to certain local governments and other public bodies, for operation of storm water conveyances and drainage systems. 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. 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. CGP Appendix C.

STORM WATER POLLUTION PREVENTION PLAN (SWPPP). The Contractor's plan for compliance with the CGP for construction activities inside the Project zone, CGP Appendix C and Section 641.

STORM WATER POLLUTION PREVENTION PLAN TWO (SWPPP2). The Contractor's plan for compliance with the CGP and MSGP for 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. CGP Appendix C, "Stabilization".

641-1.02.01 REFERENCE.

A list of websites and documents referenced herein, including SWPPP preparation documents and construction forms, are available at the DOT&PF Statewide Design and Engineering Services Storm Water web page and Construction Forms webpage.
DEC Permit information is available at the DEC Division of Water 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 one electronic copy (single PDF file) 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.

   Submit the final SWPPP. Transmit an electronic copy (single pdf file) of the final SWPPP to the Engineer when the Contractor's eNOT is filed, or within 30 days of the Department's eNOT being filed, whichever is sooner. Include all SWPPP documents.

2. Hazardous Material Control Plan. The HMCP Template is available at the DOT&PF Construction Forms webpage. The HMCP submittal, 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 required 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 an electronic copy and one hard 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 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 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: Certified Professional in Erosion and Sediment Control (CPESC), or Certified Inspector in Sediment, and Erosion Control Certified (CISEC). These equivalent certificates are included in the CGP Appendix C and repeated below.

TABLE 641-1.04 PERSONNEL QUALIFICATIONS

Personnel Title	Required Qualifications
SWPPP Preparer	1. Current certification as a Certified Professional in Erosion and Sediment Control (CPESC); or 2. 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 3. 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.

Personnel Title	Required Qualifications
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 the CGP documents and SWPPP forms, wherever a signature or initial is required.

641-1.06 RESPONSIBILITY FOR STORM WATER PERMIT COVERAGE.

107-1.02 includes the requirements to obtain permits, and to provide permit documents to the Engineer.

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 is responsible for protection, care, and upkeep of all work, and all associated off-site zones.

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.

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.

Relocation Coverage. A Utility company is not an Operator when utility relocation is performed concurrently with the Project, as outlined in Section 105-1.06. The Department maintains operational control over the Utility's plans and specifications for coordination with project construction elements, and the Contractor has day-to-day control over the various utility construction activities that occur in support of the Project. A Utility company is considered a subcontractor for concurrent relocation.

After the Contractor has an active NOI for the Project, a Utility Company performing advance relocation work under a separate SWPPP no longer has Operator status and files the NOT for the Utility Company's SWPPP covering only the completed utility work. Remaining utility relocation work is included in and performed under the Project SWPPP.

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 according to the CGP, DEC and Department SWPPP Template. Subsection 641-1.02.01 provides directions to 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, include the names of attendees and the date.

2. Developing the SWPPP.

a. Meet all CGP requirements.

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

c. Develop the SWPPP with sections and appendices according to the DEC CGP SWPPP Template and DOT&PF SWPPP Template. Include the information required by the Contract and described in the CGP Part 5.0. Use the forms available at the DOT&PF Construction Forms website.

d. Compile the SWPPP in three ring binders with tabbed and labeled dividers for each appendix. Submit the SWPPP according to Subsection 641-1.03.

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. Document permit compliance according to SWPPP2 requirements.

b. The SWPPP must consider the activities of the Contractor and all subcontractors and utility companies performing work in the Project Zone. Describe the roles and responsibilities of the Contractor, subcontractors, utility companies, and the Department with regard to implementation of the SWPPP. Include the utility companies and other operators performing Construction Activity.
Identify 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 storm water permit coverage, the operator, and 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. If the project discharges to a Tier III, Outstanding Natural Resource Water, comply with the CGP Part 2.1.6. Submittal deadlines apply prior to filing an eNOI and beginning construction activities. As of the issuance of the CGP 2021, no Tier III, Outstanding Natural Resource Water is designated in the State of Alaska.

e. There are special requirements in the CGP Part 3.2, for storm water discharges into an impaired water body. Monitoring of storm water discharges may be required. The Contractor is responsible for monitoring and reporting inside and outside the project zone.

f. 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.

g. Delineate the site according to the CGP Part 4.2.1.

h. Minimize the amount of soil exposed and preserve natural topsoil on site, unless infeasible according to the CGP Part 4.2.2.

i. Describe methods and time limits, to initiate temporary or final soil stabilization. Comply with stabilization requirements in the CGP Part 4.5.

j. If construction will cease during winter months, describe all requirements for winter shutdown according to the CGP Part 4.12.

k. Plans for ATS must meet with the requirements in the CGP Part 2.1.5 and 4.6.

l. Design all temporary BMPs to accommodate a two year 24-hour storm event. Describe and document all installed control measures in the SWPPP according to the CGP Part 5.3.6. 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 DOT&PF SWPPP Guide.

m. 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 elements described in the CGP Part 5.3.5 and the DEC CGP SWPPP Template Section 5.0.

n. Identify the inspection frequency in the SWPPP according to the CGP Part 6.1; except, inspect once every seven calendar days regardless of the precipitation amount.

o. Linear Project Inspections, described in CGP Part 6.5, are not applicable to this Contract.

p. 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.

q. The SWPPP is a dynamic document. Keep the SWPPP current by noting installation, modification, and removal of BMPs, and by using amendments,

SWPPP amendment logs, Inspection Reports, corrective action logs, records of land disturbance and stabilization, and any other records necessary to document storm water pollution prevention activities and to satisfy the requirements of the 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 Storm Water Inspector positions in the SWPPP. Document the SWPPP Manager's responsibilities in Section 2.0 Storm Water Contacts, of the SWPPP Template and:

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, on 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, Storm Water Inspectors, and Monitoring Person, and names and dates they are acting in that position. Include Department's staff certifications in SWPPP Appendix E. Include the Department's staff names, dates acting, and assignments in Section 2.0 of the SWPPP and on 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, 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 (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 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, 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, and 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. Document the visit on SWPPP Form 25D-106. The SWPPP must be developed, or amended with the 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 Governments 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 the 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. <u>During Construction</u>.

a. Delineate The Site. Comply with the CGP Part 4.2.1.

b. BMPs. Install 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. Verify they understand and comply with the SWPPP and CGP.

(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 Form 25D-105 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 Training. Provide ongoing training to all employees, subcontractors, and utility companies according to the CGP Part 4.14.

(1) Provide training no less than once a month during construction activity;

(2) Document training in the SWPPP Training Log on 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. Comply with the SWPPP and CGP Part 4.8.

g. Control Measures. Comply with the SWPPP and CGP Part 5.3.6.

(1) Maintain BMPs.

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

(3) Keep the SWPPP and HMCP current, Subsection 641-2.01.3, SWPPP Considerations and Contents.

3. Winter Construction.
If winter construction activity occurs, the project must have BMPs in place, Part 4.12.2. Inspections can be reduced to once per month if the project meets 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 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. Report the incident to the Engineer immediately;

b. Report to DEC orally 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. Report an incident of noncompliance with COE Permits to the Engineer immediately. The Engineer will notify the COE.

5. Hazardous Materials Reporting Requirements.
   Report any release of a hazardous substance 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 the CGP Part 9.3.

   a. To water.
      Any amount of hazardous material released must be reported immediately to the Engineer, DEC, and the Coast Guard.

   b. To land.
      Any release of a petroleum product, must be reported as soon as the person has knowledge of the discharge, CGP Part 9.3.2.

      (1) Release in excess of 55 gallons,

      (2) Release in excess of 10 gallons but less than 55 gallons, must be reported to the DEC within 48 hours after the person has knowledge of the discharge, and

      (3) Release in excess of 1 gallon to 10 gallons, must be recorded, logged, and provided to the DEC on a monthly basis.

   c. Use the HMCP and SPCC Plan for contact information to report spills to regulatory agencies.

   d. Implement measures to prevent the reoccurrence of and to respond to the release of hazardous materials.

   e. Prior to disposal of contaminated material, submit a Contaminated Media Transport and Treatment Disposal Approval Form to the DEC Division of Spill Prevention and Response. Dispose as approved by the DEC.

6. Maintenance of BMPs and Corrective Action.
   Implement maintenance and corrective action as required by the CGP Part 4.13 and Part 8.0, SWPPP, and manufacturer's specifications, whichever is more restrictive.

   a. Implement corrective actions. Comply with the CGP Part 8.0 and the SWPPP.
   b. Corrective Action deadlines and documentation.

      (1) Complete Corrective actions according to the CGP Part 8.2.

      (2) Document corrective actions in the Corrective Action Log, Form 25D-112, according to the SWPPP, CGP Part 5.9.2, and Part 8.3.

         If a different BMP is installed to correct the condition leading to the corrective action, a SWPPP Amendment must be completed.

(3) Document the conditions, in the Corrective Action Log, for corrective actions not completed according to the CGP 8.2. 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 and 619.

d. Apply permanent seed and other stabilization measures after land-disturbing activity has permanently ceased. Comply with the CGP, SWPPP, and the Contract Sections 618, 619, 724, and 727.

e. Incorporate final or temporary stabilization immediately after installing culverts or other drainage structures to satisfy the CGP Part 4.5, SWPPP and Engineer. Stabilize under any bridge 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 BMPs prior to the anticipated date of fall freeze-up, according to 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 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, including Department furnished material sources, disposal sites, staging areas, equipment areas, etc., according to the CGP Part 4.5.2; and

      (3) Temporary BMPs have been removed.

   b. After the Engineer has determined the conditions for submitting an eNOT have been met according to the 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 the SWPPP Appendix Q.

   e. The Contractor is responsible for coordinating local government inspections of work and ending permit coverage with local governments. See Subsection 641-1.03.6 for more information.

9. Ending Inspections, BMP maintenance, and SWPPP Updates 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 to the Engineer according to Subsection 641-1.03.1.

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 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 including 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 from 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, except inspect once every seven calendar days regardless of the precipitation amount, Subsection 641-2.01.3.n.

   Inspections required by the CGP and SWPPP must be performed by the Contractor's SWPPP Manager and the Department's Storm Water 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 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 field blank.

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 with the 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 an Inspection Report, certified by both the Superintendent and Engineer, requires corrections:

a. Document the corrections in an addendum memo addressing only the omitted or erroneous portions.

b. Superintendent and Engineer sign and certify the updated Inspection Report and the addendum memo.

c. File the corrected Inspection Report and addendum memo in 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.

The frequency of inspections may be reduced according to the CGP Part 6.2.1 if the site is stabilized and the reduced frequency is approved by the Engineer. 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 Inspections.
Conduct winter shutdown inspection 14 calendar days after the anticipated fall freeze-up date and conditions under the CGP Parts 4.12.and 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 25D-115, 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 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 an eNOI modification is filed;

h. When a Noncompliance Report is filed with the DEC.

Place all correspondence with the 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, 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.

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.

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.

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 an equivalent qualification, CGP Appendix C. Complete this form to document the positions of Superintendent, SWPPP Manager, Engineer, DOT&PF Storm Water Inspector, and when these positions have changed personnel, either permanently or temporarily. 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 for an incident of non-compliance with the CGP, or the SWPPP, that may endanger health or the environment or for failure to perform work related to Section 641.

Non-compliance.

1. **Incidents of Non-compliance.** 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. **Notice of non-compliance**, either oral or written will include:
   a. Reason/defects

   b. Corrective actions required

   c. Time allowed for completing the corrective action

3. **Levels of Non-compliance and Response** correspond with harm to the workers, the public or the environment and whether the harm is:

   a. **Not-imminent**, the Engineer will either orally or in writing, or both, provide notice to the Contractor indicating the incident of non-compliance.
   Contractor's that take corrective action and complete the action to the satisfaction of the Engineer, within the time specified, may return to the status of compliance, and avoid elevating the response to imminent.

b. **Imminent**, the Engineer will orally provide notice to the Contractor of non-compliance and promptly provide written notice to suspend work until corrective action is completed.

Additional actions, taken against the Contract whether the level of non-compliance is Not-imminent or Imminent, may include:

a. Withholding monies until corrective action is completed

b. Assessing damages or equitable adjustments

c. Employing others to perform the corrective action and deduct the cost

No additional Contract time or additional compensation is 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. CGP Part 6.6.

641-4.01 METHOD OF MEASUREMENT.

See Section 109 and as follows:

Item 641.0005.____, measured as specified in the Directive authorizing the work.

Item 641.0006.____, measured as specified in Table 641-2 Version C.

641-5.01 BASIS OF PAYMENT.

1. BMP Values. Table 641-1 BMP Values – Reserved.

2. Erosion, Sediment, and Pollution Control - Liquidated Damages. 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	
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 without 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

See Subsection 641-3.04 Failure to Perform Work, for additional work and payment requirements.

Item 641.0001.0000 Erosion, Sediment, and Pollution Control Administration. At the Contract lump sum price for administration of all work under this Section. Includes, but is not limited to, SWPPP and HMCP and SPCC Plan preparation, agency fees for SWPPP reviews, SWPPP amendments, pre-construction Inspections, Inspections, monitoring, reporting, and recordkeeping or copying Records related to the SWPPP and required by the CGP, and Record retention.

Item 641.0005.0000 Temporary Erosion, Sediment and Pollution Control by Directive. At the contingent sum prices specified in the Directive using time and materials to authorize the work, for all labor, supervision, materials, equipment, and incidentals to install, maintain, remove and dispose of temporary erosion, sedimentation, and pollution control BMPs. Prices for this item will be by time and materials according to Subsection 109-1.05, or by mutual agreement between the Engineer and Contractor. All additional Erosion, Sediment, and Pollution Control Administration necessary due to this item will not be paid for separately but will be subsidiary to other bid items.

Item 641.0006.0000 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, and CGP are determined by the Engineer according to Table 641-2. The Engineer may withhold payment due the Contractors until the Contractor pays the Liquidated Damages to the Department. The Department will not release performance bonds until Liquidated Damages assessed according to Section 641 are paid to the Department, and all requirements according to Subsection 103-1.05 are satisfied.

Item 641.0007.0000 SWPPP Manager. At the Contract lump sum price for a SWPPP Manager that conforms to this specification. When Item 641.0007.0000 appears in the Bid Schedule, the SWPPP Manager must be a different person than the superintendent, and must be physically present during construction activity with duties and authority as described in Subsection 641-2.04. When Item 641.0007.0000 does not appear in the Bid Schedule, the SWPPP Manager is subsidiary to Item 641.0001.0000.

Subsidiary Items. Temporary erosion, sediment, and pollution control measures that are required outside the Project Zone are subsidiary. Work required by the HMCP and SPCC Plan including hazardous material storage, containment, removal, cleanup and disposal,

are subsidiary to Item 641.0001.0000 Erosion, Sediment and Pollution Control Administration.

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

1. Dewatering;
2. Shoring;
3. Bailing;
4. Permanent seeding;
5. Installation and removal of temporary work pads;
6. Temporary accesses;
7. Temporary drainage pipes and structures;
8. Diversion channels;
9. Settling impoundment; and
10. Filtration.

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

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

Payment will be made under:

PAY ITEM

Item Number	Item Description	Unit
641.0001.0000	Erosion, Sediment and Pollution Control Administration	LS
641.0005.0000	Temporary Erosion, Sediment and Pollution Control by Directive	CS
641.0006.0000	Withholding	CS
641.0007.0000	SWPPP Manager	LS

CR641-123121R

SECTION 642
CONSTRUCTION SURVEYING AND MONUMENTS

642-3.02 CROSS-SECTION SURVEYS Add the following:

Original ground, post-grubbing, post-excavation, and aggregate cross sections shall be taken at identical stations so that no interpolation of data is needed to calculate end areas.

Where an exact placement is not shown on the plans, the Department will be responsible for field locating the structures, signs, and mounds. The Contractor shall provide the Engineer with sufficient horizontal and vertical control to enable the Engineer to field locate these facilities. The Contractor shall be responsible for all surveying required to construct the field located item.

(05/02/11)PARKS-Special Provision

Replace Section 643 with the following:

SECTION 643
TRAFFIC MAINTENANCE

643-1.01 DESCRIPTION. Protect and control traffic during the contract. Furnish, erect, maintain, replace, clean, move, and remove the traffic control devices required to ensure the traveling public's safety. Perform all administrative responsibilities necessary to implement this work.

Maintain all roadways and pedestrian and bicycle facilities affected by the work in a smooth and traversable condition. Construct and maintain approaches, crossings, intersections, and other necessary features throughout the project for the life of the contract.

Illuminate construction activities listed in Table 643-4 during hours of night work on roads open to the public within project limits.

643-1.02 DEFINITIONS. These definitions apply only to Section 643.

ATM. When used in this Section, ATM stands for the Alaska Traffic Manual, which is comprised of the Manual on Uniform Traffic Control Devices (MUTCD), the Alaska Traffic Manual Supplement, any adopted revisions or interim addenda to either document issued subsequently, and corrections to known errors to either document.

BALLOON LIGHT. Light surrounding by a balloon-like enclosure kept inflated by pressurized air or helium, and producing uniform light through 360 horizontal degrees.

CONSTRUCTION PHASING PLAN. A plan for each phase of the project showing how to accommodate traffic. Show the sequence of work by segment or phase, if required.

FIXED OBJECTS. Private vehicles, parked flagger vehicles, idle construction equipment, construction material stockpiles, culvert ends, individual trees, power poles, utility poles and appurtenances, and other items deemed by the Engineer to present a hazard to motorists, pedestrians, or bicyclists traveling through the work zone.

NIGHT WORK. Work occurring between sunset and sunrise on all days except the "No Lighting Required" period shown in the Table 643-1 below:

TABLE 643-1
PROJECT LOCATIONS – NIGHT TIME ILLUMINATION EXCLUSION

Latitude (degrees)	No Lighting Required		Nearby Cities
	Start	End	
South of 61	Lighting Required All Year		Everything South of Hope
61	June 11	July 1	Anchorage, Valdez, Girdwood
62	June 2	July 13	Wasilla, Palmer, Glennallen, Talkeetna
63	May 27	July 17	Cantwell, Paxson, McGrath
64	May 22	July 21	Tok, Delta, Nome
65	May 18	July 25	Fairbanks
66	May 14	July 29	Circle City
67	May 10	August 2	Coldfoot, Kotzebue
68	May 7	August 6	Galbraith Lake
69	May 3	August 9	Happy Valley
70	April 30	August 12	Deadhorse
71	April 27	August 15	Barrow
72	April 24	August 19	

TRAFFIC. The movement of vehicles, pedestrians, and bicyclists through road construction, maintenance operations, utility work, or similar operations.

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

TRAFFIC CONTROL ZONE. A portion of a road construction project, maintenance operation, utility work or similar operation that affects traffic and requires traffic control to safely guide and protect motorists, pedestrians, bicyclists, or workers.

643-1.03 TRAFFIC CONTROL PLAN. Implement an approved TCP before beginning work within the project limits.

The TCP includes, but is not limited to, signs, barricades, traffic cones, plastic safety fence, sequential arrow panels, portable changeable message board signs, special signs, warning lights, portable concrete barriers, crash cushions, flaggers, pilot cars, interim pavement markings, temporary lighting, temporary roadways and all other items required to direct traffic through or around the traffic control zone according to these Specifications and the ATM. Address in the TCPs placement of traffic control devices, including location, spacing, size, mounting height and type. Include code designation, size, and legend per the ATM and the Alaska Sign Design Specification (ASDS). Include longitudinal buffer space for the posted speed limit, according to Table 6C-2 of the ATM unless project conditions or geometric features prohibit including all or a portion of the buffer length.

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

Submit new or modified TCPs to the Engineer for approval. All TCPs must include the following information:

1. Project name and number.
2. A designated TCP number and name on each page.
3. For TCPs more than one page, each page must be numbered.
4. The posted speed limit for each roadway.
5. Existing striping width, lane width, and road surfacing.
6. Construction lane widths, striping layout, and temporary pavement marker layout.
7. Provisions for Pedestrian, Bicycle, and ADA travel through the work zone.
8. Dates and times the TCP will be in effect and why it is being used.
9. The Worksite Traffic Supervisor's signature certifying that all TCPs conform to the ATM and the Contract.
10. The Project Superintendent's signature confirming the TCP is compatible with the work plan.
11. The name(s) of the Worksite Traffic Supervisor, his/her alternate and their 24-hour telephone number(s).
12. Signs to be used and the ASDS designation number and size.
13. Location and spacing of all devices and signs.
14. A plan to address any possible slopes, drop offs, paving joints, or similar temporary features that may occur during use of the TCP.
15. For TCPs proposed to be used at night, note how the requirements will be met for the required lighting and retroreflective material.

TCPs submitted for approval without all the required information will be rejected. Allow 7 days for review of each TCP submittal. All required modifications to a TCP require a new submission and an additional 7 days for review.

A minor revision to a previously approved TCP during construction requires 48 hours for review and approval by the Engineer.

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

A waiver may be requested, in writing, of regulation 17 AAC 25 regarding oversize and overweight vehicle movements inside the project limits. If the waiver is approved, movements of oversize and overweight vehicles in or near traffic inside the project limits will be done according to the provisions of an approved Traffic Control Plan. Maintain a minimum 12-foot lateral separation between the nonstreet legal vehicles and the motoring public. The Traffic Control Plan shall specify the traffic control devices required for these operations.

Road Closures and Major Traffic Sequencing (events). Submit a written request to the Engineer for review and approval of each proposed event and event date. Allow 7

days for the Engineer to review any proposed event or subsequent changes/corrections. The proposed event date will be no less than 14 days from the date of written approval.

643-1.04 WORKSITE TRAFFIC SUPERVISOR. Provide a Worksite Traffic Supervisor responsible for maintaining 24-hour traffic operations.

1. **Qualifications**. Provide a Worksite Traffic Supervisor knowledgeable and experienced regarding the requirements of the ATM and the implementation of those requirements. Provide a Worksite Traffic Supervisor familiar with the Plans, the Specifications, proposed operations, and certified as one of the following:

   a. Traffic Control Supervisor, American Traffic Safety Services Association (ATSSA)
   b. Traffic Control Supervisor, Laborers' International Union of North America (LIUNA)
   c. Work Zone Temporary Traffic Control Technician, International Municipal Signal Association (IMSA). After December 31, 2026 IMSA certification will not be accepted.

   Certify according to Form 25D-124 that the Worksite Traffic Supervisor has a minimum 4000 hours of temporary traffic control work experience, is competent and capable, and has the authority to perform the duties and responsibilities in accordance with this section.

   a. Temporary traffic control work experience shall demonstrate an understanding of concepts, techniques, and practices in the installation and maintenance of traffic control devices, and skill in reading, interpreting, implementing, and modifying TCPs.
   b. Temporary traffic control work experience includes a combination of: flagging; installing traffic control devices in accordance with TCPs; monitoring traffic control devices and TCP performance; and recognizing and reporting deficiencies in traffic control devices and TCPs for correction.
   c. Temporary traffic control work experience is gained while serving as a Worksite Traffic Supervisor-in-training, temporary traffic control support personnel, and Flagger.

   Worksite Traffic Supervisors shall maintain current certification and be able to show their certification anytime they are on the project.

2. **Duties**.

   a. Prepare the TCPs and public notices and coordinate traffic control operations between the Project Superintendent and the Engineer.
   b. Physically inspect the condition and position of all traffic control devices used on the project at least twice each day and at approximately 12-hour intervals. Ensure that traffic control devices work properly, are clean and visible, and conform to the approved TCP. Complete and sign a detailed written report of each inspection within 24 hours. Use Traffic Control Daily Review Form 25D-104.
   c. Supervise the repair or replacement of damaged or missing traffic control devices.

d. Review and anticipate traffic control needs. Make available proper traffic control devices necessary for safe and efficient traffic movement.
e. Review work areas, equipment storage, and traffic-safety material handling and storage.
f. Hold traffic safety meetings with superintendents, foremen, subcontractors, and others as appropriate before beginning construction, prior to implementing a new TCP, and as directed. Invite the Engineer to these meetings.
g. Supervise all traffic control workers, flaggers, and pilot car drivers.
h. Certify that all flaggers are certified as required by Subsection 643-3.04.4. Submit a copy of all flagger certifications to the Engineer.
i Supervise lighting for night work.

3. **Authority**. The Worksite Traffic Supervisor shall have the Contractor's authority to stop work and implement immediate corrective action to unsafe traffic control, in locations where unsafe traffic control is present.

643-1.05 CONSTRUCTION PHASING PLAN. Submit a Construction Phasing Plan for approval no less than 5 working days prior to the preconstruction conference. Include the following:

1. Form 25D-124 designating the Worksite Traffic Supervisor, providing the 24-hour telephone number, and certifying minimum 4,000 hours of work experience as described in 643-1.04 Worksite Traffic Supervisor.
2. A construction-phasing plan for each phase or segment of the project.
3. TCPs for the first phase of the project. Show permanent and temporary traffic control measures, including the times each TCP will be used.

Submit any changes to the Engineer for approval 7 days before proposed implementation.

643-1.06 TRAFFIC MAINTENANCE SETUP. When shown on the bid schedule, Traffic Maintenance Setup items are site specific and are detailed as individual TCPs on the plan sheets. They depict the method or scheme required to route traffic safely and efficiently when any of the following restrictions occur:

1. **Lane Closure**. The closure of one or more lanes on a roadway.
2. **Detour**. The redirection of traffic through or around a traffic control zone.
3. **Road Closure**. The closure of a roadway with or without a specified detour route.
4. **One Lane Road**. A two-way roadway reduced to a single-lane roadway with flaggers, pilot cars, traffic signals, stop signs, or yield signs.

643-2.01 MATERIALS. Provide traffic control devices meeting the following requirements:

1. **Signs**. Use signs, including sign supports, that conform to Section 615, the ATM, and ASDS.

a. Construction Signs: Regulatory, guide, or construction warning signs designated in the ASDS.
b. Permanent Construction Signs: As designated on the Plans or an approved TCP.
c. Special Construction Signs: All other signs are Special Construction Signs. Neatly mark the size of each sign on its back in 3-inch black numerals.

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

3. **Barricades and Vertical Panels**. Use barricades and vertical panel supports that conform to the ATM. Use Type III Barricades at least 8 feet long. Use retroreflective sheeting that meets ASTM D4956 Type II or III.

4. **Portable Concrete Barriers**. Use portable concrete barriers that conform to the Contract. For each direction of traffic, equip each 12.5-foot section of barrier with at least two side-mounted retroreflective tabs placed approximately 6 to 8 feet apart, or a continuous 4-inch wide horizontal retroreflective stripe mounted 6 inches below the top of the barrier. Use yellow tabs or stripe when barriers are placed at centerline. Use white tabs or stripe when barriers are placed on the roadway shoulder. Use retroreflective sheeting that meets ASTM D4956 Type III, IV or V.

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

6. **Drums**. Use plastic drums that conform to the requirements of the ATM. Use retroreflective sheeting that meets ASTM D4956 Type II or III.

7. **Traffic Cones and Tubular Markers**. Use reflectorized traffic cones and tubular markers that conform to the requirements of the ATM. Use traffic cones and tubular markers at least 28 inches high. Use retroreflective sheeting that meets ASTM D4956 Type II or III.

8. **Interim Pavement Markings**. Apply markings according to Section 670 and the manufacturer's recommendations. Use either:

   a. Paint meeting Subsection 708-2.03 with glass beads meeting Subsection 712-2.08,
   b. Preformed Marking Tape (removable or non-removable) meeting Subsection 712-2.14, or
   c. Temporary Raised Pavement Markers meeting Subsection 712-2.15 or 712-2.16, as appropriate.

9. **High-Level Warning Devices**. Use high-level warning devices that conform to the ATM.

10. **Temporary Crash Cushions**. Use retroreflective sheeting that meets ASTM D4956 Type III, IV or V. Application of crash cushion must be appropriate for the intended use and be installed per manufacturer's recommendation. Temporary crash cushions used as rail or barrier end treatments must be redirective. Temporary crash cushions that are barrels or barricade filled with sand or water may only be used when the forecasted temperature during their use is above 32 degrees Fahrenheit.

11. **Sequential Arrow Panels**. Use Type A (24 X 48 inch), Type B (30 X 60 inch) or Type C (48 X 96 inch) panels that conform to the ATM.

12. **Portable Changeable Message Board Signs**. Use new truck or trailer mounted portable changeable message board signs with self-contained power supply for the sign and with:

    a. Message sign panel large enough to display 3 lines of 18-inch high characters
    b. Eight character display per message module
    c. Fully programmable message module
    d. Remote control cellular, wireless radio frequency (RF), landline
    e. Waterproof, lockable cover for the controller keyboard
    f. Capacity for electric/hydraulic sign raising or lowering
    g. Radar over speed detection
    h. Variable flash and sequence rates
    i. Light emitting diode (LED) display, using Institute of Transportation Engineers (ITE) amber/yellow
    j. The capacity for a minimum of 150 pre-programmed messages
    k. Battery-Pack Operation Duration: minimum of 55 hours under full load
    l. Power chords shall comply with the National Electrical Code (NEC) Article 600.10 Portable or Mobile Signs, paragraphs 600.10(C)(1) Cords and 600.10(C)(2) Ground-Fault Circuit Interrupter (GFCI). The cord will have integral GFCI protection located in either the attachment plug or 12 inches or less from the plug.

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

    a. "Safety Fence" by Jackson Safety, Inc., Manufacturing and Distribution Center, 5801 Safety Drive NE, Belmont, Michigan, 49306. Phone (800) 428-8185.
    b. "Flexible Safety Fencing" by Carsonite Composites, LLC, 19845 U.S. Highway 76, Newberry, South Carolina, 29108. Phone (800) 648-7916.
    c. "Reflective Fencing" by Plastic Safety Systems, Inc., 2444 Baldwin Road, Cleveland, Ohio 44104. Phone (800) 662-6338.

14. **Temporary Sidewalk Surfacing**. Provide temporary sidewalk surfacing as required by an approved TCP and the following:

    a. Use plywood at least 1/2-inch thick for areas continuously supported by subgrade. Use plywood at least 1 inch thick for areas that are not continuously supported.
    b. Do not use unsupported 1-inch plywood longer than 30 inches.

c. Use plywood with regular surfaces. Do not overlap plywood joints higher than 1/2-inch. Bevel overlap joints so the maximum slope of the overlapping edge is 2 horizontal to 1 vertical.
d. Fasten so wind and traffic will not displace temporary surfacing.

15. **Temporary Guardrail**. Use temporary guardrail that meets Section 606, except that posts may require placement under special conditions, such as in frozen ground.

16. **Flagger Paddles**. Use flagger paddles with 24 inches wide by 24 inches high sign panels, 8 inch Series C lettering (see ASDS for definition of Series C), and otherwise conform to the ATM. Use retroreflective sheeting that meets ASTM D4956 Type VIII, IX or XI. Use background colors of fluorescent orange on one side and red on the other side.

17. **Truck Mounted Attenuator (TMA)**. The TMA shall be mounted on a vehicle with a minimum weight of 15,000 pounds and a maximum weight per the manufacturer's recommendations.

18. **Portable Steel Barriers**. Use portable steel barriers that conform to the contract. For each direction of traffic, equip each section of barrier with side-mounted retroreflective tabs placed approximately 6 to 8 feet apart, or a continuous 4-inch wide horizontal retroreflective stripe mounted 6 inches below the top of the barrier. Use yellow tabs or stripe when barriers are placed at centerline. Use white tabs or stripe when barriers are placed on the roadway shoulder. Use retroreflective sheeting that meets ASTM D4956 Type III, IV, or V.

19. **Flexible Markers**. Refer to Subsection 606-2.01 Materials.

643-2.02 Crashworthiness. Temporary Work Zone devices, including portable barriers, manufactured after December 31, 2019, must have been successfully tested to the 2016 edition of Manual for Assessing Safety Hardware (MASH). Such devices manufactured on or before this date, and successfully tested to National Cooperative Highway Research Program (NCHRP) Report 350 or the 2009 edition of MASH, may continue to be used throughout their normal service lives.

Submit documentation, by the method indicated on table 643-2, that the following devices comply with Test Level 3 requirements of National Cooperative Highway Research Program (NCHRP) Report 350 or the Manual for Assessing Safety Hardware (MASH). Submit documentation of compliance to the Engineer before installing devices on the project.

TABLE 643-2
WORK ZONE TRAFFIC CONTROL DEVICE AND BARRIER CRASH TESTING COMPLIANCE

Category	Devices	Devices Manufactured Before Dec. 31, 2019[1]	Devices Manufactured after Dec. 31, 2019[1]	Method of Documentation
1	Low-mass single-piece devices w/o attachments; traffic cones, tubular markers, single piece drums, delineators	NCHRP 350, MASH 2009, or MASH 2016	MASH 2016	Manufacturer's Certification for devices exceeding height and weight limits
2	Category 1 devices with attachments, barricades, portable sign supports, drums w/lights, other devices weighing less than 100 pounds but not included in Category 1	NCHRP 350, MASH 2009, or MASH 2016	MASH 2016	FHWA eligibility letter, at Test Level 32.
3	Fixed sign supports, truck mounted attenuators, temporary crash cushions, bridge railing, bridge and guardrail transitions, and guardrail and barrier end treatments.	NCHRP 350, MASH 2009, or MASH 2016	MASH 2016	FHWA eligibility letter, at Test Level 32.
	Portable Concrete and steel barriers	NCHRP 350, MASH 2009, or MASH 2016	MASH 2016	FHWA eligibility letter, if available, at Test Level 3, or DOT&PF eligibility determination, unless otherwise required in the Contract

1 The Engineer will determine whether a device is in serviceable condition. Serviceable means the device will function equivalent to a new device of the same manufacture.
2 When no test level is specified in a FHWA Eligibility letter; it is implied that the tests were run for Test Level 3.

In Table 643-2, Category 1 devices that exceed the following weights and heights require certification that they meet the evaluation criteria of NCHRP Report 350 or MASH, Test Level 3. This certification may be a one-page affidavit signed by the vendor. Documentation supporting the certification (crash tests and/or engineering analysis) must be kept on file by the certifying organization. No certification is required for devices less than or equal to both the weight and height on the schedule below:

Device	Composition	Weight	Height
Cones	Rubber	20 lb	36 in.
	Plastic	20 lb	48 in.
Candles	Rubber	13 lb	36 in.
	Plastic	13 lb	36 in.
Drums	Hi Density Plastic	77 lb	36 in.
	Low Density Plastic	77 lb	36 in.
Delineators	Plastic or fiberglass	N/A	48 in.

643-3.01 GENERAL CONSTRUCTION REQUIREMENTS. Keep the work, and portions of the project affected by the work, in good condition to accommodate traffic safely. Provide and maintain traffic control devices and services inside and outside the project limits, day and night, to guide traffic safely.

Unless otherwise provided in this Section, keep all roadways, business accesses, and pedestrian facilities within the project limits open to traffic. Obtain the Engineer's approval before temporarily closing residential, commercial, or street approaches. Provide access through the project for emergency vehicles and school and transit buses. Properly sign and/or flag all locations where the traveling public is redirected or stopped. Organize construction operations so the total of all construction related stoppages experienced by a vehicle traveling through the project does not exceed 20 minutes except when indicated otherwise in the Contract.

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

Continue to operate all illumination and signalization according to the requirements of Subsection 660-3.09. When moving approach lanes, realign signal heads as necessary according to the ATM. Coordinate any modifications to existing traffic signals with the agency that maintains and operates them. Operate flood lighting at night according to the ATM. Adjust flood lighting so that it does not shine into oncoming traffic.

Provide and maintain safe routes for pedestrians and bicyclists through or around traffic control zones at all times, except when regulations prohibit pedestrians or bicyclists. Station a flagger, where construction activity encroaches onto the safe route in a traffic control zone, to assist pedestrians, and bicyclists past the construction activity.

Maintain business access(s) during flagging operations.

Immediately notify the Engineer as soon as an employee or a subcontractor becomes aware of any traffic related crash that occurs within the project limits, between construction warnings signs, along a detour route, or involving traffic in a queue back up

from project work. Within 3 days fill out the information on Form 25D-123 Work Zone Crash Report and submit a copy to the Engineer.

643-3.02 ROADWAY CHARACTERISTICS DURING CONSTRUCTION. Obtain an approved TCP before reducing existing roadway lane and shoulder widths and before starting construction. Maintain a clear area with at least 2 feet between the edge of traveled way and the work area. Use barricades, traffic cones, or drums to delineate this area. Place traffic control devices on the work side of the clear area. Space them according to the ATM.

Traffic Traversing Unpaved Surface(s).

The total length of unpaved surfaces(s), measured parallel to the roadway, may not exceed the disturbed ground limit in Subsection 652-1.04 and as noted in 643-3.02.

Limit the concurrent unpaved surfaces to [xx], and the immediate area of work. Patch with hot mix asphalt less than 48 hours after removing the existing pavement.

Except:

> [Replace with roadway]. Limit the concurrent unpaved surfaces to [xx], and less than [xx] feet total measured parallel to the roadway. Patch with hot mix asphalt less than [xx] days after removing the existing pavement.
>
> [Replace with roadway]. Traffic may traverse a continuous gravel surface for [the project duration, days, months, etc.]

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

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

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

Pave lanes next to the median first. Pave lanes next to exit and entrance ramps last. Place temporary 12:1 sloped wedge of asphalt concrete against the abrupt pavement

edge on lanes next to exit and entrance ramps. Do not open the roadway to traffic until slope wedges are in place.

643-3.03 PUBLIC NOTICE. Give notice at least 3 days before major changes, delays, lane restrictions, or road closures to local officials and transportation organizations, including but not necessarily limited to:

- Alaska Trucking Association
- Alaska State Troopers
- Division of Measurement Standards
- Local Police Department
- Local Fire Department
- Local Government Traffic Engineer
- School and Transit Authorities
- Local Emergency Medical Services
- Local Media (newspapers, radio, television)
- Railroads (where applicable)
- U.S. Postal Service
- Major Tour Operators

Provide local traffic enforcement and maintenance agencies 24-hour notice before shutting down a traffic signal system. Provide notice as required by utility companies before repairing or replacing a utility.

Provide the Alaska State Troopers, local police and fire department with the radio frequencies used on the project and the 24-hour telephone numbers of the Worksite Traffic Supervisor and the Project Superintendent. These telephone numbers are used to alert construction employees when emergency vehicles must pass through the project. When notified of emergencies make every necessary effort to expedite rapid passage.

Additional notices may be given through the Navigator or 511 System for selected projects. Check the special provisions for those requirements.

643-3.04 TRAFFIC CONTROL DEVICES. Before starting construction, erect permanent and temporary traffic control devices required by the approved TCPs. The Engineer will determine advisory speeds when necessary.

For lane closures on multilane roadways, use sequential arrow panels. During hours of darkness when required by the approved TCP, use flashing warning lights to mark obstructions or hazards and steady-burn lights for channelization.

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

During non-working hours and after completing a particular construction operation, remove all unnecessary traffic control devices. Store all unused traffic control devices in

a designated storage area which does not present a nuisance or visual distraction to traffic. If sign panels are post mounted and cannot be readily removed, cover them entirely with either metal or plywood sheeting. Completely cover signal heads with durable material that that fully blocks the view of signal head and will not be damaged or removed by weather.

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

Use only traffic control devices that meet the requirements of the "Acceptable" category in ATSSA (American Traffic Safety Services Association) "Quality Guidelines for Temporary Traffic Control Devices" and meet crashworthiness requirements per Section 643-2.02.

Immediately replace any devices provided under this Section that are lost, stolen, destroyed, inoperable or deemed unacceptable while used on the project. Stock repair parts for each Temporary Crash Cushion used on the project. Repair damaged crash cushions within 24 hours.

Maintain pre-existing roadside safety hardware at an equivalent or better level than existed prior to project implementation until the progress of construction necessitates removing the hardware. All existing hazards that are currently protected with roadside safety hardware or new hazards which result from project improvements shall be protected or delineated as required in the plans, specifications, and approved TCPs until permanent roadside safety hardware is installed. All temporary roadside safety hardware shall meet crashworthiness requirements of Subsection 643-2.02.

All items paid under this Section remain the property of the Contractor, unless noted otherwise in the contract. Remove them after completing the project.

1. **Embankments**. Close trenches and excavations at the end of each continuous work shift, except as indicated by the Engineer.

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

2. **Adjacent Travel Lane Paving**. When paving lifts are 2 inches or greater and you cannot finish paving adjacent travel lanes or paved shoulders to the same elevation before the end of the paving shift, install: W8-11 (Uneven Lanes), W8-9 (Low Shoulder), W8-17 (Shoulder Drop-Off), W14-3 (No Passing Zone), R4-1 (Do Not Pass), R4-2 (Pass with Care), and W8-1 (Bump) signs as appropriate. Place additional signs every 1500 feet if the section is longer than 1/2 mile.

3. **Fixed Objects, Construction Vehicles and Equipment Working On or Next to the Traveled Way**. Do not park equipment in medians. Locate fixed objects at least 30 feet from the edge of traveled way. Fixed objects that exist prior to construction activity

are not subject to this requirement unless the proposed temporary traffic routing moves the edge of traveled way closer to the pre-existing fixed object. Vehicles and other objects within parking lots in urban environments are considered preexisting fixed objects regardless of whether they are or are not present continuously throughout the day.

When worksite restrictions, land features, right of way limitations, environmental restrictions, construction phasing, or other construction conditions allow no practicable location meeting the preceding requirements, the Engineer may approve alternate locations for fixed objects. Alternate locations shall be as far as practicable from the edge of traveled way. When the alternate location provides 15 feet or more separation from the edge of traveled way, the Engineer may verbally approve the alternate location. When the alternate location provides less than 15 feet separation, written approval is required.

When the Engineer determines a fixed object or fixed objects present unacceptable hazard, use drums, or Type II barricades with flashing warning lights, or use portable concrete or steel barriers, or temporary crash cushion to delineate or shield the hazard, as approved by the Engineer.

Remove obstructions greater than 4 inches above the nominal foreslope grade at the end of each continuous work shift.

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

   Flaggers must be certified as one of the following:

   a. ATSSA Flagger
   b. ATSSA Flagging Instructor
   c. LIUNA Flagger
   d. LIUNA Traffic Control Technician
   e. IMSA Work Zone Temporary Traffic Control Technician

   After December 31, 2026, IMSA certification will not be accepted.

   Flaggers shall maintain current flagger certification. Flaggers must be able to show their flagger certification anytime they are on the project.

   Flaggers must maintain their assigned flagging location at all times, unless another qualified flagger relieves them, or the approved traffic control plan terminates the flagging requirements. Remove, fully cover, or lay down flagger signs when no flagger is present. Keep the flaggers' area free of encumbrances. Keep the flagger's vehicle well off the roadway and away from the flagging location so the flagger can be easily seen.

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

Obtain the Engineer's written approval before flagging signalized intersections. When flagging a signalized intersection, either turn off and cover the traffic signal or place it in the All-Red Flash mode. Coordinate changing traffic signal modes and turning off or turning on traffic signals with the agency responsible for signal maintenance and operation and the Engineer. Get their written approval in advance. Only uniformed police officers are permitted to direct traffic in an intersection with an operating traffic signal.

5. **Pilot Cars**. You may use pilot cars when part of an approved TCP, if the Engineer determines one-way traffic is necessary, or if the route through the traffic control zone is particularly hazardous, involved, or frequently altered to preclude adequate signing, Do not use pilot cars to avoid localized traffic control at several locations. Pilot car operators may not control Automated Flagger Assistance Devices while operating a pilot car.

   Organize construction operations so the total of all stoppages experienced by a vehicle traveling through a project does not exceed 20 minutes. However, this does not imply that you may allow 20 minutes in all cases. Coordinate multiple pilot-car operations within a project or adjoining projects to minimize inconvenience to the traveling public. Two or more pilot cars may be used to provide two-way traffic through the traffic control zone to reduce the waiting period. The flagger or pilot car operator must record each pilot car's departure time in a bound field book furnished by the Engineer. Whenever practical, the flagger should tell the motorist the reason for and approximate length of the delay. Make every reasonable effort to yield right-of-way to the public and prevent excessive delay.

   Use an automobile or pickup as the pilot car, with the company logo prominently displayed. Equip the pilot car with a two-way radio for contact with flaggers and other pilot cars. Mount a G20-4 sign (Pilot Car Follow Me) on the rear at least 5 feet above the driving surface. Use high intensity flashing strobe lights, oscillating beacons, or rotating beacons on all Pilot Cars. Vehicle hazard warning lights may supplement but are not permitted to be used instead of high intensity flashing strobe lights, oscillating beacons, or rotating beacons. Identify the last vehicle in the column.

   When pilot car operations are approved, establish all required pilot car traffic control devices before beginning work. Continue pilot car operations until no longer necessary and an approved TCP is in place for operations without pilot car, including all required traffic control devices.

6. **Street Sweeping and Power Brooming**. Keep free of loose material paved portions of the roadway and haul routes open to the public, including sections of roadway off the project where the Contractor's operations have deposited loose material. Use

equipment for brooming and sweeping as recommended by the manufacturer and the following:

Dirt, dust and construction materials, mobilized as a result of power brooming and or sweeping, shall not be pushed, ejected, thrown or drift beyond the lesser of, 2 feet from the equipment perimeter or the edge of the paved surface.

All equipment shall operate to typical industry standards. Maintain equipment to operate as designed by the manufacturer. Equipment will employ safety equipment, warning lights, and other as required by the Specifications and these Special Provisions.

Sweeper and Broom Options: Table 643-5, Traffic Control Rate Schedule, Street Sweeping

a. **Regenerative Sweeper**: Sweeper that blows a stream of air at the paved surface, causing fine particles to rise, and then caught through a vacuum system.

b. **Vacuum Sweeper**: Sweeper that creates a vacuum at the paved, surface sucking dirt, dust, and debris into a collection system.

c. **Mechanical Broom Sweeper**: Sweeper designed to pick up and collect larger size road debris, stones and litter, etc. In addition to the requirements noted in these Specifications, use of a mechanical broom sweeper requires the Engineer to approve the sweeper for the intended use.

d. **Power Broom**: Power brooming that wets, pushes and or ejects loose material directly into an attached collection/pickup container may be used when approved by the Engineer. The added moisture will be contained to the paved roadway surface.

   Dry Power Brooming is not permitted. Power brooming without direct/immediate means of collection/pickup is not permitted.

7. **Watering**. Furnish, haul, and place water for dust control and pavement flushing, as directed. Use water trucks that can provide a high-pressure water stream to flush the pavement and a light-water spray to control dust. If the flushing operations contaminate or fill adjacent catch basins, clean and restore them to their original condition. This requirement includes sections of roadway off the project where flushing is required. The Engineer will control water application.

   Obtain an Alaska Department of Natural Resources permit for water removal before taking water from a lake, stream, or other natural water body. Comply with the Alaska Department of Fish and Game screening requirements for all water removal operations.

8. **Portable Changeable Message Board Signs**. Furnish Changeable Message Signs when approved on a TCP. Display only messages approved on the TCP. Follow application guidelines in the ATM.

9. **Truck Mounted Attenuator (TMA)**. TMAs are mounted on the rear of work vehicles. Impact attenuators shall meet crashworthiness requirements of 643-2.02. TMAs shall be mounted on a vehicle with a minimum weight of 15,000 pounds and a maximum weight in accordance with the manufacturer's recommendations. TMAs shall have an adjustable height so that it can be placed at the correct elevation during usage and to a safe height for transporting. Approach ends of TMAs shall have impact attenuator markings in accordance with the ATM. Do not use a damaged attenuator in the work. Replace any damaged TMA at your expense.

10. **Traffic Control Vehicles**. Use high intensity flashing strobe lights, oscillating beacons, or rotating beacons on the Work Zone Supervisor's vehicle and on vehicles being used to transport and set-up traffic control devices. Vehicle hazard warning lights may supplement but are not permitted to be used instead of high intensity flashing strobe lights, oscillating beacons, or rotating beacons.

643-3.05 AUTHORITY OF THE ENGINEER. When existing conditions adversely affect the public's safety or convenience, the Contractor will receive an oral notice, and then a written notice according to Subsection 105-1.01, Authority of the Engineer. The notice will state the defect(s), the corrective action(s) required, and the time required to complete the corrective action(s). In no case shall this time exceed 24 hours. If corrective action(s) are not completed within the specified time, the Engineer may immediately suspend work on the offending operations until the defect(s) are corrected. The Engineer may require outside forces to correct unsafe conditions. The cost of work by outside forces will be deducted from any monies due under the terms of this Contract.

643-3.06 TRAFFIC PRICE ADJUSTMENT. A Traffic Price Adjustment, under Item 643.0023.____, will be assessed for unauthorized lane closures or reductions. Unauthorized lane reductions will be assessed as one full lane closure, for each lane reduced without authorization.

Authorized lane closures and/or lane reductions are those shown in the Contract, an approved TCP, or authorized in writing.

Unauthorized lane reductions include unacceptable roadway, pedestrian walkway or route, and bicycle route or pathway surfaces, such as severe bumps, ruts, washboarding, potholes, excessive dust or mud, and non-conforming or out of place traffic control devices. Failure to install temporary crash cushions or barriers, when required according to the Contract or TCP, is also considered an unauthorized lane reduction. The Engineer will make the sole determination whether unauthorized lane reductions or closures are present.

Failure to maintain an acceptable infrastructure or traffic control plan will result in a price adjustment equal to 100 percent of the applicable rate shown in Table 643-3, Adjustment Rates, for the time the roadway or pedestrian facility is in an unacceptable condition.

The rates are liquidated damages which represent highway user costs, based on Average Daily Traffic (ADT). The Engineer will use the rate shown for the current ADT for this project, as published in the Regional Traffic Volume Report prepared by the Department's Planning Section. Adjustment rates for unauthorized reduction or closure of each lane of pedestrian walkways or route, and bicycle route or pathway, are the same as for one full roadway lane closure.

TABLE 643-3
ADJUSTMENT RATES

Published ADT	Dollars/Minute of Unauthorized Lane Reduction or Closure
Less than 1,000	$6
1,000-4,999	$25
5,000-9,999	$75
10,000-29,999	$105
30,000+	$150

643-3.07 MAINTENANCE OF TRAFFIC DURING SUSPENSION OF WORK. Approximately one month before work is suspended for the season, schedule a preliminary meeting with the Engineer and Maintenance & Operations to outline the anticipated roadway condition and the work expected to be completed before shutdown. Schedule a field review with the Department for winter maintenance acceptance. At the field review, the Engineer will prepare a punch list for implementation before acceptance.

To be relieved of winter maintenance responsibility, leave all roads with a smooth and even surface for public use at all times. Properly crown the roadbed surface for drainage and install adequate safety facilities. Make sure all illumination and signals, including vehicle detectors, are in good working order.

After the project is accepted for winter maintenance and until ordered to resume construction operations, the Department is responsible for maintaining the facility. The Department will accept maintenance responsibility only for portions of the work that are open to the public, as determined by the Engineer. The Department will not accept maintenance responsibility for incomplete work adjacent to accepted roads. The contractor is responsible for maintaining all other portions of the work. The Engineer will issue a letter of “Acceptance for Winter Maintenance” that lists all portions of the work that the Department will maintain during a seasonal work suspension. The contractor retains all contractually required maintenance responsibilities until receipt of this letter.

If the contractor suspends work due to unfavorable weather (other than seasonal) or due to failure to correct unsafe conditions, carry out Contract provisions, or carry out the

Engineer's orders. All costs for traffic maintenance during the suspended period will be borne by the Contractor.

When work is resumed, replace or renew any work or materials lost or damaged during temporary use. If the Department caused damage during winter suspension, payment will be made for repairs by unit pay item or in accord with Subsection 109-1.05, Compensation for Extra Work. When the Engineer directs, remove any work or materials used in the temporary maintenance. Complete the project as though work has been continuous.

643-3.08 CONSTRUCTION SEQUENCING. The construction sequencing detailed in these provisions, the Special Provisions, and the Plans is suggested only. The Contractor may propose alternative construction sequencing.

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

Unless otherwise determined by the Engineer and on an approved Traffic Control Plan (TCP), do not restrict traffic during the times listed below:

1. **Monday through Friday**: 0530 hrs to 0800 hrs and 1630 hrs to 1900 hrs.

2. **Around any Holiday**:

    a. If a holiday falls on Sunday, Monday, or Tuesday, the above stipulations apply from 1200 hrs on the Friday before the holiday to 0300 hrs. on the day after the holiday.
    b. If a holiday falls on Wednesday, the above stipulations apply from 1200 hrs on the Tuesday before the holiday to 0300 hrs. on the Thursday after the holiday.
    c. If a holiday falls on Thursday, Friday, or Saturday, the above stipulations apply from 1200 hrs on the day before the holiday to 0300 hrs. on the Monday after the holiday.

3. **During the Alaska State Fair**: Friday from 1600 hrs. to Sunday 2300 hrs on all streets except Palmer-Wasilla Highway. Weekend traffic restrictions not allowed on Palmer-Wasilla Highway.

Lane restrictions, if allowed, conducted so that no more than a 10 minute accumulated stopped delay, 40 vehicles, or 1/4 mile (1320 feet) of traffic detained, whichever occurs first, before releasing the detained motorists. During paving operations, a 20 minute stopped delay, 80 vehicles, or 1/2 mile (2640 feet) of traffic detained, allowed for motorists, except school buses. If a queue of traffic develops at a stop, empty the entire queue to include the last car that entered the queue at the time the queue was released.

Lane restrictions, if allowed shall be conducted so that no more than a 5 minute accumulated stopped delay, 20 vehicles, or 1/8 mile (660 feet) of traffic is detained, whichever occurs first, before releasing the detained motorists. During paving operations, a 10 minute stopped delay, 40 vehicles, or 1/4 mile (1320 feet) of traffic detained, allowed for motorists, except school buses. If a queue of traffic develops at a stop, empty the entire queue to include the last car that entered the queue at the time the queue was released.

Do not delay the school busses through the construction zone; obtain the local school bus schedule and coordinate work efforts. Submit the plan, as a TCP, to the Engineer for approval before the implementation of the school bus coordination plan.

643-3.09 INTERIM PAVEMENT MARKINGS. Place permanent or interim pavement markings according to this Subsection, details shown on the Plans, approved TCPs, and Parts III and VI of the ATM before opening existing paved roadways, temporary paved roadways, detours, interim paving lifts, and roadways with seal coats and surface treatments for more than one continuous work shift. This work may include restriping the existing roadway before beginning construction, before seasonal suspension, and/or after seasonal suspension.

Remove conflicting pavement markings according to Subsection 670-3.04, Paint Removal.

Mark existing roadway sections that will be opened to traffic during the winter. Mark over the existing lines and markings, unless shown otherwise on the Plans or an approved TCP.

Maintain all interim pavement markings for their intended life including reapplication when necessary. There will be no compensation to upgrade interim pavement markings required for work operations lasting up to 2 weeks.

Use only temporary raised pavement markers as interim pavement markings on final pavement surfaces. Completely remove and dispose of them when placing the final markings. Completely remove any residual adhesive that might misguide motorists. Place final pavement markings on finished pavement surfaces and interim pavement surfaces before suspending work for the winter.

Stage the construction to avoid routing traffic over conflicting markings, for more than one continuous work shift. If traffic is routed over conflicting markings during a work shift, delineate the roadway with a complement of warning signs, channelizing devices, and flaggers as required by the ATM.

Use only temporary raised pavement markers meeting Subsection 712-2.16 as interim markings on seal coat and surface treatment pavements. Install the markers according to the manufacturer’s instructions before applying the asphalt surface material and cover coat. Remove the vinyl protective covers after applying the asphalt pavement.

On multicourse surface treatments, install the temporary raised pavement markers after applying the full width of the first layer of cover coat. Install the markers on each day's completed surface before removing the pilot car operations and allowing unescorted traffic on the surface treatment.

Apply final pavement markings according to Subsection 670-3.01, Construction Requirements, of these Special Provisions.

Do not place final pavement markings until traffic has traveled over the seal coat or surface treatment for at least 15 days and no more than 21 days, as directed by the Engineer.
Apply final pavement markings within 10 days of completing the final sweeping or brooming of the mainline seal coat or surface treatment.

643-3.10 LIGHTING FOR NIGHT WORK. Illuminate the night work areas according to Table 643-4.
Table 643-4 does not provide a comprehensive list of operations that require lighting. Provide lighting for other operations when necessary.

Use balloon lighting as the main light sources. Do not use floodlights without prior approval by the Engineer. When approved, install floodlighting in a manner that minimizes glare for motorists, workers, and residents living along the roadway. Locate, aim, louver, and/or shield light sources to reduce glare.

The Engineer shall be the sole judge of when glare is unacceptable, either for traffic or for adjoining residences. When notified of unacceptable glare, modify the lighting system to reduce glare to an acceptable level.

TABLE 643-4
NIGHT WORK ILLUMINATION EQUIPMENT AND LOCATION REQUIREMENTS

Type of Work or Equipment	Lighting Configuration
Paving, Milling, Striping, Pavement Marking Removal, Rumble Strip Installation.	At least one machine-mounted balloon light of at least 2000 watts. Provide additional lights or wattage if necessary to provide complete coverage.
Rolling, Pavement Sweeping.	At least 4 sealed beam halogen lamps in the front and four in the back. Each should be at least 55 watts.
Flagging.	One balloon light of at least 2000 watts, located within 30 feet of the flagger location. Locate so the flagger and the flagging location are illuminated. Provide additional lights or wattage if necessary to provide complete coverage of the flagging location.
Truck Crossings where haul vehicles cross or enter a road with more than 10,000 ADT, or where the haul vehicle crossing or entering location is controlled by portable traffic signals or flaggers.	At least one balloon light of at least 2000 watts, located on the main road on the far right side of the intersection. Locate light within 30 feet of the edge of the side street. If there is a flagger at the crossing, locate the light or lights so the lighting requirements for Flagging are also satisfied.

If the Contractor fails to provide required lighting equipment or provides lighting that creates unacceptable glare, the Contractor shall cease all construction activities that require illumination, including flagging operations, until the condition or conditions are corrected.

Use lighting equipment in good operating condition and that complies with applicable state and local adopted codes and standards, and OSHA, NEC, and NEMA requirements.

Provide suitable brackets and hardware to mount lighting fixtures and generators on machines and equipment. Design mountings so lights can be aimed and positioned as necessary to reduce glare. Locate mounting brackets and fixtures so they don't interfere with the equipment operator or overhead structures. Connect fixtures securely in a manner that minimizes vibration.

Ensure ground, trailer, and equipment-mounted light towers or poles are sturdy and freestanding without the aid of guy wires. Towers shall be capable of being moved as necessary to keep pace with the construction operation. Position the ground and trailer-mounted towers and trailers, to minimize the risk of being impacted by traffic on the roadway, or by construction traffic, or equipment.

Raise trailer or equipment mounted lights to maximum height, except do not exceed the clearance required for overhead objects such as overhead signals, overhead signs, trees, aerial utilities, or bridges. Aim and adjust lights to provide the required light levels. Provide

uniform illumination on the hopper, auger, and screed areas of pavers. Illuminate the operator's controls on all machines uniformly.

Furnish each side of non-street legal equipment with a minimum of 75 square inches high intensity retroreflective sheeting in each corner, so at least 150 square inches of sheeting is visible from each direction. Provide red sheeting on the rear of the equipment and yellow sheeting elsewhere.

Existing street and highway lighting and conventional vehicle headlights may supplement but do not relieve the Contract requirement to provide lighting for night work, according to the requirements of Table 643-4.

Provide sufficient fuel, spare lamps, spare generators, and qualified personnel to ensure that all required lights operate continuously during nighttime operations. Ensure generators have fuel tanks of sufficient capacity to permit operation of the lighting system for a minimum of 12 hours. In the event of any failure of the lighting system, discontinue the operation that requires illumination until the required level and quality of illumination is restored.

Maintain a supply of at least twenty emergency flares for use in the event of emergency or unanticipated situations. Comply with local noise ordinances.

Install all post-mounted electroliers located within the clear zone, on NCHRP 350 or MASH compliant breakaway bases.

643-3.11 HIGH VISIBILITY GARMENTS. Ensure all workers within project limits wear outer garments that are highly visible and comply with the following requirements:

1. **Standards**. Use high visibility garments conforming to the requirements of ANSI/ISEA 107-2004, Class 2 for tops or Class E for bottoms, and Level 2 retroreflective material.

2. **Labeling**. Use garments labeled in conformance with Section 11.2 of ANSI/ISEA 107-2004 or ANSI/ISEA 107-2010.

3. **Tops**. Wear high visibility vests, jackets, or coverall tops at all times.

4. **Bottoms**. Wear high visibility pants or coverall bottoms during nighttime work (sunset to sunrise). Worksite traffic supervisors, employees assigned to traffic control duties, and flaggers wear high visibility pants or coverall bottom at all times.

5. **Outer Raingear**. Wear raingear tops and bottoms conforming to the requirements of this Subsection 643-3.11.

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

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

Payment for high visibility garments for workers is subsidiary to other traffic contract items.

643-4.01 METHOD OF MEASUREMENT. Section 109 and as follows: Quantities will not be measured during winter suspension of work.

1. **Traffic Maintenance**. Calendar Day: Every day shown on the calendar, beginning and ending at midnight. Measurement begins on the day following receipt of the Notice to Proceed or on the first day of work at the project site, whichever is later, and ends on the date of project completion.

2. **Traffic Control Device Items**. By the number of units of each bid item shown on the bid schedule (or the Traffic Control Rate Schedule, if item 643.0025.____, Traffic Control, is included) that are installed, accepted, and operational. Incomplete or unsatisfactory devices will not be measured. Special Construction Signs are measured by the total area of legend-bearing sign panel, as determined under Subsection 615-4.01. Compensation for a 24-hour period shall be made under Construction Signs in the Traffic Control Rate Schedule, Table 643-5. Items measured by the day are for each item per 24-hour period.

3. **Traffic Maintenance Setup Items**. By each lane closure or one-lane road in place per hour. By each detour or road closure in place per 24-hour period.

4. **Portable Concrete Barrier**. By each nominal 12.5-foot section placed according to the approved TCPs, for the initial placement and for each subsequent relocation when moved more than 10 feet in any direction. Each transition piece (sloping end) will be measured as a single section.

5. **Temporary Crash Cushion**. By each acceptable installation.

6. **Interim Pavement Marking**. By the single-stripe station. A single stripe is a marking or a temporary raised pavement marker 4 inches wide. Wider striping is measured in multiples of 4 inches. Centerline gaps are not deducted from measurements.

7. **Flagging and Pilot Car**. By the number of approved hours, supported by certified payroll.

8. **Street Sweeping**. By the number of operated hours, supported by certified payroll and approved by the Engineer.

9. **Watering**. By the 1,000 gallons (M-Gallon) of water applied. The Engineer may specify measurement by weight or volume. If by weight, convert to gallons at 8.34 pounds per gallon. If by volume, convert to gallons at 7.48 gallons per cubic foot.

10. **Traffic Price Adjustment**. By each minute that any lane of traffic is not open to full use by the traveling public, measured to the nearest minute. The Engineer will determine whether the roadway is opened to full use.

11. **Traffic Control**. By the units specified in the Special Provisions.

12. **Portable Changeable Message Board Sign**. By the 24-hour period for each sign, as shown on an approved TCP and displaying an approved message.

13. **Plastic Safety Fence**. By the linear foot, as placed, to protect or channelize pedestrian traffic as shown on an approved TCP. Any adjustment in configuration of the fence at the same location that does not result in an increased amount of fence is not measured. Opening and closing the fence to gain access to and from the worksite is not measured.

14. **Temporary Sidewalk Surfacing**. By the square yard as shown on an approved TCP.

15. **Temporary Guardrail**. By the linear foot, including end treatments, as shown on an approved TCP.

16. **Portable Steel Barrier**. By the linear foot placed according to the manufacturer's recommendation and approved TCPs, for the initial placement, and for each subsequent relocation when moved more than 10 feet in any direction.

17. **Hotline Road Report**. No measurement required to provide a 24-hour toll free (1-800 ###-####) "Hotline Road Report" telephone with a prerecorded message, and weekly notices with daily updates. Work will be subsidiary to Pay Item 643.0001.____ or 643.0002.____, Traffic Maintenance.

643-5.01 BASIS OF PAYMENT.

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

   Items required by the Contract that are not listed on the bid schedule or not included in other items are subsidiary to Item 643.0001.____ or 643.0002.____ Traffic Maintenance, except the following:

   a. Traffic Price Adjustment
   b. Traffic Maintenance Setup

2. **Traffic Control Device Items**. The contract price includes all resources required to provide, install, maintain, move, and remove the specified devices. Warning lights,

high-level warning devices, vertical panels, and sign supports required for traffic control devices are subsidiary.

3. **Traffic Maintenance Setup Items**. Each setup consists of all traffic control devices, flaggers, pilot cars, and subsidiary items necessary to implement the TCP shown on the Plans. Warning lights, high-level warning devices, vertical panels, and sign supports required for traffic control devices are subsidiary.

   Construction and obliteration of temporary roadways, when required on the Plans or approved TCP under a traffic maintenance setup item, is paid for under their respective roadway pay items.

   When topsoil or seeding is required for detours, payment will be made under Sections 620 and/or 618.

4. **Portable Concrete Barrier**. The contract price includes all resources required to provide, install, maintain, and remove each barrier section.

5. **Temporary Crash Cushion**. The contract price includes all resources required to provide, install, maintain, repair, and remove each crash cushion.

6. **Interim Pavement Marking**. The contract price includes all resources required to provide, install, maintain, and remove the specified markings. Installation of word and symbol markings are subsidiary. The No-Passing Zone signing, described in Subsection 643-3.04, is subsidiary.

7. **Flagging and Pilot Car**. The contract price includes all required labor, vehicles, radios, flagger paddles and pilot car signs, and transportation to and from the worksite.

   The Engineer will pay for Item 643.0032.____ Flagging on a contingent sum basis at the rate of $82.00/hour. The Engineer does not require a change order/directive for the flagging Pay Item. Flagging associated with Change Order work paid at the prices according to Subsection 109-1.05 Compensation for Extra Work.

8. **Street Sweeping**. The contract price includes all resources required to keep the roadway free of loose material.

9. **Watering**. The contract price includes all resources required to provide watering, as directed.

10. **Traffic Price Adjustment**. If Item 643.0023.____, Traffic Price Adjustment, is shown on the bid schedule, the total value of this contract will be adjusted, for unauthorized lane reductions or closures, at the rates listed in Table 643-3.

11. **Traffic Control**. Payment for Item 643.0025.____, Traffic Control, will be made at the unit rate value contained in the Traffic Control Rate Schedule shown in the Special

Provisions for the accepted units of traffic control devices. The Engineer does not require a change order/directive for Pay Item 643.0025.____, Traffic Control.

12. **Portable Changeable Message Board Sign**. The contract price includes all resources required to furnish, move, and operate the sign.

13. **Plastic Safety Fence**. The contract price includes all resources required to install, maintain, and remove the fence.

14. **Temporary Sidewalk Surfacing**. The contract price includes all resources required to construct, maintain, and remove the surfacing.

15. **Temporary Guardrail**. The contract price includes all resources required to construct, maintain, and remove the guardrail.

16. **Portable Steel Barrier**. The contract price includes all resources required to provide, install, maintain, move, and remove each barrier.

17. **Lighting for Night Work**. Payment for illuminating night work areas and any required adjustments to work zone illumination is subsidiary to other items.

18. **Pavement Breaks**. Temporary hot mix asphalt at pavement breaks, as noted in Subsection 643-3.02. Gravel Surface Not Specified is subsidiary to Pay Item 401.0001.____.

19. **Temporary Pavement Markings**. Except where specified as an individual Pay Item (Interim Pavement Markings) temporary pavement markings are subsidiary to Section 670 Pay Items. Refer to Section 670 Traffic Markings, for further information.

20. **Temporary Crash Cushion / Redirective**. The price listed in the Traffic Control Rate Schedule, Table 643-5, will be full compensation for the purchase, installation, maintenance during construction, removal, and salvaging the Temporary Crash Cushion / Redirective unit(s). Deliver the salvaged unit(s) to the nearest DOT&PF Maintenance & Operations Station or as directed by the Engineer.

Traffic control devices, barriers, and crash cushions required to delineate or shield fixed objects will not be measured or paid for separately, but will be subsidiary

Traffic control devices, barriers, and crash cushions required to delineate or shield guardrail posts or non-crashworthy ends will not be measured or paid for separately, but will be subsidiary, when required for failure to meet completion timelines in subsection 606-3.01.

TABLE 643-5
TRAFFIC CONTROL RATE SCHEDULE

Traffic Control Device	Pay Unit	Unit Rate
Construction Signs	Each/Day	$6.50
Special Construction Signs	Square Foot	$31.00
Type II Barricade	Each/Day	$3.30
Type III Barricade	Each/Day	$11.00
Traffic Cone or Tubular Marker	Each/Day	$1.10
Drums	Each/Day	$3.30
Temporary Guardrail	Lineal Foot	$35.00
Portable Concrete or Steel F Shape Barrier (12.5 foot long or $8/foot for other lengths)	Each	$100.00
Temporary Crash Cushion / Non-redirective Water Filled Barrier (all required per end)	Each	$2500.00
Temporary Crash Cushion / Non-redirective Water Filled Barrels (all required per end)	Each	$3285.00
Temporary Crash Cushion / Non-redirective Sand Filled Barrels (all required per end)	Each	$4325.00
Temporary Crash Cushion / Redirective	Each	$9230.00
Plastic Safety Fence	Lineal Foot	$1.00
Temporary Sidewalk Surfacing	Square Foot	$2.00
Flexible Markers (Flat Whip, Reflective)	Each	$60.00
Cars and Trucks w/driver		
Pilot Car (4x2, 1/2 ton truck)	Hour	$128.00
Watering Truck – up to 4900 gallon capacity	M-Gallon	$40.00
Watering Truck – more than 4900 gallon	M-Gallon	$30.00
Street Sweeping: Regenerative Sweeper, Vacuum Sweeper, Mechanical or Power Broom with Vacuum	Hour	$214.00
40,000 GVW Truck with Crash Attenuator	Hour	$162.00
Electronic Boards, Panels, and Signals		
Sequential Arrow Panel	Each/Day	$60.00
Portable Changeable Message Board Sign	Calendar Day	$210.00

PAY ITEM		
Item Number	**Item Description**	**Unit**
643.0002.0000	Traffic Maintenance	LS
643.0003.0000	Permanent Construction Signs	LS
643.0023.0000	Traffic Price Adjustment	CS
643.0025.0000	Traffic Control	CS
643.0032.0000	Flagging	CS

C643-24.1001

SECTION 646
CPM SCHEDULING

Replace Subsection 646-2.01 with the following:

646-2.01 SUBMITTAL OF SCHEDULE.

Submit a detailed initial CPM Schedule at the preconstruction conference for the Engineer's acceptance as set forth below.

The construction schedule for the entire Project shall not exceed the specified contract time. Allow the Engineer 14 days to review the initial CPM Schedule. Revise promptly. The finalized CPM Schedule must be completed and accepted before beginning work on the Project.

646-3.01 REQUIREMENTS AND USE OF SCHEDULE.

Replace the first sentence of No. 2 Schedule Updates. with the following:

Hold job site progress meetings with the Engineer for the purpose of updating the CPM Schedule. Meet with the Engineer monthly or as deemed necessary by the Engineer.

CR646.1-23.0501

Add the following Section:

SECTION 647
EQUIPMENT RENTAL

647-1.01 DESCRIPTION. This item consists of furnishing construction equipment, operated, fueled, and maintained, on a rental basis for use in construction of extra or unanticipated work at the direction of the Engineer. Construction equipment is defined as that equipment actually used for performing the items of work specified and shall not include support equipment such as, but not limited to, hand tools, power tools, electric power generators, welders, small air compressors and other shop equipment needed for maintenance of the construction equipment.

The work is to be accomplished under the direction of the Engineer, and the Contractor's operations shall at all times be in accordance with the Engineer's instructions. These instructions by the Engineer shall be to the Contractor's supervisory personnel only, not to the operators or laborers. In no case shall these instructions by the Engineer be construed as making the Department liable for the Contractor's responsibility to prosecute the work in the safest and most expeditious manner.

647-2.01 EQUIPMENT FURNISHED. In the performance of this work, the Contractor shall furnish, operate, maintain, service, and repair equipment of the numbers, kinds, sizes, and capacities set forth on the Bid Schedule or as directed by the Engineer. The operation of equipment shall be by skilled, experienced operators familiar with the equipment.

The kinds, sizes, capacities, and other requirements set forth shall be understood to be minimum requirements. The number of pieces of equipment to be furnished and used shall be, as the Engineer considers necessary for economical and expeditious performance of the work. The equipment shall be used only at such times and places as the Engineer may direct.

Equipment shall be in first class working condition and capable of full output and production. The minimum ratings of various types of equipment shall be as manufactured and based on manufacturer's specifications. Alterations will not be considered acceptable in achieving the minimum rating. Equipment shall be replaced at any time when, in the opinion of the Engineer, their condition is below that normal for efficient output and production.

Equipment shall be fully operated, which shall be understood to include the operators, oilers, tenders, fuel, oil, air hose, lubrication, repairs, maintenance, insurance, and incidental items and expenses.

647-2.02 EQUIPMENT OPERATORS AND SUPERVISION PERSONNEL. Equipment operators shall be competent and experienced and shall be capable of operating the equipment to its capacity. Personnel furnished by the Contractor shall be, and shall remain during the work hereunder, employees solely of the Contractor.

The Contractor shall furnish, without direct compensation, a job superintendent or Contractor's representative together with such other personnel as are needed for Union, State, or Federal requirements and in servicing, maintaining, repairing and caring for the equipment, tools, supplies, and materials provided by the Contractor and involved in the performance of the work. Also, the Contractor shall furnish, without direct compensation, such transportation as may be appropriate for the personnel.

647-3.01 CONSTRUCTION REQUIREMENTS. The performance of the work shall be according to the instructions of the Engineer, and with recognized standards and efficient methods.

The Contractor shall furnish equipment, tools, labor, and materials in the kinds, number, and at times directed by the Engineer and shall begin, continue, and stop any of the several operations involved in the work only as directed by the Engineer.

Normally, the work is to be done when weather conditions are reasonably favorable, 6 days per week, Mondays through Saturdays, except holidays.

The Engineer will begin recording time for payment each shift when the equipment begins work on the project. The serial number and brief description of each item of equipment listing in the bid schedule and the number of hours, or fractions thereof to the nearest one quarter hour, during which equipment is actively engaged in construction of the project shall be recorded by the Engineer. Each day's activity will be recorded on a separate sheet or sheets, which shall be verified and signed by the Contractor's representative at the end of each shift, and a copy will be provided to the Contractor's representative.

647-4.01 METHOD OF MEASUREMENT. Section 109.

Hourly Rental Rate: Includes the equipment rate plus the operating costs including: furnishing, travel time, operating, maintaining/servicing and repairing the equipment along with the costs incidental to the equipment and its' operation.

647-5.01 BASIS OF PAYMENT. Payment is for the time that fully operational equipment is engaged in the performance of the work directed by the Engineer. Time not paid for includes: idle periods, maintaining/servicing and repairing the equipment, making change-overs of equipment parts, and time to travel to and from the project. Payment will only be for time supported by certified payroll.

Furnishing and operating equipment that is heavier, has larger capacity, or greater power than specified will not entitle the Contractor to extra compensation.

PAY ITEM

Item Number	Item Description	Unit
647.2002.0000	Backhoe, 4WD, 1 CY Bucket, 75-HP Minimum, 15 ft Depth	CS

C647-16.1103-2

Replace Section 651 with the following:

SECTION 651
CONTROL OF WORK – SUPPLEMENTAL REQUIREMENTS

651-1.01 DESCRIPTION. Supplemental requirements for Section 105, Control of Work.

651-1.02 RELATED SECTIONS. Section 105, Control of Work

651-1.03 UTILITIES. Request locates from the utilities having facilities in the area. Use the Alaska Digline, Inc. "Locate Call Center" for the following utilities.

ALASKA DIGLINE, INC.

Locate Call Centers:	
Anchorage	278-3121
Statewide	(800) 478-3121

Call Centers will notify the following:
- Alaska Communications Systems (ACS)
- GCI Communication Corp.
- Homer Electric Association (HEA)
- Marathon Pipe Line LLC. (MARATHN)
- State of AK, DOT/PF Anchorage Street Lights (DOT)

State Facility Utilities: before beginning work, contact the Central Region Maintenance & Operations Office at (907) 269-0760 to obtain the District Superintendent's phone number where the project is located, and request locates.

Call the following utilities and agencies directly:

1. xxxxxx

Utility Work by Others.

Utility work by others will occur concurrently with construction of this project. The Contractor shall give the Utility, through the Engineer, 15 calendar days advance written notice regarding the dates when the utility owner is required to begin and end operations.

Utility work is not anticipated for this project, however; if utility work is added to the project the Contractor shall give the Utility, through the Engineer, 15 calendar days advance written notice regarding the dates when the utility owner is required to begin and end operations.

For utility work by others, the Contractor shall:

1. include utility work on the Construction Phasing Plan and Progress Schedule;

2. 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;

3. provide clearing and grubbing. Payment will be made under Section 201, Clearing and Grubbing;

4. provide traffic control and flagging. Payment will be made under Section 643, Traffic Maintenance;

5 provide Right-of-Way and/or Construction Surveying before utility relocation. Include:
   - Control for utility relocation - either ROW or Centerline staking with Station information.
   - Slope staking.
   - Proposed structures, not including utilities to be relocated by others.

   Payment will be made as follows:

   a. Subsidiary to Pay Item 642.0001.___ Construction Surveying, if the Contractor is required to provide the surveying as part of the Contract and/or,

   b. Under Pay Item 642.0003.___ Three Person Survey Party, if the Construction or Right of Way staking required by the utility is either in advance of the 2 week work plan, or not required by the Contract.

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

6. remove and replace pavement. Payment will be made under Section 202, Removal of Structures and Obstructions; Section 401, Hot Mix Asphalt and Surface Treatments; Section 408, Hot Mix Asphalt and Surface Treatments, Type V, and according to project typical section.

7. remove and replace sidewalk and curb and gutter. Payment will be made under Section 202, Removal of Structures and Obstructions, Section 608, Sidewalks, and Section 609, Curbing.

8. provide bedding and backfill material, and excavation, according to Section 204, Structure Excavation for Conduits and Minor Structures, and the project typical sections.

9. coordinate with the utility owner(s) and provide potholing services at the locations identified or as directed by the Engineer. Payment will be made under Section 682, Utility Potholing.

Work done by utility owner(s) is as follows:

Replace Section 652 with the following:

SECTION 652
PROSECUTION AND PROGRESS – SUPPLEMENTAL REQUIREMENTS

652-1.01 DESCRIPTION. Supplemental requirements for Section 108. Prosecution and Progress.

652-1.02 RELATED SECTIONS. Section 108, Prosecution and Progress.

652-1.03 PROSECUTION AND PROGRESS. In Subsection 108-1.03:

- Replace the last sentence in the 1st paragraph with: "Submit the following at the Preconstruction Conference:"

- Replace No. 1 with: "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, subcontractors, and utilities will start and finish each of the salient features of the work, including scheduled periods of shutdown. Indicate anticipated hours of operations and periods of multiple shift work. Revise the proposed schedule promptly. Promptly submit a revised CPM Schedule if there are substantial changes to the schedule, or upon request of the Engineer."

652-1.04 LIMITATION OF OPERATIONS. In Subsection 108-1.04:

- Add: "Limit ground disturbed by construction activities and not permanently stabilized between all roadways combined, at any specific time, to a maximum of 11,000 feet parallel to the roadway(s), unless additional length is approved. Stabilize disturbed ground according to Section 641 Erosion, Sediment, and Pollution Control."

Replace Section 660 with the following:

SECTION 660
SIGNALS AND LIGHTING

660-1.01 DESCRIPTION. Furnish and install, modify, remove, or salvage one or more traffic signal systems, flashing beacon systems, highway lighting systems, sign illumination systems, traffic count systems, electrical equipment on structures, falsework lighting, partial installations for future systems, or combinations thereof, as specified.
Where an existing system is to be modified, reuse the existing material in the revised system as shown on the Plans or specified in the Special Provisions, and salvage or dispose of all other materials.
When required by the Special Provisions, provide an on-site manufacturer's representative to:

1. Energize and adjust the electrical system.
2. Provide acceptable instruction for the operation and maintenance of the electrical system.

660-1.02 DEFINITIONS.

Use the definitions in NEMA TS 2-2003 V02.06, *Traffic Controller Assemblies with NTCIP Requirements*, Section 1, Definitions, along with the following:

1. Electrolier. The complete assembly of pole, mast arm, luminaire, ballast or driver, and light source.
2. Luminaire. The assembly which houses the light source and controls the light emitted from the light source. Luminaires consist of hood (including socket, lamp, and ballast or driver), reflector, and glass globe or refractor.
3. Lighting Standard. The pole and mast arm which supports the luminaire.
4. Vehicle. Any motor vehicle licensed for highway use by the State of Alaska.

660-2.01 MATERIALS. Use materials that conform to Section 740, the Materials Certification List, the Plans, Specifications, and the following:

Concrete	Section 501 (Class A)
Grout	Subsection 701-2.03
Reinforcing Steel	Section 503
Paint	Subsection 708-2.01
Steel Pipe Pile	Section 715
Anchor Plate	ASTM A709
Galvanizing	Subsection 716-2.07
Anchor Bolts	Section 740-2.02
Precast Concrete Products	Subsection 550-2.03

1. Equipment List(s) and Drawings. Within 30 days after the Contract award, submit an electronic portfolio of equipment and materials proposed for installation to the

Department for review and approval. Include a table of contents in the portfolio(s) that includes each item's intended use(s) and the following:

a. Materials on the *Qualified Products List*: The Qualified Products List does not apply to the 660 items. Provide catalog cuts of materials to the Engineer for review and approval.

b. Materials Not on the *Qualified Products List*: Catalog cuts that include the manufacturer's name, type of product, size, model number, conformance specifications, and other data as may be required, including manufacturer's maintenance and operations manuals, or sample articles.

c. Pole Package. A complete set of design, fabrication, and installation proposals for each signal and lighting pole. Include stamped engineering calculations, mill certifications, shop drawings, welding plans, equipment lists, and pole installation plans.

d. Materials Not Requiring Certification: Only submit those materials for review and approval if they are included on the Materials Certification List (MCL).

2. As-Built Plans. Prepare 3 complete sets of red lined as-built plans and keep them current with the construction. Detail in the as-built plans all construction changes made to the Plans. Include the following information on the appropriate sheets:
   a. Location and depth of conduit runs,

   b. Station and offset of all junction boxes,

   c. Heights of signal faces and overhead signs, and

   d. A list of equipment, including manufacturer, brand, and model number installed in each controller cabinet.

   Furnish copies of the as-built plans at least twice a month during construction so that they may be reviewed for accuracy and completeness. Furnish any additional information required to clarify the as-built plans and correct all discrepancies. The Department will not make progress payments for the signal and illumination work completed until reviewing accurate as-built plans reflecting the construction progress. Correct any deficiencies before payment.
   Before final inspection of the work, submit 3 complete sets of as-built plans to the Engineer. You may substitute 2 colored copies of the as-built plans in lieu of keeping the 3 separate original copies. If you elect to do this, a sample of the method of copying must be approved before starting any work on the signal and lighting items.

   Place 1 copy of the controller cabinet diagram, detector assignment sheet and the intersection and phase diagram as reviewed by the Engineer inside of each controller cabinet.

   Place 1 copy of the controller cabinet diagram, detector assignment sheet and the intersection and phase diagram as reviewed by the Engineer in clear plastic envelopes and attach to the inside of each controller cabinet. In addition, submit two complete

sets of all electrical related plan sheets. The engineer will deliver one copy of each to MOA Signal Electronics and MOA Street Light Maintenance.

3. Warranties, Guarantees, and Instruction Sheets. Deliver to the Engineer all manufacturers' warranties, guaranties, instruction sheets, and parts furnished with materials used in the work before the Department assumes maintenance responsibilities.

CONSTRUCTION REQUIREMENTS

660-3.01 GENERAL.

1. Scheduling of Work. Complete each new traffic signal system, highway lighting system, and sign illumination system and ensure it is ready for operation before opening to traffic the corresponding section of new alignment. Contact the regional DOT&PF Traffic Signal Technician 24 hours in advance of work on a signal or lighting system. Contact shall be made through the Engineer.

   Contact the MOA Signal Electronics Shop and MOA Street Light Maintenance 48 hours in advance of work on a signal and/or lighting systems. During final inspection, contractor shall provide traffic control for MOA signals to perform inspection of signal equipment as many times as necessary until inspections are passed. Contact and scheduling shall be made through the Engineer.

   After staking pole foundations, verify there will be no overhead or underground utility conflicts with foundations, poles, mast arms, or conduits. Locate and protect existing underground and overhead utilities. The location of cables, conduits, junction boxes, foundations and poles that are shown on the Plan sheets are approximate and it is the Contractor's responsibility to verify the actual location when working in the area. See Subsection 105-1.06.

   Existing signing and traffic markings shall not be allowed to conflict with new signal modifications. New signing and traffic marking modifications shall not conflict with existing signals and shall be kept current with signal modifications.

   Conduct work with the existing traffic signal systems remaining in operation unless authorized otherwise by the Engineer.

   Incidental materials and other items that are not shown on the Plans, assembly drawings, or specified herein, that are necessary to complete the system, must be furnished and installed as though such materials and other items were shown on the Plans, assembly drawings, or specified herein.

   Protect metallic materials against corrosion. Hot-dip galvanize ferrous metals such as bolts, braces, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts not of corrosion resistant steel, according to ASTM A 123 or A 153, except where other equivalent protection treatment is specifically approved in writing by the Engineer.

   Asphalt patches placed in existing asphalt for loops and conduit crossings must be

placed prior to the end of shift in which the loops and crossings are placed. Asphalt patches will match the thickness of the existing asphalt to a maximum of 3 inches thick. Where the existing asphalt is thicker than 3 inches, use compacted crushed aggregate base course to make up the difference.

Do not place traffic signal systems in operation until the street lighting is energized at controlled intersections.

Install detector loops and underground conduit before applying new pavement.

Do not pull conductors or cables into conduit until the junction boxes are set to grade, crushed rock sumps are installed, grout is placed around the conduit, and metallic conduit is bonded.

In vehicular undercrossings, place soffit lights in operation as soon as practicable after removing falsework from the structure. Place lighting for pedestrian structures in operation before opening the structure to pedestrian traffic.

2. Safety Precautions. Before starting work on existing street lighting circuits, de-energize the system by opening disconnect switches, and/or opening bypass switch plugs, and tagging each opened device as detailed in Part 4, Section 44, Article 440 of NESC. Where said circuits are under the control of an electric utility, obtain written assurance daily from the utility that the circuit being worked on has been de-energized.

   Prior to beginning work, perform lockout/tagout procedures and establish an electrically-safe work condition per NFPA 70E Article 120.Post suitable signs at load centers when any of the circuits from that load center are being worked on.

   Existing circuits listed on the wiring diagrams and Plan sheets were obtained from as-built information and must be verified before work involving those circuits.

3. Excavating and Backfilling. Complete excavation and backfill required to install the signal and lighting components embedded in the roadway as shown in the Plans, including foundations, conduits, junction boxes, and loop detectors before final lift paving. Provide traffic control to complete this work according to the requirements of Section 643. Place excavated materials where it will not interfere with surface drainage.

   Support and protect conduits and utilities scheduled to remain in service when encountering them during excavation.

   Excavate trenches wide enough to install the number of conduits specified and to compact the bedding and backfill materials according to these specifications.

   To install conduits, excavate trenches deep enough to allow for 6 inches of bedding material, the depth of the largest conduit, and the minimum burial depth specified between the top of the conduit and finished grade of the ground above the conduit. Keep the longitudinal profile of trench bottoms free of irregularities that would prevent

the assembled conduit run from continuously contacting the top of the bedding material.

When conditions allow HDPE conduit to be installed by a plowed technique, restoring the area disturbed from the process shall be accomplished according to Subsection 204-3.01. Density testing may be waived and compactive effort substituted at the discretion of the Engineer. This work is subsidiary to conduit installation. Use Selected Material, Type A for backfill.

Dispose of, according to Subsection 203-3.01, excavated materials that remain after completing backfill work and excavated material not meeting the requirements of Selected Material, Type C, as defined in Subsection 703-2.07. Disposal of this material is subsidiary to the 660 Pay Items.

Dewater foundation and conduit excavations immediately before and during embedding and backfilling operations. Backfill excavations with materials that meet the following requirements:

a. Backfill foundations with material that meets the requirements of Selected Material, Type A that passes through a 3 inch sieve.
b. Within the limits of the typical section, embed conduits and backfill trenches using material that meets the requirements of the lift where it is located, reusing excavated materials if it meets the requirements of the applicable lift.
c. In other locations, embed conduits and backfill trenches using material that meets the requirements of Selected Material, Type C, reusing excavated materials if it meets this requirement.
d. Import, when ordered, embedment and backfill materials that satisfy the preceding materials requirements.
   Embed conduit(s) between two 6 inch lifts of material cleaned free of rocks exceeding a 1 inch maximum dimension. Grade and compact the first lift to provide a surface that continuously contacts the assembled conduit run.

   Within 6 feet of paved surfaces and around foundations, backfill in uniform layers no more than 6 inches deep and compact each layer according to Subsection 203-3.04. In other locations, compaction may be as approved by the Engineer.

4. Welding. Complete welding according to Subsection 504-3.01.7. Welding and approved shop drawings.

   Submit shop drawings of the proposed work with the welding plans for approval. The shop drawings shall include material specifications, component dimensions, the types of welds that will be made, and the proposed type and extent of weld inspection.

   Repair the holes that were used to mount equipment, in reused poles and mast arms by welding in disks flush with the adjoining surface. For the disk material, use steel that matches the ASTM designation, grade, and thickness of the steel used to fabricate each pole. Cut disks that match the dimensions of the hole being repaired from pieces of steel plate bent to match the pole's radius at the hole. Grind the welds smooth and flush with the adjoining pole and disk surfaces. Repair the damaged finish

according to Subsection 660-3.01.8.

5. Removing and Replacing Improvements. The Contractor shall complete the following work at the Contractor's expense.

   a. Remove improvements that block completion of the work detailed in the Plans as specified herein.

   b. Reconstruct with new materials the non-reusable improvements the Contractor removed to complete the work.

   c. Replace with new materials the reusable items damaged by the Contractor, that are specified for reuse.

   d. Reconstruct with new materials improvements damaged or removed by the Contractor not conflicting with the work and not scheduled for removal.

   Nonreusable improvements consist of cast in place items, including asphalt concrete pavement, sidewalks, curb and gutter, lawns, and traffic markings. Reusable improvements include the items that were made before installation. Crushed aggregate base material may not be used as backfill in the base course if excavation depth exceeds the thickness of the base course.

   Complete reconstruction work, including materials, according to the applicable sections of the Alaska SSHC, and leave the work in a satisfactory and serviceable condition. In completing the reconstruction work, match the alignments, widths, thicknesses, shapes, sizes, cross sections, and finishes of the existing improvements.

   If removing a portion of sidewalk or curb and gutter, remove an entire segment between the weakened plane contraction joints or between an expansion joint and a weakened plane contraction joint.

   Before removing a segment of Portland or asphalt cement concrete material, cut completely through the material with a saw along the outline of the area to be removed. Make cuts neat and true and prevent shatter outside the area removed.

   To replace lawns, leave the top of the backfilled excavation low enough to install 4 inches of compacted topsoil. Match the top of the topsoil with the bottom of the vegetative mat. Apply seed and keep the seeded areas watered according to Section 618.

   Remove, keep alive, and replant trees, shrubs, and plants according to Section 621. Replace the trees, shrubs, and plants that do not survive with plants of like size and type.

6. Salvaging and Reusing Electrical Equipment. When the Plans include existing electrical equipment scheduled for removal or relocation, remove, and store the equipment listed in the following paragraph without damaging it. Deliver removed

equipment not scheduled for reuse to the local District Maintenance Station or place specified in the Plans or Special Provisions. Notify the district superintendent or person specified by telephone one week before planned delivery date.

Salvage the controller assemblies, signal heads, mounting brackets, luminaires, lighting standards, signal posts and poles, mast arms, optical detectors, load centers, light emitting diode optical units, and the lids of junction boxes scheduled for removal and other materials scheduled for relocation. The Contractor shall replace at the Contractor's expense salvaged equipment damaged or destroyed before or during delivery or reinstallation.

Controller assemblies and load centers include the cabinet and equipment contained in the cabinet before Contract award.

Remove from the highway right-of-way materials associated with the equipment removed or relocated and not scheduled for reuse, including conduits, junction boxes, conductors, and foundations. Raze the tops of foundations abandoned in place according to Subsection 660-3.02. Fill the holes left by removing junction boxes and foundations with Selected Material, Type A and compact as directed.

With approval, after removing conductors, buried conduits that do not interfere with other construction may be abandoned in place. The Department may require a credit for this waiver. Remove the ends of abandoned conduits from the junction boxes that will remain in service.

Within 15 days of the Notice to Proceed, complete an inventory of the materials that will be salvaged in the presence of the Engineer. Note the location and condition of the materials. When material specified for reuse is found in an unserviceable condition, the Engineer will determine whether to repair it or replace it with new material that will be paid for as extra work under Subsection 109-1.05. Retain a copy of the inventory and give the original documents to the Engineer.

When the Plans specify reinstalling existing equipment at new locations and installing State furnished equipment, complete the following work at the Contractor's expense.

a. For poles, install new foundations, furnishing the new nuts, bolts, washers, and conduits needed to complete the installations.

b. For lighting poles, install new illumination tap wires and fused disconnect kits.

c. For luminaires, clean the luminaires inside and out and install new lamps of the same wattage.

d. For signal heads, furnish and install the mounting brackets needed to complete the relocation, and clean the signal heads inside and out.

e. For poles and undisturbed poles from which the Plans specify removing equipment, repair the holes that were made to mount equipment according to

Subsection 660-3.01.4 Welding and repair the finishes according to Subsection 660-3.01.8 Repairing Damaged Finishes.

Repair holes left in the shafts of existing metal poles, due to removal of equipment or mast arms, by welding in a suitable disk, grinding smooth, and painting as provided for repair of damaged coatings in AASHTO M 36 or using a knockout seal.

When ordered, the Engineer will pay for repairing existing damaged finishes on existing equipment according to Subsection 660-3.01.8 as extra work.

If deciding to use new equipment rather than reusing the equipment specified, notify the Engineer of the change and include a submittal according to Subsection 660-2.01.1.

Deliver the salvaged materials undamaged to the local DOT & PF Maintenance and Operations Yard.

Contact the local state Electrician one week before planned delivery.

7. Field Tests. Electrical circuits must pass the following tests before the Engineer will accept the work for payment. Perform these tests in the presence of the Engineer and document the results of each test on a per circuit basis. Retain a copy of test results and give the original documents to the Engineer. Furnish equipment needed to perform these tests.

   Replace or repair at the Contractor's expense, and in an approved manner, faulty materials and work revealed by these tests. After making repairs, repeat tests on the repaired circuit and continue this process until circuits have passed required tests. The Department reserves the right to have the Contractor retest circuits, and to use the retest results to accept or reject individual circuits.

   a. Grounds. Before completing the circuitry and functional tests, physically examine conduits ends, junction box lids, load centers, and the foundations for signal posts and poles, lighting poles, and controller cabinets to ensure the grounding system required by Subsections 660-3.06 and 661-3.01 has been installed and splices and connections are mechanically firm.

   b. Continuity. When loop detector work is included, test each loop detector circuit for continuity at the roadside junction box before splicing the loop detector to the lead-in cable. Each loop detector must have a resistance less than 0.5 ohms.

      After splicing the loop detectors to the lead-in cables, test each pair at the controller or detector cabinet. Each pair must have a value less than 5 ohms for single pair lead-in cables and 10 ohms for multipair lead-in cables. The continuity test ohm reading at the cabinet must be greater than the ohm reading measured for the loop detector at the junction box.

c. Insulation Resistance (megohm) Test. Complete this test to verify the integrity of each conductor's insulation after pulling the conductors and cables into position and before terminating the conductors. At 500 VDC, each conductor's insulation shall measure a minimum resistance of 100 megohms or the minimum specified by the manufacturer. With single conductors, complete the test between each conductor and ground. In each multiconductor cable, complete the test between conductors and between each conductor and ground.

When loop detector work is included, after splicing the loops to the shielded pairs in the lead-in cables, measure each pair in the lead-in cables at the controller or detector cabinet between one conductor and the cabinet ground rod.

d. Inductance Test. When loop detector work is included, measure each detector loop and lead-in cable system at the controller or detector cabinet. The inductance must be in the range of 50 to 500 microhenries.

e. Circuit. Energize every signal indication circuit with lamps installed before installing the load switches.

f. Functional. Perform the following tests on each signal and lighting system after the component circuits have satisfactorily passed the tests for continuity, grounding, insulation integrity, and circuitry.

(1) For each new traffic signal system, complete at least 24 hours of flashing operation, followed by not less than 5 days of continuous, satisfactory operation. The Engineer may decide to omit the flashing portion of the test for modified signal systems and for new signals that replaced existing signals that remained in operation during the construction phase.

If the Engineer omits flashing operation and the system performs unsatisfactorily, correct the condition and repeat the test until the system runs for five days with continuous, satisfactory operation.

Begin the signal functional tests between 9:00 a.m. and 2:00 p.m. on any day, except a Saturday, Sunday, a legal holiday, or the day before the legal holiday.

Before each system activation, aim signal faces according to Subsection 660-3.08 and ensure equipment specified in the Plans is installed and operable, including: pedestrian signals and push buttons; signal backplates and visors; vehicle detectors; highway lighting; and regulatory, warning, and guide signs.

(2) Perform the functional test for each highway lighting system and sign illumination system until the systems burn continuously 5 days without the photocell, followed by a 5 day operational test using the photocell.

(3) Perform the functional test for each flashing beacon system for not less than 5 days of continuous, satisfactory operation.

(4) Perform a continuous 5 day burning test on each pedestrian overpass and underpass lighting system before final acceptance.

A shut down of the electrical system due to a power interruption does not

constitute discontinuity of the functional test if the system functions normally when power is returned.

8. Repairing Damaged Finishes. Examine new, reused, and State furnished equipment for damage to its finish before putting the equipment into service. Repair the damaged finishes found according to the following:

   a. Galvanized. Repair damaged areas more than 12 inches away from welds and slip fit areas, by applying minimum 7.8 mils of zinc-based alloy applied according to ASTM A780.

      If the damaged areas are within 12 inches of welds and slip fit areas, make the repair by applying a minimum 7.8 mils of zinc rich paint applied according to ASTM A780.

   b. Painted. Repair damage to painted finishes according to the following:
      (1) Wash the equipment with a stiff bristle brush using a solution containing two tablespoons of heavy-duty detergent powder per gallon of water. After rinsing, wire brush surfaces to remove poorly bonded paint, rust, scale, corrosion, grease, or dirt. Remove dust or residue remaining after wire brushing before priming.
      (2) Factory or shop cleaning methods may be used for metals if equal to the methods specified herein.
      (3) Immediately after cleaning, coat bare metal with pretreatment, vinyl wash primer, followed by 2 prime coats of zinc chromate primer for metal.
      (4) Give signal equipment, excluding standards, a spot finishing coat on newly primed areas, followed by 1 finishing coat over the entire surface.
      (5) Give nongalvanized standards 2 spot finish coats on newly primed areas.

      Paint coats may be applied either by hand brushing or by approved spraying machines. Perform the work in a neat and workmanlike manner. The Engineer reserves the right to require the use of brushes for the application of paint, should the work done by the paint spraying machine prove unacceptable.

9. Regulation and Code. Complete work according to the standards of the NEC, the NESC, and local safety codes as adopted and amended by the Authority Having Jurisdiction.

10. Failed Equipment and Workmanship. For the term of the Contract, from initial equipment installation through final acceptance, Subsection 105-1.16, when directed, promptly replace failed equipment, equipment components and repair failed workmanship.

660-3.02 FOUNDATIONS. Use foundation type shown in Plans.

1. Cast-in-Place Foundations. Cast-in-place foundations for posts and poles in drilled holes. Use either precast or cast-in-place foundations for cabinets. Locate the tops of traffic signal post and pole foundations flush with the adjacent finished walkway, shoulder, or surrounding ground.

a. Form the entire controller foundation and the top 12 inches of pole or post foundations and give the top a smooth steel trowel finish.

b. Place conduits in the center of the pole-post foundations with clearance allowed for bushings. If subsurface conditions prevent completing a drilled hole, and when approved, use a corrugated metal pipe (CMP) form as a substitute for the drilled hole. Consider the savings in concrete to offset the cost of supplying and installing the CMP form. No additional payment will be made for the CMP formed foundation.

c. When a CMP is used, over-excavate the area around the form enough to allow for proper compaction around the form. Backfill and compact according to Section 205, and Subsections 203-3.04 and 660-3.01. Do not use water for drilling operations or for any other purpose where it may enter the hole.

d. Use controller cabinet anchor bolts as recommended by cabinet manufacturer and set with a template.

e. Place Class A concrete meeting Section 501. Place reinforcing steel meeting Section 503. If required, use corrugated steel pipe that is at least 14 gauge, meeting Subsection 707-2.01.

f. Drill holes or use forms that are vertical and true to the locations shown in the Plans. Before placing the form or reinforcing steel cage, remove loose material to ensure the foundation rests on firm, undisturbed ground.

g. If a reinforcing steel cage is required, place and secure it symmetrically about the vertical axis and securely block it to clear the sides of the foundation. Use a template to securely support all anchor bolt assemblies and conduit ends so they do not move during concrete placement.

h. Do not permit surface water to enter the hole. Before placing concrete, remove all water that may have infiltrated in the hole. Thoroughly moisten both the forms and the ground before placing concrete. Pour each foundation in one continuous pour.

i. Do not erect or place posts, poles, and pedestals on the foundation until 7 days after placing the concrete. Plumb the assembly by adjusting the nuts on the anchor bolts before attaching the skirt.

j. Replace, with no additional compensation, all finished foundations with anchor bolts that do not match the base plate of the pole or are out of plumb. Do not modify the anchor bolts or base plate to get the base plate set on the leveling nuts. Protect foundation anchor rods from damage before installing controller cabinets. The Engineer must approve the method used for protection. This work does not relieve the Contractor of responsibility specified under Subsection 107-1.15.

k. Furnish anchor rods that conform to ASTM F1554, the grade and supplementary Charpy V-Notch requirements listed in the Plans. Furnish each anchor bolt with three nuts and two washers.

Install the bottoms of the bottom leveling nuts in a level plane within 1 inch of the top of foundations. Adjust nuts until their tops form a level plane. Install one washer on top of leveling nuts and, after setting the pole on these washers, install one washer under top nuts.

Bring leveling nuts (bottom nuts) to full bearing on the bottom of the base plate.

Generously lubricate the bearing surface and internal threads of top nuts with beeswax. Tighten top nuts to a "snug" condition. Use a click type torque wrench to apply 600 foot-pounds of torque to the "snug" top nuts.

l. Attach a bare, copper wire as a grounding electrode conductor to the spiral bar in the reinforcing steel cage. Use an irreversible compression type connector to make the attachment. Protect the attachment during concrete placement. In foundations that lack reinforcing steel cages, install 21 feet of coiled #4 AWG, bare, copper wire as the grounding electrode. Route the conductor to protrude near the top, center of the foundations. Slide a minimum 6 inch long, Schedule 80 polyvinyl chloride (PVC) or high-density polyethylene (HDPE), protective sleeve over the conductor. Allow 1 inch of the sleeve and 24 inches of conductor to protrude from the foundations.

2. Pile Foundations.

a. Install pipe piles according to Section 505.

b. Install pipe piles open-ended and to a minimum depth of 15 feet (less top projection).

c. Use CJP groove welds for all circumferential welds.

d. Inspect 100% of CJP welds using UT or RT.

e. Backfill and compact the work hole around upper portion of each pile in 8-inch lifts with a soil-cement mixture.

f. Certify steel pipe piles by matching the stencils on the pipe piles (by 300 foot lots) to the physical and chemical tests for the applicable lot.

g. Use no more than one splice per foundation. Locate the splice at least 10 feet from the top of the pile.

3. All Foundations.

a. Install frangible couplings according to the manufacturers written installation instructions. Use shims furnished by the coupling manufacturer.

b. Provide new foundations and anchor bolts of the proper type and size for standards that are to be relocated. Install the anchor bolts on a bolt circle that matches the base plate.

c. Install a raised Type III junction box on the door side of the controller cabinet and butt it against the cabinet's foundation unless installing a one-piece cabinet/junction box foundation. Extend the top of the controller cabinet foundation 18 inches above the junction box and provide it with a 1-inch diameter drain. The drain connected to the cabinet interior must empty to the rear and above the ground. Place all conduits in the door side half of the foundation to provide adequate terminal block clearance.

d. Existing foundations may be abandoned-in-place unless otherwise stated in the Plans. However, remove the tops of the foundations, reinforcing steel, anchor bolts, and conduits to at least 12 inches below the roadway subgrade, sidewalk, or unimproved ground. Backfill the resulting hole with Selected Material, Type A and compact material as directed by the Engineer.

660-3.03 CONDUIT. Electrical conductors shall be installed in conduit, except for overhead wiring, wiring inside poles, and when otherwise specified. Use rigid metal conduits (RMC) and fittings for raceways, including bored casings, except when the Plans specify using polyethylene conduits. Install conduits of the sizes specified along the routes detailed on the Plans. When routing is not shown, route conduits as directed by the Engineer.

1. Install conduits at least 30 inches below the finished grade of the ground above the conduit, except conduits that will be sealed under a minimum 4 inch thick Portland cement concrete sidewalk may be installed a minimum of 18 inches below the top back of curb or surface above the conduit, whichever is lower.

2. Install conduits that cross unpaved areas and paved roadways that will be overlaid in excavated trenches. Excavate, bed conduits, and backfill trenches according to Subsection 660-3.01.3, Excavating and Backfilling.

3. Install conduit(s) under paved roadways and approaches that will not be overlaid by boring or drilling methods. Jacking conduits into position is allowed. However, if subsurface conditions prevent the successful completion of the work, install the conduit(s) by boring or drilling methods without additional compensation.

4. If encountering obstructions during jacking or drilling operations obtain approval and cut small holes in the pavement to clear the obstruction. Locate the bottom inside face of the bore pit no closer than the catch point of a 11/4 to 1 slope (a horizontal to vertical ratio) from the edge of pavement. Do not leave these pits unattended until installing an approved means of protection.

5. Sweep both rigid metal and polyethylene conduits through the open bottom of junction boxes by installing 90 degree rigid metal elbows on the ends of conduit runs. To each elbow, install a nipple that terminates 5 to 12 inches above the bottom edge of each junction box. At junction boxes where polyethylene conduits runs are to enter the junction box, install a 5 foot section of RMC on the horizontal end of the RMC sweeps.

6. When loop detector work is included, install the tails of loop detectors without elbows through the walls of junction boxes at elevations that ensure the loops drain into the box. Extend the ends a minimum of 2 inches beyond the inside wall of the box.

7. Drill a 3/8 inch drain hole in the bottom of the lower straight section of elbows and in the bottom of conduits at the low points of conduit runs. Smooth the edges of the drilled holes on the inside of elbows to prevent scraping the conductors. Cover the holes with a wrap of approved filter cloth secured with 2 self-clinching nylon cable ties.

8. Keep conduits clean. Install grounding bushings and approved plastic insert type plugs on the ends of conduit runs before backfilling around the conduit ends. Tapered or universal fit plugs are acceptable for temporary usage. Any permanent plug or cap shall be an approved watertight cap.

9. At the low points of conduit runs, install sumps containing a minimum 2 cubic feet of coarse concrete aggregate material that conforms to Subsection 703-2.02. Compact the aggregate sumps as directed to prevent settlement of the trench backfill.

10. Install conduits that must cross existing facilities such as storm drainpipes, duct systems, and other underground utilities at the minimum depths specified, going under the facilities if necessary. Install additional drains and aggregate sumps at the low spots, if any.

11. Position conduits in trenches, junction boxes, and foundations to provide clearances of at least 21/2 inches around 2 inch conduits and at least 2 inches around conduits larger than 2 inches.

12. Fabricate rigid metal conduits less than 10 feet long from standard lengths of conduit. Cut conduits squarely to ensure the threading die starts squarely on the conduit. Cut the same number of threads as found on the factory threaded ends. Ream the inside of conduit ends cut in the shop or field to remove burrs and sharp edges. Do not use slip joints or pieces of running thread pipe.

13. Coat drilled holes, shop and field cut threads, and the areas with damaged zinc coating with zinc rich paint.

14. When standard couplings cannot be used to join conduit components, use approved threaded unions.

15. Bury a continuous strip of 4 mils thick, 6 inch wide polyethylene marker tape above underground conduit runs. Install the tape 9 inches (± 3 inches) below finished grade, using two strips side by side to mark road crossings. Furnish tapes with a black legend on a red background.

16. When the Plans specify using polyethylene conduit, install RMC in structures and foundations, between type 2 and 3 load centers and the nearest junction box, and on the surfaces of poles and other structures.

17. In foundations, install 90 degree elbows and conduits of the size and quantity shown on the Plans. Extend the conduits a maximum of 2 inches above the top of the foundations for posts and poles with breakaway bases and 4 inches above the top of foundations for fixed base structures.

18. Seal conduits leading to electrical equipment mounted on soffits, walls, and other locations below the grade of the serving junction box with an approved duct sealing compound.

19. Install expansion fittings in conduits that cross expansion joints.

20. Install a polypropylene pull rope with a minimum 200 pound tensile strength in future use or spare conduits and reinstall the plugs. Double back pull rope, at least two feet, into both ends of each conduit. Tapered or universal fit plugs are acceptable for temporary usage. Any permanent plug or cap shall be an approved watertight cap.

21. Install a pull tape with a minimum 200 pound tensile strength in all traffic signal conduits entering signal poles, signal junction boxes, and signal controller cabinet foundations. Double back pull tape, at least two feet, into both ends of each conduit.

22. The Contractor may install conduits larger than the sizes specified. If used, it must be for the entire length of the run. Reducing couplings or bushings are not allowed. Complete work associated with installing conduits larger than specified without extra compensation.

23. Clean existing conduits that will remain in service using a heavy-duty air compressor that delivers at least 125 cubic feet of air per minute at a pressure of 110 pounds per square inch. Clean the conduits before pulling in new cables and after removing cables to be removed or replaced as follows:

    a. When the conduits contain cables that will remain in service, leave the cables in place during the cleaning, and

    b. Ream empty conduits with a mandrel or cylindrical wire brush before blowing them out with compressed air.

24. When modifying existing conduit runs, complete the work as required for new installations using the same sizes and types of conduit. When extending existing conduits, add no more than a 90 degree horizontal bend to the extension.

25. When installing a junction box in a continuous run of existing conduit, remove a length of conduit in each conduit run and complete the work of installing the conduits, elbows, and nipples as required for a new installation.

26. When adjusting existing junction boxes to a new grade, remove cables and replace the nipples as required to provide the clearances specified for new installations.

27. Remove the ends of abandoned conduits from junction boxes that will remain in service.

28. When Plans call for connecting polyethylene conduit to RMC use a UL listed DuraLine Shur Lock type coupler or approved equivalent rated for direct bury application. The coupler must be rated for same wall thickness as the adjoining conduits. Thread the ends of the RMC with the same number of threads as found on the factory threaded ends of RMC. Ream the inside of conduit ends cut in the shop or field to remove burrs and sharp edges.

660-3.04 JUNCTION BOXES. Install precast reinforced concrete junction boxes of the types specified. For junction boxes that contain traffic signal conductors, furnish cast iron lids with the word TRAFFIC inscribed into them. For junction boxes that contain lighting conductors exclusively, furnish cast iron lids with the word LIGHTING inscribed into them.

Junction Box Location

When shown, install junction boxes at the station and offset locations specified. When lateral locations are not specified, install junction boxes 8 feet from the face of curb or edge of pavement. If the 8 feet offset falls:

1. In a pedestrian facility separated less than 7 feet from the roadway face of curb or edge of pavement, increase the offset and install the junction boxes on the backside of the facility. When lacking the right of way to install junction boxes outside the pathway, install at locations as directed, avoiding curb ramps, curb ramp landings, and the middle of walkways.

2. In a pedestrian facility separated at least 7 feet from the roadway face of curb or edge of pavement, reduce the offset and install the junction box next to the facility.

3. Outside the right of way, install the boxes just inside the right of way line.

4. In a raised median, install junction boxes near the center of the median.

5. In a ditch bottom or area that collects drainage, install the junction boxes at locations as directed.

6. Behind guardrails that shield slopes steeper than 3:1 (a horizontal to vertical ratio), install junction boxes between posts and at least 5 feet back from the face of rail.

7. On top of underground utilities or storm drains, install the junction boxes at locations as directed.

Longitudinally, install junction boxes adjacent to the loop detectors or pole they serve, except avoid installing Type 1A junction boxes in driveways and in locations subject to use by heavy trucks. When shown near the ends of medians, install junction boxes at least 10 feet from the median end. When the offsets for electroliers and flashing beacon posts place them near the junction boxes that serve them, install the junction boxes on

the side of the electroliers and posts downstream of traffic flow. When installing copper signal interconnect cable use minimum size Type II junction boxes.

Four (4) Limitations

Limit the distance between adjacent junction boxes to the following dimensions:

1. 300 feet for conduits that exclusively contain two loop lead-in cables.
2. 300 feet for conduits that contain a single cable other than signal interconnect.
3. 190 feet for conduits that contain more than one cable.

If the preceding limitations require installing additional junction boxes not shown on the Plans, the Engineer will pay for them as extra work; otherwise, installing additional junction boxes will be at the Contractor's expense.

After grading the roadside, vertically adjust those junction boxes that do not conform to the following criteria. In unpaved areas that will not be seeded, in areas adjacent to pedestrian facilities, and in paved medians, install the tops of junction boxes 1 inch below finished grade. In seeded areas, adjust tops of junction boxes to be flush with final grade.

Bond junction box lids to an equipment grounding conductor according to Subsection 660-3.06. Attach the jumpers to the lids with brass or stainless-steel hardware.

Install a porous backfill material under each junction box. Porous backfill material shall conform to Subsection 703-2.10, Gradation B. Dimensions for porous backfill material include an 18" depth and a length and width equal to those of the junction box it drains. Compact the porous backfill material as directed to prevent junction box settlement.

In every new and reused junction box, install an electronic marker. Conform markers to the American Public Works Association Standards including but not limited to:

1. Color - red
2. Material - high-density polyethylene
3. Shape - round (ball like)
4. Size - 4 to 5 inches in diameter
5. Configuration - encapsulating an antenna tuned to the appropriate frequency for locating power
6. Responsive range - up to 5 feet away from the locator device
7. Environmental conditions - including extremes in temperature at the installation site
8. Contain no internal power source

Acceptable marker manufacturers include:

1. 3M, Dynatel EMS ball marker model no. 1402-XR
2. Tempo (a Textron Company), Omni Marker
3. Substituted, equivalent approved equal device

660-3.05 WIRING. Install power conductors serving the cabinet sized such that their ampacity rating is greater than the cabinet total connected load after applicable diversity factors have been applied. Make wiring neat in cabinets by cabling wires together with self-clinching nylon ties. Terminate all spare conductors on terminal blocks. Attach all

conductors, including spares, to terminal blocks with “spade” type terminal lugs. Furnish additional terminal blocks if enough locations are unavailable in existing terminal blocks. Install signal cabling continuously without splices from the controller cabinet to the termination lugs in the signal housing.

1. Do not pull conductors into conduits until the following conditions are met:

    a. The prescribed clearances around conduit ends are provided,

    b. Crushed rock sumps are installed under junction boxes,

    c. Conduit ends protrude above the bottom of junction boxes within the prescribed range,

    d. New conduits are free of material that became lodged in them during the completion of the work,

    e. Reused conduits are cleaned according to Subsection 660-3.03,

    f. Junction boxes are set to grade, and

    g. Grounding bushings are installed on the ends of metallic conduits.

2. Pull conductors by hand or by approved commercially built cable-pulling equipment that is specially designed for that purpose. Do not pull cable by any other means. Equip the cable pulling device with a force limiting circuit and force gauge.

3. Use wire-pulling lubricant when placing the cables and conductors in conduit. Do not allow the tension of the wire or cable to exceed the manufacturer’s recommend allowable tension for the conductor or cable.

4. When adding new conductors to a conduit with existing conductors, remove all conductors and clean the conduit with a mandrel or brush. Pull both old and new conductors through as a unit. In a new installation, pull all conductors through the conduit as a unit.

5. Leave at least 1 foot of slack in the bottom of each signal or combination signal and lighting pole of each signal conductor or cable. Neatly leave at least 3 feet of slack illumination and signal conductor or cable curled up in the bottom of each junction box or splice location.

6. Separate the neutral for pedestrian push button circuits from the signal light circuit neutral.

7. Run all signal and feeder conductors continuously without splices from a terminal block located in a cabinet, compartment, or signal head, to a similarly located terminal block. When modifying an existing signal system when specifically shown in plans, splice existing conductors (cables) to new conductors (cables) as required to complete the signal system. Make these splices when indicated in the plans.

8. Route highway illumination cable through each lighting pole designated for connection to that cable’s circuit. Do not splice illumination cable between a load center and a

pole or between poles. Join the individual conductors by using non-insulated, overlap type pressure connectors. Insulate with mastic-lined heat shrink tubing or 2 layers of one-half lapped UL listed electrical tape. Do not use wire binding screws, studs, or nuts. Stagger splices to minimize the overall diameter.

9. Install all loops in 1-inch rigid schedule 80 PVC conduit in the roadway and to the nearest junction box. Run loop lead-in cable continuously without splices from the controller cabinet to the curbside detection junction box nearest the loop being spliced to the lead-in cable. Splice the loop(s) to the lead-in cable by soldering at the junction box and encapsulating in a waterproof splice kit.

   Multiple loop configurations must have the individual lead-ins, multiple pair, or single pair brought to the controller cabinet for termination. Make series connection of loop lead-ins in the controller cabinet only. Wind all loops in the same direction with the starting lead marked with an “S.” Connect the black conductor of the pair shown in Table 660-1 to the “S” designated conductor of the loop. Connect multiple loop detectors in the same lane so that the adjacent loops are in alternating directions clockwise (CW), counter clockwise (CCW), etc.
10. When splicing loop detectors to multi-pair loop lead-in cables, complete the work according to the following.

    a. See the Plans for the identifying number assigned to each loop detector and the loops assigned to each loop lead-in cable. Using this information, splice the loop detector tails to the paired conductors found in each lead-in cable, using the color code in Table 660-1.
    b. Remove a short section of cable jacket and only cut the shielded pairs dedicated to loop detectors being spliced. Run these pairs, without splices, to the controller cabinet.
    c. Join loop and lead-in conductors with crimp and self-solder adhesive-lined heat shrink sealed butt splice connectors.

TABLE 660-1
MULTIPLE PAIR LOOP LEAD-IN COLOR CONNECTION SCHEDULE

Loop Detector Number	Colored Pair
The lowest numbered loop detector	Red and Black
The second lowest numbered loop detector	Blue and Black
The third lowest numbered loop detector	White and Black
The fourth lowest numbered loop detector	Green and Black
The fifth lowest numbered loop detector	Brown and Black
The sixth lowest number loop detector	Yellow and Black
Spare pair	Orange and Black

    d. Crimp spade terminals to the ends of the shielded pairs in the controller cabinet.
11. Maintain the electrical isolation between shields and do not allow the drain wires to come in contact at any point other than the ground bus in the cabinet. Tie all drain wires to the ground bus at the controller cabinet.

12. Encapsulate illumination/power cable splices in four-piece molds that are held together with stainless steel hose clamps. Two pieces form a cylinder and two flexible end caps. Seal the ends and allow the conductor entry. Use molds with dimensions suitable for the splice made, encase the cable jackets, and fill with an insulating and sealing epoxy resin. Furnish molds rated for 600 VAC operation, feature fill, and vent funnels for epoxy resin. Fill the splice mold bodies with epoxy resin that is resistant to weather, aromatic and straight chain solvents, and that will not sustain combustion.

    When approved by the Engineer, one splice may be used in the following cases:

    a. An in-line splice may be used when a planned cable run exceeds the length available from the manufacturer on a single spool of cable.

    b. In a run of 1,000 linear feet or more.

    When a cable is spliced, it shall occur within an appropriately sized junction box or in the base of an electrolier designed for said splice.
    Insert a loose woven polyester web that allows a full 1/4 inch of insulating compound to flow between the splice and the inside of the mold. Fill the PVC molds with epoxy resin that cures transparent, is nontoxic, is non-corrosive to copper, and does not support fungi or mold growth.
13. Encapsulate all loop lead-in cable splices in rigid, transparent, PVC or PE approved tubing filled with re-enterable polyurethane electrical insulating and sealing compound. Furnish splice kits rated for 1000 volts AC operation and direct burial. When filling the mold bodies of loop lead-in cable splices, use a compound that provides re-entry capabilities.

14. Permanently identify all cables and single wire conductors by labeling all pole bases and cabinets, at each detector loop tail/lead-in cable and illumination cable splices, and in junction boxes adjacent to lighting and signal poles. When modifying an existing system, label all new and existing lighting cables/conductors with circuit numbers at locations noted above. If the existing circuits are not identified, the Engineer will provide the required circuit numbers.

15. Label the cables used in the signal and illumination systems with the following legends:

    a. Use the legends included in Table 740-2, for the cables listed.

    b. Use the loop number shown on the Plans to label each tail of all loop detectors and the paired loop lead-in conductors in the controller cabinet.

    c. For interconnect cables, use the first letter of the direction the cable follows to the adjacent intersection on each cable. Add a number suffix if more than one cable is routed to the adjacent intersection.

    d. Furnish the two types of identification tags listed below that feature handwritten legends. Write the legends specified neatly and legibly, using a black marking pen recommended by the tag manufacturer. Replace at no expense to the State all

identification tags the Engineer deems illegible.

(1) Type 1 Tag: Use identification cable ties for labeling loop detector tails and the paired conductors included in each loop lead-in cable in the controller cabinet. Furnish identification cable ties made of nylon that feature a nonmagnetic stainless steel locking device embedded in the head and a tag attached "flag style" to the head. Use cable ties consisting of a single strap with a minimum size tag of 3/4 inch by 3/8 inch.

(2) Type 2 Tag: To label all other cables, use cable tags made of nylon reinforced vinyl impervious to the elements and which will not tear. Provide tags with a 4 inch by 1-3/4 inch minimum size that attach flag style at one corner to a single strap. Furnish yellow tags for labeling all signal and interconnect cables and red tags for labeling lighting and feeder cables.

e. Label all cables in the controller cabinet with Type 1 Tags only. All controller cabinet tags shall be within six inches of the termination of the cable.

f. Label all loop detector tails and paired loop conductors with Type 1 Tags only. All other cables shall be labeled with Type 2 Tags outside of the controller cabinet.

16. Terminate the control and power cables as shown in Table 740-2.

17. Telemetry cable termination shall be coordinated with a signal technician. Provide type No. 66B3-50 terminal blocks as required.

18. Wire luminaires using No. 10 AWG illumination tap conductors that run from the fused disconnect kit in the pole base.

    Install a fused splice connector between the line and luminaire ballast tap conductors in the base of every pole equipped with a luminaire.
    Attach the conductors to the connector halves with setscrew type pressure connectors. Provide the plug and socket assembly so that the fuse remains in the load side plug without exposing live metal parts when the connector separates and the coil springs are not included in the current carrying circuit.
    Make the fused connectors readily accessible from the handhole. Install tap conductors to prevent slack when their ends touch the top of the foundation.

19. Retrofit reused poles with new tap wires, fused disconnect kits, and fuses.

20. Whenever conductors cannot be terminated as specified in the Plans in circuit breakers due to size, splice a piece of #8 AWG copper power conductor onto the end of each conductor using an overlap type, irreversible compression connector. Insulate the splice with heat shrink tubing. Complete the splice in the space between the top of the load center foundation and the bottom of the cabinet. Limit the length of the #8 AWG conductors to 5 feet. Note: this splice is acceptable only if the overcurrent protective device protecting the #8 AWG conductors is rated 40A or less.

21. Spare lighting conductors shall be capped in the pole bases and load centers by cutting the wire flush with the end of the insulation and bending the conductor back against itself and securing with three layers of electrical tape to prevent any possibility of making contact with ground or current carrying conductors.

660-3.06 BONDING AND GROUNDING. All installations must comply with the grounding

and bonding requirements of NEC Article 250 and the following requirements: Normally non-current-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, including metallic cable sheaths, metal conduits, non-metallic conduit grounding wire, junction box lids and frames, cabinets, transformer cases, and metal posts and poles, must be electrically connected to earth ground, and must be connected together and to the electrical supply source in a manner that establishes an effective ground-fault current path. Make fixtures mounted on metal poles, including signal components and luminaires, mechanically and electrically secure to the pole. An equipment grounding conductor must be installed between the grounding lug near the base of the pole and the lighting fixture.

Install grounding bushings with insulated throats on the ends of metallic conduits.

Install an insulated or bare stranded copper wire for the equipment grounding conductor in conduits, except those conduits installed for future use. Install size #8 AWG grounding conductors, except in those conduits that contain circuit conductors larger than #8 AWG. In this case, install a wire equal in size to the largest circuit conductor. Attach the grounding conductors to the grounding bushings, leaving 12 inches of slack between each bushing. Connect grounding conductors together using irreversible compression type connectors to form a fully interconnected and continuous grounding system.

Retrofit existing spare conduits that will contain new cables exclusively with new grounding bushings. When the Plans require installation or removal of conductors from existing conduits, retrofit with new equipment grounding conductors sized according to the preceding paragraph.

Bond junction box lids to the equipment grounding conductor using copper braid with a cross sectional area equal to a #8 AWG and eyelet spaced at 6 inch intervals. Connect bonding jumpers to the grounding conductors using irreversible compression type connectors.

Replace missing or damaged conduit and junction box lid bonding jumpers.

Join the equipment grounding conductors from the conduits to the #4 AWG grounding electrode conductor using irreversible compression type connectors at Portland cement concrete foundations. For pile foundations, attach the equipment grounding conductor from the conduit to the pile cap adapter with a listed mechanical grounding connector.

When installing signal poles, signal posts, and lighting standards with frangible coupling bases, run a 5 feet long grounding conductor from the grounding bushing on the conduit to the grounding lug located in the handhole of each pole.

Bond slip base type standards and pedestals by using 2 conductors from the conduit, one attached with a ground rod clamp to an anchor bolt and the other connected to the grounding lug located in the handhole of each pole.

Solidly ground one side of the secondary circuit of a transformer.

Install a 3/4 inch by 10 feet copper clad ground rod inside each controller cabinet foundation and a #6 AWG bare stranded copper wire for the grounding electrode conductor. Furnish one piece bronze clamps with a hex head setscrew that are suitable for direct burial and for use with copper clad ground rods.

When routing a new conduit into an existing junction box or replacing an existing junction box, new and existing conduits shall have the grounding improved to current specifications.

660-3.07 TRAFFIC CONTROLLER ASSEMBLIES. Prepare each solid-state, traffic controller assembly to operate various traffic signal devices as shown on the Plans. The controller must provide right-of-way, clearance, and other indications using duration and sequence as determined by preset programming.

Details of operation for the complete controller assembly must be according to the traffic phases; preferential phase sequence and concurrence; signal indications; signal indication sequence; detection requirements; and other details shown on the Plans or as specified herein.

1. Shop Tests. The Controller Assembly manufacturer shall conduct a pretest of the cabinet and controller assembly. The pretest includes but is not limited to:
   a. Ensure the cabinet is free of paint scratches, dents, sharp edges, and other physical defects.

   b. Ensure cabinet hinges, heater, ventilation system, lighting, and door locking mechanism function properly.

   c. Ensure that there are no short circuits between AC+, AC-, and GND anywhere in the cabinet.

   d. Check that there is no continuity between AC+ and DC+.

   e. Check for continuity between any green wire connection point and GND.

   f. Ensure devices within the cabinet are labeled properly.

The Controller Assembly manufacturer shall conduct a final test of the cabinet and controller assembly. Qualified Cabinet Test Technicians shall conduct the final test. The final test includes but is not limited to ensuring proper operation of flash colors & combination, standard controller phasing, pedestrian pushbutton isolation, MMU, circuit breaker/fuse operation, telemetry operation, loop panel/detector rack operation, EVP operation, and proper police & auxiliary panel operation.

Upon completing the final test, the cabinet shall be run, "burned in," under full loads for a period of not less than 48 hours with a test timing plan in effect which utilizes full cabinet phases and functionality.

In the course of testing, a component found to function incorrectly or exhibit physical damage must be replaced with an equivalent new component before delivery. Should the cabinet fail during burn in, the cause of the failure must be remedied and the test restarted with another 48 hours of burn in. The intent of this specification is to meet or

exceed the requirements of Econolite test procedure MWI-10-28 Rev. C. With prior approval of the Engineer, other equivalent test procedures may be substituted.

Upon completion of the pretest, final test, and burn in, the Controller Assembly manufacturer shall issue a letter of certification stating that the required tests have been completed, note defects found and the remedial action taken. Further, the certification shall state the assembly conforms to the NEMA TS 2-2003 v02.06, Traffic Controller Assemblies with NTCIP Requirements, Section 2 Environmental Requirements. Submit the certification letter and copies of the test results to the Engineer.

The work required in this subsection is subsidiary to the associated traffic signal system under Pay Item 660.0001.____Traffic Signal System Complete.

2. Controller Cabinet Installation.

   a. Where the cabinet is mounted on a concrete pedestal foundation, place a 1-inch drain hole or pipe with screen in the foundation, connecting to the cabinet and emptying above the ground line.

   b. Place a 3/8-inch fillet of silicone caulking between each controller cabinet and the concrete slab foundation to prevent dust and dirt from entering the cabinet.

   c. When called for in the Plans or Special Provisions, add 2 inches of approved foam insulation within the bottom of the cabinet between the control equipment and the concrete base. Design all wiring, terminals, and other items to allow sufficient room for the insulation.

   d. On Precast Controller Foundations. When called for in the Plans or Special Provisions, place a 3/8-inch thick, 2-piece exterior grade plywood board on the bottom of the cabinet and under the foam insulation. Place the plywood within the controller cabinet, and do not extend under it. Make holes to allow for the conduits entering the cabinet. Place a pliable sealant composed of a silicon caulking compound between the plywood board and the cabinet and between the plywood board and all the conduits.

   e. Place a ground rod in the Type III junction box next to the cabinet or in the foundation of the cabinet if it is precast foundation.

   f. See Subsection 660-3.05 and Section 740 for wiring requirements.

3. Controller Operation. Provide the following operations.

   a. Wire the controller cabinet to flash the yellow signals on the main street or highway, and the red signals on the cross streets and left turn lanes.

   b. Make the flashing circuit independent of the controller unit. They must remain in operation upon shutdown of the controller or removal of the controller from the cabinet.

c. Wire the controller cabinet so that removal of the conflict monitor causes the intersection to go into flashing operation.

d. Accomplish transfer to flashing operation by relays between the normal load switching device and the field terminals.

e. Do not operate pedestrian pushbuttons at more than 24 volts.

f. Controller Priorities. Prioritize the drives, controls, and equipment so that each device, control, or item of equipment overrides the operation of those items listed below it:

(1) Power failure

(2) Power restart

(3) Flashing

(4) Railroad preemptor

(5) Emergency vehicle preemptor

(6) Phase selector

(7) Interconnect

(8) Time switch

(9) Normal controller unit operation

Provide the following preemption operations when called for on the Plans or as specified in the Special Provisions.

a. General. Preemption units must use the controller unit functional inputs and timings to the largest extent possible. Signal load switching control must remain with the controller unit.

b. Railroad Preemption. The Railroad Preemption Routine must consist of 4 functional intervals in the order listed below:

(1) Enter Preemption Interval.

(a) Energize a 120 VAC alarm circuit which may be used for a sign, bell, or beacon.

(b) Immediately advance to the pedestrian clearance interval of any walk that is being displayed. On any phase other than the track clearance phase(s), abbreviate the pedestrian clearance interval by a timer with a minimum range of 0-30 seconds.

(c) Following the pedestrian clearance period, the controller must advance into and time normally the vehicle clearance intervals.

(d) If the preemption is received while in the track clearance phase(s), skip step (b) and (c) above.

(2) Track Clearance Interval.

(a) Provide a timing period to allow sufficient green clearance time for any vehicles that may be stopped on or immediately behind the railroad tracks. The timing must be adjustable over a range of 0 to 30 seconds.

(b) Following the track clearance period, the controller must advance into and time normally the vehicle clearance interval(s).

(3) During Preemption Interval. Allow the controller to operate normally except for phases that conflict with the railroad crossing. Keep this interval in effect until the preemption call is removed.

(4) Leaving Preemption Interval.

(a) De-energize alarm circuit.

(b) Immediately advance to the active phase normal pedestrian and/or vehicle clearance interval(s).

(c) The controller must advance to those phases that were omitted under preemption control when complete control is returned to the controller unit.

c. Emergency Equipment Preemption. The Emergency Equipment Preemption Routine must consist of 3 functional intervals in the order listed below:

(1) Enter Preemption Interval.

(a) Energize a 120 VAC alarm circuit which may be used for a sign, bell, or beacon.

(b) Immediately advance to the pedestrian clearance interval of any walk that is being displayed. On any phase other than the track clearance phase(s), abbreviate the pedestrian clearance interval by a timer with a minimum range of 0-30 seconds.

(c) Following the pedestrian clearance period, the controller must advance into and time normally the vehicle clearance intervals.

(d) If the preemption call is received while in the preempt phase(s), skip step (b) and (c) above.

(2) Preempt Phase Interval. Hold the controller in the preempt phase(s) until the call is removed.

(3) Leaving Preemption Interval. When the preemption call is removed, the controller unit must immediately revert to normal operation.

660-3.08 SIGNAL AND LIGHTING INSTALLATION REQUIREMENTS. Install signal and lighting equipment according to the details shown on the Plans and the following:

Apply anti-seizing compound to the following fasteners: frangible couplings, mechanical grounding connectors, bolts that secure handhole covers and signal mounting hardware to poles and mast arms. Remove the fasteners from luminaire mounting brackets, fused disconnect kits, grounding bushings, and signal faces that secure the visors, and apply anti-seizing compound to these fasteners before completing the installation.

Before passing conductors through the holes made in posts, poles, and mast arms for wireways, remove the burrs and sharp edges from the inside and outside of these holes.

Until each traffic signal and/or flashing beacon goes into operation, keep the vehicular and pedestrian signal faces covered with beige colored canvas shirts sized to fit the signal faces shown in the Plans. Each signal shirt shall feature elasticized openings that fit over the visors and at least two straps to secure it to the signal. Provide shirts with a legend that reads "out of service" and a center section that allows an operator to see the indications during system tests.

When not shown in the Plans, determine the shaft lengths of lighting and signal poles and signal mast arm connector plate locations to provide the plan mounting heights of luminaires and traffic signal heads.

Furnish work to install foundations for relocated poles, including conduit, excavation, reinforcing steel, class A concrete, anchor bolts, nuts, and washers.

1. Electrolier Installation. Before installing electroliers, check the socket position of each luminaire to verify it matches the position indicated in the instructions for the light distribution type shown on the Plans.

   Install electroliers with mast arms with a slight rake by plumbing the side of the pole opposite the mast arm. After the pole has been plumbed, level the luminaire as recommended by the manufacturer.
   Install electroliers without mast arms with the centerline of the pole plumb.

2. Signal Pole Installation. Install signal poles with a slight rake by plumbing the side of the pole opposite the mast arm just above the base plate. Tighten the nuts on the anchor bolts/rods as described in Subsection 660-3.02.

   Cover the gap between the foundation and base plate by installing a metal skirt around the base plate, secured with stainless steel sheet metal screws.

3. Vehicular Signal Head Installation. With two-piece mast arms, do not install signal heads within 12 inches on either side of the overlapped splice section.

   Attach each side mounted terminal compartment with two 1/2" x 13 bolts, with washers, threaded into holes tapped into the side of the pole at the location shown on Alaska Standard Plan T-30. Install the vertical pipe members plumb.
   When installing 4 or 5 sections vertically stacked signal heads on the sides of poles, secure the vertical pipe to the pole using a steel conduit hanger mounted 6 inches

below the top horizontal pipe.

Aim through phase vehicular signal faces at a point located a distance from the face as shown in Table 660-2. If two through signal faces are not visible from this point at a height of 42 inches above finished grade, consult the Engineer for corrective measures.

TABLE 660-2

THROUGH PHASE SIGNAL FACE AIMING POINTS

85th Percentile Speed (mph)	Minimum Visibility Distance (feet)
20	175
25	215
30	270
35	325
40	390
45	460
50	540
55	625
60	715

4. Pedestrian Signal and Push Button Installation. Orient pedestrian signal faces at the center of the crosswalk on the opposite side of the street. Attach each clamshell bracket with two 1/2" x 13 bolts threaded into holes tapped into the side of the pole. Install a spacer, furnished by the bracket manufacturer, on each bolt.

   Install the push button on the crosswalk side of the pole. Install push button signs above each push button. Furnish signs with the arrow pointing in the direction of the appropriate crosswalk. When channel is used for mounting push button signs, tap the top and bottom sign bolts into the pole.
5. Underpass Lighting System Installation. Mount the luminaires as detailed on the drawings to orient the axis of the lamp perpendicular to the axis of the underpass.

6. Flashing Beacon Installation. When the Plans specify using the flasher in a signal controller cabinet to energize beacons, furnish a two pole, fused block with built in fuse pullers and two fuses to protect the flasher. Furnish and leave 5 feet of cable in the cabinet. Others will install the fused block and terminate the beacon cables.

7. Wood Pole Installation. Place the poles in the ground to at least 6 feet deep.

   After setting each pole in the ground, backfill the space around the pole with selected earth or sand, free of rocks 4 inches and larger, or deleterious material. Place the material in layers approximately 4 inches thick and thoroughly compact them with mechanical tampers.

   Furnish poles that provide a minimum vertical clearance of 21 feet between the pavement and low point of overhead conductor.

660-3.09 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS. This work consists of protecting and maintaining the existing and temporary electrical systems during the life of the Contract. The work includes locating, repairing, replacing, adjusting, realigning, cleaning, and relocating components of traffic signals, lighting systems, interconnect, and flashing beacons to keep them wholly operational and positioned according to the following specifications.

Furnish the Engineer with the name and phone number of the person who will maintain the existing and temporary electrical facilities at the Preconstruction Conference. Make this person available at times until the date of Acceptance for Traffic and Maintenance and provide labor, materials, and equipment this person may need to complete repairs ordered by the Engineer.

When beginning work, the Engineer will notify the Contractor and the local maintenance agencies in writing of the transfer of maintenance responsibilities, providing an effective date and time. Maintenance does not include replacing defective equipment or repairing equipment damaged before the transfer of maintenance responsibility. Therefore, before starting work on the project, inventory the condition of the existing equipment with the Engineer and document the damaged and defective equipment. If beginning work before providing the Engineer with an inventory, the Contractor waives the right to claim extra compensation when the Engineer later finds damaged or defective equipment.

Keep components of the existing and temporary electrical systems operational during the progress of the work, except when the Engineer allows shutdowns to alter or remove the systems. The Engineer will consider these systems operational when no damaged or defective equipment is found in service, components are clean, located, and aligned as specified herein, and photoelectric controls operate the lighting systems. The State will pay for electricity used to operate the systems if the public benefits from their operation. Furnish replacement equipment compatible with equipment used in the Central Region.

Begin work to repair, replace, adjust, realign, clean, and/or relocate components of an affected system within one hour when ordered by the Engineer. If work is not complete, the Engineer may have outside forces complete the repairs and deduct the amount billed from monies due the Contractor.

1. Records. When working on a traffic signal system, print a record of work performed in the diary found in each controller cabinet. Make sure each entry includes:

    a. The dates and times beginning and completing work, and the names of the Crewmembers completing the work.

    b. The characteristics of the equipment failure or faulty operation evident before repair.

    c. The changes made or corrective actions taken.

d. The printed name and signature of the person responsible for making the repairs or changes.

The Engineer will limit signal system shutdowns to the hours traffic restrictions are allowed in Subsection 643-3.08, Construction Sequencing. During shutdowns, use flag persons to control traffic. Provide local traffic enforcement and maintenance agencies 24 hour notice before shutting down a traffic signal system.

Locate existing conduit runs, buried cables, junction boxes, and underground utilities before starting work that may damage these facilities or interfere with these systems.

Where roadways remain open to traffic and the work includes modifying the existing lighting systems, energize the modified circuit by sunset on the same day the Contractor retires the original circuit.

Relocate or replace signal poles, lighting standards, sign poles, flashing beacon poles, load centers, and controller cabinets whenever reducing clearance from the traveled way to less than 15 feet.

2. Alignment. During the various phases of construction, shift the signal heads to keep them aligned horizontally and vertically with the approaches according to the following:

   a. For overhead signals located 53 feet and more from the stop line, maintain 18 feet to 20 feet of clearance between the traveled way and the bottom of each signal. For closer signals refer to the MUTCD for maximum clearances.
   b. For side mounted signals, maintain 9 feet to 11 feet of clearance between the traveled way and the bottom of the signal.
   c. Align overhead signals controlling a single lane with the center of the lane.
   d. Align overhead signals controlling two lanes with the lane lines separating the lanes.
   e. When the horizontal angle to the side mounted far right signal exceeds 20 degrees, relocate this signal to an overhead location. Measure the angle 10 feet back from the stop line on the lane line between the two farthest left through lanes.
      (1) With two or more through lanes, center one signal head over each lane.
      (2) With one through lane and protected permitted signal phasing, leave the five-section signal over the lane line and center the signal to be relocated over the through lane.
      (3) Otherwise, install the relocated signal 8 feet to the right of the signal centered over the through lane.
   f. For pedestrian signals, maintain 7 to 9 feet between the traveled way and the bottom of each pedestrian signal.
   g. Aim signal heads according to Table 660-2 found in Subsection 660-3.08. When no longer required, salvage original and Department provided equipment according to the Plans and No. 6. Salvaging or Reusing Electrical Equipment, found in Subsection 660-3.01. Remove other materials used in the temporary systems from the project.

660-3.10 FALSEWORK LIGHTING. When required by the Special Provisions, install falsework lighting where vehicular traffic with or without pedestrian traffic crosses through or under structure falsework.
Provide illumination of the portal faces of falsework during the hours from dusk to dawn. Provide illumination of the pavement and pedestrian openings through or under falsework 24 hours a day.
Submit a plan for the proposed lighting installations and do not commence falsework construction until the Engineer has reviewed such plans. The Engineer will make a subsequent review after you place falsework lights in operation.
Falsework lighting equipment remains your property and must be removed from the site of the work upon completion of the project or when directed.

660-3.11 TRAFFIC SIGNAL MODIFICATIONS. Required work is detailed in the Plan sheets and notes and the following. Work related to the Traffic Signal Communications System will be paid for separately.

The Contractor will have 10 hours to "changeover" the new controller assembly. Changeover includes but is not limited to removing the existing controller assembly, replacing with new controller assembly, landing new and existing wires, programming the new controller unit, and bringing the signal back to full functionality. The 10 hour window will only occur on the days assigned under an approved traffic control plan. The Contractor will be assessed a Traffic Price Adjustment for an unauthorized lane closure according to Subsection 643-3.06. Refer to section 643 for further restrictions.

Traffic control during the changeover will be paid for under section 643 Pay Items. At a minimum, traffic control will include the following:

1. A portable changeable message board in advance of each approach with the message "Traffic Signal Work, New Traffic Pattern Ahead, from 00:00 AM/PM mm/dd/yy to 00:00 AM/PM mm/dd/yy

2. A flagger for each approach

Traffic signal modifications are subject to the full Standard Specification for Highway Construction, the Special Provisions, and the following:

1. Traffic Controller Cabinet: When a new traffic controller cabinet is called for, ensure legible labeling of all cabinet cables including but not limited to; control, detector, EVP, UPS, interconnect, and telephone. Label detectors and signal heads individually.

2. Traffic Signal Heads: When new traffic signal heads are required, provide with new LED units and new mounting hardware. If new heads are not called for, replace any missing visors or backplates subsidiary to the Traffic Signal Modification Pay Item.

   When replacing traffic signal or pedestrian indications conform to Subsections 740-2.14 and 2.15 and maintain brand consistency throughout intersection. When new heads are provided aim heads according to Table 660-2.

3. Loops: When shown in the plans, replace inductive loops including homerun cable and required splice. Loop tests are required per Section 660-3.01.7.

4. Conduits: Unless new conduits are called for reuse existing conduits. When new conductors are being added to existing conduits, conform to sections 660-3.03, 3.05, and 3.06.

5. EVP Components: When called for in the plans provide EVP components including all cables and mounting hardware. Ensure proper operation of EVP system.

6. UPS: When called for in the plans provide fully functioning UPS system. If no separate UPS item exist, the UPS will be paid for subsidiary to the Traffic Signal Modifications Pay Item.

7. Load Center: When called for in the plans provide fully functioning Load Center. If no separate load center item exists, the load center will be paid for subsidiary to the Traffic Signal Modifications Pay Item.

8. Conductors: Reuse existing conductors except where the plans call for new conductors.

Salvage decommissioned reusable traffic signal equipment, components/materials and deliver to the local Maintenance & Operations station within 72 hours of removal. Refer to section 660-3.01 for delivery locations. Decommissioned components damaged as part of the salvage effort must be replaced with new components at no additional cost.

660-4.01 METHOD OF MEASUREMENT. Section 109 and the following:

Bored Casing. By the linear foot along the slope of the bored or jacked casing for the actual length bored or jacked, in place.

Traffic Loop. By each loop unit, complete and in place, including all conduit, conductors, and other equipment to the nearest junction box.

Traffic Loop Replacement. By each loop unit damaged during the milling operation, complete and in place, including all conduit, conductors, and other items necessary per this section to replace fully functioning loops. Work to include splicing of loops to existing lead-in cable.

Relocate Electrolier. By each complete unit, removed, relocated, reinstalled, and functional.

Temporary Electrolier. By each electrolier and foundation furnished, installed, and maintained as directed by the Engineer.

Signals and Lighting (Miscellaneous). Measured in accordance with the directive authorizing the work.

660-5.01 BASIS OF PAYMENT.

Payment Includes labor, equipment, and materials required to provide fully functional

traffic signals and lighting systems, permanent and temporary, using new equipment. Remanufactured or rebuilt equipment will not be permitted.

Subsidiary to each Pay Item including but not limited to (Except when included as a separate Pay Item):

1. General construction requirements,
2. Bonding and grounding,
3. Bored Casings,
4. Completing tests,
5. Conductors,
6. Conduit,
7. Dewatering excavations,
8. Excavation, trenches in rock or soil, bedding, backfill for foundations, conduits, components,
9. Foundations including concrete to complete foundations,
10. Junction boxes including adjustment to final grade,
11. Labeling conductors,
12. Maintaining temporary and existing electrical systems,
13. Minor routing changes directed by the Engineer,
14. Preparing as-builts,
15. Removal and disposal of existing/new unused foundations, conduit, conductors, and junction boxes,
16. Removing, repairing, and replacing improvements,
17. Removal of signs and reinstallations required to install foundations, conduits, and junction boxes,
18. Repairing damage to finishes on new equipment,
19. Salvaging reusable equipment and materials and delivering to the local Maintenance and Operations station including but not limited to existing signal structure (refer to section 660-3.01 for delivery locations),
20. Wiring, and

21. Replacing failed equipment, equipment components and repairing failed workmanship.

660 Pay Items do not include: roadway planing, roadway paving, drainage structures, erosion, sediment, and pollution control, signing, striping and pavement markings, traffic control, and components of the traffic signal communication system when included as separate pay items.

PAY ITEM

Item Number	Item Description	Unit
660.2003.0000	Traffic Signal System Modifications	LS

SECTION 670
TRAFFIC MARKINGS

670-1.01 DESCRIPTION. Add the following:

Furnish, locate, and install Pavement Markings as shown on the Plans and as directed.

Pavement Marking Type: Methyl Methacrylate (MMA)

670-2.01 MATERIALS. Replace the material reference,

"Methyl Methacrylate Markings Subsection 712-2.17", with,

Methyl Methacrylate Pavement Markings Subsection 712-2.17

Add the following:

Methyl Methacrylate Pavement Markings are a combination of methyl methacrylate, glass beads and anti-skid aggregate.

Replace the last sentence with the following:

Submit a single certification from the manufacturer of the marking material, for each material combination, certifying the combination of marking material, glass beads and anti-skid aggregate, as furnished, provides the durability, retroreflectivity, and skid resistance specified.

670-3.01 CONSTRUCTION REQUIREMENTS. Replace No. 4 with the following:

4. Methyl Methacrylate Pavement Markings (MMA).

   a. General. 15 days before starting work meet with the Engineer for a prestriping meeting. At this meeting, do the following:
      (1) Furnish a striping schedule showing areas and timing of work, placing materials and the Traffic Control Plans to be used.
      (2) Discuss placement of materials, potential problems.
      (3) Discuss work plan at off ramps, on ramps and intersections.
      (4) Discuss material handling procedures.
      (5) Provide copies of the manufacturer's installation instructions and copies of the Material Safety Data Sheets.

   b. Manufacturer's Representative. Provide the services of a manufacturer's representative (the "Manufacturer's Representative"). Ensure the Manufacturer's Representative observes the application of the pavement marking materials. Cooperate with the Manufacturer's Representative and the Engineer to ensure that the materials are placed according to these Specifications and the manufacturer's recommended procedures.

c. Manufacturer Certified Installers. Install pavement markings using only striping installers certified by the marking materials manufacturer for the specific striping material and method. Submit these certifications to the Engineer at the Preconstruction Conference.

d. Preparation. Prepare the roadway surface to receive pavement markings according to these Specifications and the manufacturer's recommendations. Clean and dry the roadway surface. Completely remove contaminants such as dirt, loose asphalt, curing agents, surface oils, or existing road marking materials before applying pavement marking material.

e. Equipment.

(1) Grooving Equipment.
Use grooving equipment that produces a dry cut. Use vacuum shrouded equipment or other equally effective containment procedures.

(2) Marking Equipment.
(a) Longitudinal Marking: Use truck mounted application equipment capable of installing a double centerline and a single shoulder line in a single pass. Use automatic bead applicators that place a uniform layer of beads on the lines. Hand units are not permitted.
(b) Other Markings: Use manual or automatic application equipment. Use stencils or extruders to form sharply defined markings.

f. Application. Apply marking material according to these Specifications and the manufacturer's recommendations. Use equipment designed and capable of properly mixing at the place and time of application and approved by the manufacturer for the type of product being installed.

Anti-skid Aggregate. During marking material application, anti-skid aggregate will be evenly distributed and visible throughout the top 20 mils of the marking material mixture, and after the application, in the surface of the cured material.

Groove the area(s) designated in the Plans. Install markings in the same work shift as the grooving operation. Markings will be measured flush with the pavement surface.

(1) Longitudinal Markings. Groove the pavement to a depth of 125 mils. Apply markings for lane lines, edge lines, and centerlines to yield a thickness of 125 mils.

(2) Other Markings.
(a) Transverse and Symbol Markings:

Groove the area for inlaid markings to a depth of 125 mils. Apply marking for symbols, arrows, stop bars, railroad symbols, and cross walks to yield a thickness of 125 mils.

(b) Roundabouts:
As designated on the plans, groove the area for inlaid markings in roundabouts to a depth of 500 mils. Apply markings to yield a thickness of 500 mils.

(c) Gore Markings:
Diagonal gore markings will not be inlaid unless shown in the Plans.

g. Disposal of Waste. Waste material(s) are the Contractor's property. This includes grindings and removed marking material. Do not dispose of or store waste material(s) on State property. Dispose of waste material(s) according to applicable Federal, State, and local regulations.

h. Sampling. On the form provided by the Engineer, record the following readings and locations where they were taken using project stationing, and submit them to the Engineer with 24 hours for evaluation. Thickness of material and depth of slot are measured from the surface of the pavement.

(1) For inlay longitudinal applications, record the depth of the slot every 500 feet during the grinding operation.

(2) For inlay other markings measure the thickness in three locations for each marking.

Inspect the markings initially, and again two weeks after placement, to ensure the material has cured properly. Remove soft spots or abnormally darkened areas and replace with material meeting specifications.

The Engineer may elect to use the Contractor's readings or perform additional sampling.

Add the following:

Refer to the Survey Field Books identifying the no passing zones (see Subsection 642-3.01)

670-3.04 PAVEMENT MARKING REMOVAL. Add the following:

Coordinate removal work with construction activity. Remove pavement markings the same day permanent markings are applied, unless otherwise directed. Use vacuum shrouded equipment or other equally effective containment procedures.

Replace Subsection 670-3.06 with the following:

670-3.06 TOLERANCE FOR LANE STRIPING.

1. Length of Stripe. ± 2 inches.
2. Width of Stripe. ± 1/8 inch.
3. Lane Width. ± 4 inches from the width shown on the Plans.
4. Stripes on Tangent. Do not vary more than 1 inch laterally within a distance of 100 feet when using the edge of the stripe as a reference.
5. Stripes on Curves. Uniform in alignment with no apparent deviations from the true curvature.
6. All Stripes. Keep the center of the stripe within planned alignment.
7. Double Stripes. ± 1/4 inch.
8. Thickness of Surface Applied. Minimum specified to a maximum of + 30 mils.
9. Depth of Inlay Slot. Minimum specified to a maximum of + 40 mils.
10. Thickness of Inlaid Marking Material. Fill inlay area completely from the bottom of the inlay to the surface of the pavement.

If it is determined that the material is being placed too thin, the beads are not properly placed, the anti-skid aggregate is not visible, or otherwise not to specification, make immediate adjustments to correct the problem.

Pavement markings applied by any method will be unacceptable if:

1. Marking is not straight or wide enough.
2. Thickness of line is not uniform.
3. Thickness of line is less than specified.
4. Material is uncured.
5. Material blackens or is inconsistent in color.
6. Inlay slot is not the specified depth.
7. Inlay slot is not filled to the specified depth.
8. Edge of the markings is not clear cut and free of overspray.
9. Reflective elements are not properly embedded.
10. Retroreflectivity of the markings is less than specified.
11. Anti-skid aggregate is not visible in the marking material during application and the dried surface.
12. Markings exhibit poor adhesion.
13. Color is not as specified.

Perform repairs using equipment similar to the equipment initially used to place the materials. Do not perform repairs in a "patch work" manner. If more than one repair is required in a single 500-foot section, grind and repair the entire section.

670-4.01 METHOD OF MEASUREMENT. Add the following:

Thickness will be measured from the top of the marking to the top of the pavement surface. Marking material placed in a depression left by pavement line removal will not be included in measuring the thickness of the line.

Delete No. 2.

Replace No. 3 with the following:

3. Each. Pavement markings using letters, numbers, and arrows will be measured on a unit basis with each separate word or symbol constituting a unit. Railroad Markings will be measured by the complete unit shown for each lane of travel.

Replace No. 4 with the following:

4. Foot Basis. Longitudinal pavement markings, transverse, and gore markings, surface applied or inlaid will be measured by the linear foot of 4-inch-wide line. Wider striping will be measured in multiples of 4 inches.

670-5.01 BASIS OF PAYMENT. Add the following:

For all phases of construction: There will be no separate payment for:

- Over-runs of material caused by the variation of the gradation of the asphalt
- Additional material required to achieve the thickness specified on open graded pavement

All work and materials associated with pavement markings are subsidiary to 670 items, including but not limited to:

- Milling for installation of the inlaid pavement markings including the removal of millings
- Temporary pavement markings and removal of conflicting markings, including repair of the roadway surface, milled surface or otherwise
- Traffic Control required for the installation of permanent and temporary pavement markings, removal of conflicting markings, and repairs

Add the following Pay Items:
Payment will be made under:

PAY ITEM

Item Number	Item Description	Unit
670.0010.0000	MMA Pavement Markings	LS

CR670.1-110812R

Add the following Section:

SECTION 682
UTILITY POTHOLING

682-1.01 DESCRIPTION. Expose subsurface utilities using a vacuum-extract truck. Record the location of the utility(s). Backfill the pothole and dispose of waste materials.

682-2.01 MATERIALS.

Backfill Material:	Aggregate Base Course, Grading D-1 Section 703
Asphalt Patch Material:	Hot Mix Asphalt Type II, Class B Section 401

682-3.01 CONSTRUCTION. Submit the utility potholing schedule to the Engineer and utility companies not less than 7 days before starting potholing.

Deliver the vacuum-extract truck to the job-site with the debris tank empty.

Expose the subsurface utilities. Log the as-built information, subsection 682-3.02. Backfill the pothole immediately after the Engineer accepts the logged data. Backfill the first 6 inch lift using the excavated material, compact the material. Backfill the balance of the pothole using Aggregate Base Course, Grading D-1, compact the material. In paved areas, use Hot Mix Asphalt Type II, Class B to patch over the pothole, match the thickness of the surrounding pavement.

Dispose of excavations off-site. Before beginning potholing, provide to the Engineer a certificate, signed
by the owner or owner's representative, identifying the disposal site and acceptance of the project potholing excavations.

Utilities damaged by the potholing operation require the Engineer to be immediately notified. The Contractor is responsible for the repairs and the associated costs. Contact and coordinate repairs with the utility owner.

682-3.02 AS-BUILTS. Create a utility pothole log, as-built, recording for each pothole: the date of potholing operation, utility type and size, station, offset, elevation, groundwater, and other pertinent data. Survey the utility location using the project horizontal and vertical control; comply with the requirements of Section 642. Submit the completed log to the Engineer within two working days following the completion of the pothole
excavation.

682-4.01 METHOD OF MEASUREMENT. The pay unit, contingent sum, is measured by the hour of work performed.

682-5.01 BASIS OF PAYMENT. Pay Item No. 682.2000.0000 Vac-Truck Pothole is paid at $450/hour for the work to pothole;

expose the utility(s), backfill the hole, patch disturbed pavement and dispose of excavations. The paid time includes the work; labor, and the fully operated vacuum truck or combination of vacuum truck and other Engineer approved equipment engaged in potholing at the area(s) identified in the Plans and/or identified by the Engineer. The paid time includes the time to empty the vacuum truck of excavation material, including the travel time, from this project only, to a certified disposal site.

Travel time to and from the project, idle time, maintenance and repairs (labor, material and time) are incidental and not included in the measured time.

PAY ITEM

Item Number	Item Description	Unit
682.2000.0000	Vac-Truck Pothole	Hour

Add the following Section:

SECTION 690
WATERWAY

690-1.01 DESCRIPTION. Construct a waterway bed (culvert lining, stream bed, and or similar), and waterway bank (protection and revegetation), at the locations on the Plans and or as staked. Maintain the waterway bank protection and revegetation for the term of the Contract.

Provide a plan and schedule for the culvert, waterway bed and waterway bank construction meeting the requirements of the Contract documents (Section 107 Legal Relations and Responsibility to Public - Permits, Section 643 Traffic Maintenance and similar).

690-1.02 REFERENCES.

1. Stream Bank Revegetation and Protection: A Guide for Alaska; published by Alaska Department of Fish and Game; printed copy available from the Department, and electronic copy available on the internet.

2. Alaska Coastal Revegetation & Erosion Control Guide, published by the Alaska Plant Materials Center, printed copy available from the Department, and electronic copy available on the internet.

690-2.01 MATERIALS.

Clearing and Grubbing	Section 201
Excavation and Embankment (waterway bed and bank)	Section 203 & 703
Structure Excavation for Conduits and Minor Structures	Section 204 & 703
Structural Plate Pipe	Section 602 & 707
Culverts and Storm Drains	Section 603 & 707
Riprap	Section 611
Seeding	Section 618 & 724
Topsoil	Section 620 & 726
Erosion, Sediment, and Pollution Control	Section 641
Selected Material	Section 703

Vegetative Mat.

Living native plants and grasses that grow within the right-of-way. Preferred plants include Willow, Alder, Fireweed, Calamagrostis, Bearberry, Red Top, and other native species.

Vegetative mat free of noxious weeds as included in, 11 AAC 34.020.a. Prohibited Noxious Weeds, items 1-14.

Waterway Fill.

Bed Fill. A blend of 60% riprap, Class 1, and 40% selected material, Type B.

Unclassified waterway excavation may be substituted for the selected material Type B.

CONSTRUCTION REQUIREMENTS

690-3.01 EQUIPMENT. Provide equipment of a size and type to efficiently complete the work with the least impact on the waterway. Submit to the Engineer a list of equipment to be used during construction for review and approval. Do not damage the culvert structure or surface finish. Do not operate equipment directly on the surface of the culvert; work off of protective pad/dunnage or waterway bed fill material.

690-3.02 PLANT STOCK.
Vegetative Mat.

Collect vegetative mat from inside the right-of-way, from the more fertile soils within the areas to be cleared and grubbed, out of sight of the roadway, and from areas where waterway bank revegetation and bank protection work is occurring. Establish fertility by observing the quality and quantity of the plants and grasses in their natural location.

If vegetative mat is not available within the right-of-way, acquire the material from an offsite donor site similar to the transplanting site with the consent of the property owner; or with the approval of the Engineer purchase material from a commercial supplier.

Submit, at least one week before the harvest, the harvest site locations for site inspection and approval.

Cut vegetative mat in blocks at least 12-inch thick by 6-square foot sections, intact, and without damage to the plant shoots, roots, or rhizomes.

Maintain the plant material in live condition. Protect the material from damage, sun, wind, and drying during salvage, storage, transporting, and installation. Keep the material in a cool shaded area and moist throughout the root zone at all times. Water the mat prior to collecting, when necessary, to maintain the mat in a healthy and vigorous condition.

Plant the mats the same day if possible and no more than 48 hours from time of salvage.

The Engineer will reject plants:

That show signs of improper storage, handling, are dried out, molded, or have insect pests, diseases;

Vegetative Mat

1) Plants included in the vegetated mat listed on the Alaska Department of Natural Resources Divisions of Agriculture webpage with an Alaska Natural Heritage Program Invasiveness Ranking greater than 70, including plants as part of the vegetative mat;
2) Containing prohibited noxious weeds (as listed in 11 AAC 34.020(a)).

690-3.03 EXCAVATION. Excavate to the dimensions shown on the Plans. Control excavated material to minimize disturbance to the channel and banks.

690-3.04 WATERWAY BED. Place waterway bed fill material in the culvert and existing waterway channel by methods that do not cause segregation or damage. Place or rearrange individual rocks to obtain a uniformly dense, compact, low permeability mass, matching the drawings and the waterway's natural channel. Place the fill in lifts of maximum depth equal to size of maximum rock or 8-inches whichever is greater. Fill voids by machine or hand tamping after placing each lift. Compact bed materials, each lift, by mechanical means as approved by the Engineer. Make waterway bed surface roughness similar to the natural waterway bed.

Fill all voids left during placement of fill material, of waterway features with selected material Type B. Use water pressure, metal tamping rods, and similar hand operated equipment to force material into all surfaces and subsurface voids between the rocks, and the rocks and structure. After water is restored to the waterway, if voids are present between the rocks, add additional selected material Type B as directed by the Engineer.

690-3.05 WATERWAY BANK. Place vegetative mat on the topsoil. Plant vegetative mats between May 15 and August 1.

a. Wet the bank

b. If the vegetative mat has lost topsoil, such that the in-place thickness of the mat will not be 12-inches thick, place additional topsoil mixed with fertilizer over the cuttings, filling voids, and increase the mat thickness to 12-inches plus the initial 4-inches of topsoil.

c. Stake out all areas to be planted with vegetative mats as shown on the Plans prior to installation. Notify the Engineer of the delineated areas three working days prior to installation. Install only after receiving the Engineers approval.

d. Place vegetative mats tightly together, without gaps, with full contact of the root mass to the soil surface below, tamp into place and anchor with wooden stakes 18-inches long and spaced 1 per square yard.

690-3.06 WATERWAY BANK PERIOD OF ESTABLISHMENT. Establishment period extends one complete growing season (May 1 to September 30), after the planting year, acceptance, and final inspection beginning from the date of Project completion, Subsection 105-1.15. The growing season may include the time remaining after September 30, from the first 45 days of deep watering in the planting year resuming after May 1 of the following year, 690-3.08.

Employ all possible means to preserve/maintain the plants/vegetative ground cover in a healthy and vigorous condition to ensure successful establishment. Maintain the plants according to Subsection 690-3.08, to not less than the requirements for acceptance, Subsection 690-3.07.

690-3.07 PLANT ACCEPTANCE AND REPLACEMENTS. Engineer and Contractor, in the growing season (May 1 to September 30) after the planting year and before June 30, inventory the vegetative mat planted on the project to determine the area of dead and unhealthy plants/organic materials.

Vegetative Mat.

a. Acceptance. Acceptance requires a minimum of 75% of the original planting area to be in a healthy and vigorous condition in the growing season after the planting year.

b. Replacement. Replace the dead and unhealthy mat to maintain at least 75% of the original area planted.

The Engineer will select which vegetative mat area to replace.

Perform replacement planting between July 1 and July 15 according to the original planting procedures and as described in this subsection.

Contractor is responsible for replacing vegetative mat vandalized, stolen, or damaged

during the maintenance period.

690-3.08 MAINTENANCE. Install and maintain plastic safety fence meeting the requirements in Section 643. Install plastic safety fence per the manufacturer's recommendations upon completion of waterway bank protection and revegetation. Remove plastic safety fence at the end of the maintenance period for the vegetative mat.

Deep water vegetative mat immediately after planting. Deep watering shall provide water penetration throughout the entire layer, to the top of the waterway bank fill, with minimum runoff. Rain will not be considered a substitute for deep watering unless permitted by the Engineer.

Deep water the vegetative mat as follows:

1. Deep water at least twice a week during the first 45 days after planting.

2. 45 days after planting, deep water during the remainder of the first growing season ending September 30 of the same year as the planting, through the maintenance period ending September 30 of the second growing season, as follows:

   a. Once a week in May, June and July.
   b. Once between August 10 and August 20.
   c. Once during the last week in September.

3. The Engineer may direct the Contractor to deep water past September 30 or provide supplemental watering any time during the life of the project when weather conditions are excessively warm or dry.

Daily water vegetative mat, or as directed by the Engineer. Keep the mats moist until final acceptance of the project or as accepted by the Engineer.

Watering equipment shall be equipped with, or followed by a vehicle equipped with a Type B advance warning arrow panel using caution mode according to Part VI of the Alaska Traffic Manual.

690-4.01 METHOD OF MEASUREMENT. Section 109.

690(10) Waterway Bed Fill: linear foot of the waterway.
690(11) Waterway Bank Fill: linear foot of bank.
690(12) Waterway Bank Revegetation and Protection: linear foot of bank.

Measured between reference points shown on the Plans.

690-5.01 BASIS OF PAYMENT.

1. Pay Items 690.2001/2009/2010.____ Waterway Bed Fill. All materials and work to

construct and maintain in place the waterway bed fill including rock ribs and other associated elements.

2. Pay Item 690.2002.____ Waterway Bank Fill. All materials and work to construct and maintain in place the waterway bank fill.

3. Pay Item 690.2003/2006.____ Waterway Bank Revegetation and Protection. All materials and work to construct the waterway bank revegetation and protection.

   Partial payments of up to 80% of full amount may be authorized for Pay Item 690.2003.____, at time of acceptance. The balance will be paid with one final payment at the completion of the establishment period if a minimum of plants according to Subsection 690-3.07 are living, vigorous and healthy.

4. Pay Item 690.2004/2005/2008.____ Waterway Restoration. All materials and work to construct waterway restoration, including the plant material consultant.

5. Pay Item 690.2007.____ Waterway – Live Willow Staking. All materials and work to construct waterway live staking, including the plant material consultant.

Hauling, stockpiling, and disposal of unsuitable and surplus material and the use of a Type B Advance Warning Arrow for watering are subsidiary to Section 690 Pay Items.

Water diversion is subsidiary to 603 Pay Items.

PAY ITEM		
Item Number	**Item Description**	**Unit**
690.2001.____	Waterway Bed Fill	LF
690.2002.____	Waterway Bank Fill	LF
690.2003.____	Waterway Bank Revegetation and Protection	LF
690.2004.____	Waterway Restoration	LF
690.2005.____	Waterway Restoration	LS
690.2006.____	Waterway Bank Revegetation and Protection	LS
690.2007.____	Waterway – Live Willow Staking	SY
690.2008.____	Waterway Restoration	CS
690.2009.____	Waterway Bed Fill	CY
690.2010.____	Culvert Bed Fill	LS
690.2011.____	Waterway – Brush Layer	LF
690.2012.____	Waterway – Regrade Stream	LF
690.2013.____	Waterway – Void Filling	LF
690.2014.____	Waterway – Live Willow Staking	LS

CFHWY00830

DIVISION 700 – MATERIALS

Note: Use this specification, when the project will require a sole-source product by name, and when named products include ***Iron and Steel Products, Manufactured Products, and all Construction Materials*** *identified in the Contract.*

INSERT the paragraph below within each Material Specification Subsection identifying or requiring one or more Named Products, Iron or Steel products, Manufactured products, and all Construction Materials.

EDIT statements (a), (b), (c) below (add or delete statements, if needed), one line for each product named in the subsection, to indicate whether the product IS or IS NOT "Manufactured in the United States," as known by the Department at the time of advertising.

Products identified by name in the list below are Iron or Steel Products, Manufactured Products, or Construction Materials. The information below represents the Department's knowledge at the time of advertisement regarding whether products are "Manufactured in the United States" as defined in Section 106 of the contract. Including this information in the Contract does not relieve the Contractor of responsibility for complying with Section 106 of the Contract and the Buy America Act and BABA Act, or from providing the Non-Compliant Minimal Use & De Minimis Register Form 25D-60 and the Certificate of Domestic Materials Compliance Form 25D-62 as required in Subsection 106-1.01.

(a) **Named Product A is/is not** "Manufactured in the United States".
(b) **Named Product B is/is not** "Manufactured in the United States".
(c) **Named Product C is/is not** "Manufactured in the United States".

HSP20-11B

SECTION 702
ASPHALT MATERIALS

Replace Subsection 701-2.01 with the following:

702-2.01 ASPHALT BINDER. Meet AASHTO M 320 or M 332 for the specified Performance Grade, except as indicated in Table 702-2.01-1 Exceptions to Performance-Graded Binder Specifications.

TABLE 702-2.01-1
EXCEPTIONS TO PERFORMANCE GRADED ASPHALT BINDER SPECIFICATIONS

Performance Grade	AASHTO Specification	Viscosity AASHTO T 316	MSCR, AASHTO T 350			PAV, Dynamic Shear AASHTO T 315	Direct Tension AASHTO T 314
			$J_{NR3.2}$ kPa^{-1}	J_{NR} Diff	% $Recovery_{3.2}$		
PG 52-28	M 320	None	—	—	—	None	Delete
PG 52-34 E	M 332	None	None	Delete	60 min.	None	Delete
PG 58-28 E	M 332	None	None	Delete	60 min.	None	Delete
PG 58-34 V	M 332	None	None	Delete	60 min.	None	Delete
PG 64-28 E	M332	None	None	Delete	60 min.	None	Delete
PG 52-40 E	M 332	None	None	Delete	75 min.	None	Delete
PG 58-34 E	M 332	None	0.25 max.	Delete	85 min.	None	Delete
PG 64-40 E	M 332	1 Pa•s max.	0.10 max.	Delete	95 min.	5000 max. @ 4°C	Delete

None indicates no exceptions from the listed test. Delete indicates this property is not required from the listed test.

Use asphalt binders without re-refined engine oil bottoms (REOB)/vacuum tower extenders (VTAE) as a modifier. REOB/VTAE are materials as defined in the Asphalt Institute document IS-235. Furnish a certificate of compliance according to Subsection 106-1.05.1 certifying that REOB/VTAE were not used as a modifier of asphalt binder.

HSM20.44-23.0801

702-2.03 EMULSIFIED ASPHALT.

Replace item 1. with the following:

1. Cationic Emulsified Asphalt. Meet AASHTO M 208, except CRS-2P meet AASHTO M316.

HSM20.32-21.1231

702-2.07 WARM MIX ASPHALT (WMA). Add the following to Table 702-3:

WMA Technology	Process Types	WMA Supplier
AD-here ULTRA 1	Chemical Additive	Arkema – Road Science
Cecabase RT	Chemical Additive	Arkema – Road Science

HSM20.44-23.0801

SECTION 703
AGGREGATES

703-2.03 AGGREGATE FOR BASE AND SURFACE COURSE.

In Table 703-1 replace the line for Degradation Value with the following:

TABLE 703-1
AGGREGATE QUALITY PROPERTIES FOR BASE AND SURFACE COURSE

PROPERTY	BASE COURSE	SURFACE COURSE	TEST METHOD
Micro-Deval	15%, max.	15%, max.	AASHTO T 327

HSM20.40-22.0501

Replace Subsection 703-2.04 with the following:

703-2.04 AGGREGATE FOR HOT MIX ASPHALT. 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 Type IV, and VH mixes.

Coarse Aggregate. Aggregate retained on the No. 4 Sieve.

Meet Table 703-3 requirements:

TABLE 703-3
COARSE AGGREGATE QUALITY FOR HMA

Description	Specification	Type II, Class A	Type I; Type II, Class B; Type III	Type IV	Type VH
LA Wear, % max.	AASHTO T 96	45	45	45	45
Micro-Deval, % max.	AASHTO T 327	18	18	18	18
Sodium Sulfate Loss, % max. (5 cycles)	AASHTO T 104	9	9	9	9
Fracture, % min.	ATM 305	90, 2 face	80, 1 face	90, 2 face	98, 2 face
Flat-Elongated Pieces, % max.	ATM 306				
1:5		8	8	8	8
Absorption, % max.	ATM 308	2.0	2.0	2.0	2.0

Nordic Abrasion, % max.	ATM 312	-	-	-	8 [a]

a. Hard Aggregate that meets the Nordic Abrasion values specified may be obtained from, but not limited to, the following sources:

- MS 52-068-2, located at MP 217 on the Parks Highway near Cantwell
- Alaska Lime Co, Jim Caswell, located at MP 216.5 on the Parks Highway near Cantwell
- CalPortland plants located in Dupont Washington
- Jack Cewe Ltd located in Coquitlam British Columbia, Canada

Fine Aggregate. Aggregate passing the No. 4 sieve.

Aggregate shall meet the quality requirements of AASHTO M 29, including S1.1, Sulfate Soundness.

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, and shall not exhibit rut depth larger than 1/4-inch, as determined by ATM 419.

Fine aggregate for Type IV and VH mixes:

- do not blend back natural sand
- shall be non-plastic as determined by ATM 205
- shall have a minimum uncompacted void content (Fine Aggregate Angularity) determined by AASHTO T 304, Method A, of 45%

408 HMA. **Type VH or V**. If V remove the "H" from Table 703-4, far right column header below.

TABLE 703-4
BROAD BAND GRADATIONS FOR HOT MIX ASPHALT AGGREGATE
Percent Passing by Weight

SIEVE	GRADATION				
	Type I	**Type II**	**Type III**	**Type IV**	**Type VH**
1 inch	100	-	-	-	-
3/4 inch	80-90	100	-	-	100
1/2 inch	60-84	77-99	100	100	65-90
3/8 inch	48-78	68-88	80-90	80-95	55-80
No. 4	28-63	48-68	44-81	55-70	40-60
No. 8	14-55	33-53	26-70	35-50	≤ 45
No. 16	9-44	20-40	16-59	20-40	≤ 35
No. 30	6-34	14-30	9-49	15-30	≤ 25
No. 50	5-24	9-21	6-36	10-24	≤ 20
No. 100	4-16	6-16	4-22	5-15	≤ 12

No. 200	4-7	3-6	4-7	4-7	4-7

C703.1-22.0501

703-2.07 SELECTED MATERIAL.

Replace 1. Type A with the following:

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 ATM 204 and ATM 205. Meet the following gradation as tested by ATM 304:

Sieve	Percent Passing by Weight
No. 4	20-55%
No. 200	0-6%, determined on the minus 3-inch portion of the sample

C703.1-22.0501

703-2.10 POROUS BACKFILL MATERIAL.

Add the following to the end of the paragraph:

Use Gradation A unless otherwise specified.

HSM20.33-21.1231

703-2.13 STRUCTURAL FILL. Replace Table 703-12 with the following:

TABLE 703-12
AGGREGATE GRADATION FOR STRUCTURAL FILL

SIEVE	PERCENT PASSING BY WEIGHT
3-inch	100
3/4-inch	75-100
No. 4	20-55
No. 200	0-6

Replace Subsection 703-2.16 with the following:

703-2.16 RECYCLED ASPHALT PAVEMENT (RAP). RAP shall be free of contamination and deleterious materials. RAP maximum particle size shall not exceed 1.5-inch.

C703.1-22.0501

SECTION 706
CONCRETE AND PLASTIC PIPE

Replace Subsection 706-2.07 with the following:

706-2.07 CORRUGATED HIGH DENSITY POLYETHYLENE (HDPE) PIPE FOR CULVERTS, STORM DRAINS, AND UNDERDRAINS. Meet the following:

Corrugated Pipe and Fittings (non-pressurized)

AASHTO M 294 and 252	Type S

Perforations

1. Underdrains	Class 2
2. Underdrains and Storm Drains	Class 1

Joints	Subsection 705-2.05.3.

Polyethylene Pipe Manufacturer

1. Participate in the National Transportation Product Evaluation Program (NTPEP) work plan for HDPE thermoplastic pipe and listed on the NTPEP audit website displaying NTPEP compliance.

2. Conduct and maintain a quality control program under the NTPEP.

3. Provide a manufacturer's certificate of compliance identifying production lots for all materials.

Provide corrugated polyethylene pipe and fittings manufactured from high-density polyethylene (HDPE) virgin compounds. May use clean, reworked polyethylene materials from the manufacturer's own production.

Do not install pipe that is more than two years from the date of manufacture.

C706.1-19.0501

SECTION 712
MISCELLANEOUS

712-2.08 GLASS BEADS.

Replace the 2nd sentence with the following:

Glass Beads shall contain no more than 200 ppm of lead or 200 ppm of arsenic when tested in accordance with EPA testing methods 3052, 6020B, or 6020C.

HSM20.35-21.1231

Replace Section 724 with the following:

SECTION 724
SEED

724-2.01 DESCRIPTION. Grass seed to provide a living vegetative cover.

724-2.02 MATERIALS. Provide seed mix as specified in the Special Provisions. Provide seed collected or harvested within 2 years of the targeted seeding date. Provide all seed in pure live seed (PLS) unless otherwise directed.

Furnish seed true of genus and species. Meet applicable requirements of the State of Alaska *Seed Regulations*, Alaska Administrative Code, Title 11, Chapter 34, (11 AAC 34), and the Federal Seed Act, 7 CFR Part 201.

The Engineer will review requests for genus, species, or cultivar substitutions(s). The Contractor shall submit a proposed seed mix accompanied by approval from the Alaska Plant Materials Center, and confirmation the vendor can provide the requested mix in quantities adequate for the project.

1. Prohibited and Restricted Noxious Weeds and Quarantined Pests. Furnish seed certified to be free of prohibited noxious weeds or quarantined pests, and certified to contain no more than the maximum allowable tolerances for restricted noxious weeds, according to 11 ACC 34.

   a. Seed found to contain prohibited noxious weeds or quarantined pests will be rejected, according to 11 AAC 34.020(a) and 11 AAC 34.105 through 34.180, respectively.

   b. Seed found to contain restricted noxious weed seed in excess of the maximum allowable tolerance per pound will be rejected, according to 11 AAC 34.020(b).

   Prohibited and restricted noxious weeds are listed in 11 AAC 34.020, and can be viewed at the following URL: http://plants.alaska.gov/invasives/noxious-weeds.htm.

2. Labeling. Ensure each bag or container of individual seed species is labeled to meet requirements of 11 AAC 34.010. Do not remove labels from bags or containers.

3. Certification. Certify seed is free of prohibited noxious weeds and restricted noxious weeds are within allowable tolerances. Furnish to the Engineer a statement signed by the vendor identifying the lot number or lot numbers, certifying each lot of seed has been tested within the preceding nine months, by a recognized seed testing laboratory, a member of the Association of Official Seed Certifying Agency (AOSCA), or the Alaska Plant Materials Center.

   Seed will be rejected if:

a. Contains prohibited noxious weeds;

b. Contains restricted noxious weeds above maximum allowable tolerances;

c. Not certified as tested within the preceding nine months;

d. Wet, moldy, or otherwise damaged in transit or storage; or

e. Containers do not have labels or the labels have been removed.

Seed may be rejected for:

a. Discrepancies in the lot numbers listed on the statement to the lot numbers indicated on the labels of the seed containers.

The Contractor shall immediately remove rejected seed from the project premises. If seed is rejected for containing prohibited noxious weeds or for exceeding maximum allowable tolerances of restricted noxious weeds, dispose of rejected seed according to 11 AAC 34.075(g).

C724-20.1130

Replace Section 726 with the following:

SECTION 726
TOPSOIL

726-2.01 TOPSOIL. Furnish topsoil that is representative of the existing, natural organic blanket of the project area, and free of prohibited and restricted noxious weeds (Prohibited and Restricted Noxious Weeds 11AAC 34.020 http://plants.alaska.gov/invasives/noxious-weeds.htm). 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

C726-20.0101-1

Replace Section 727 with the following:

SECTION 727
SOIL STABILIZATION MATERIAL

727-2.00 GENERAL. Free of restricted and prohibited noxious weeds (11 AAC 34), 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 stand-alone 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, barley, 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 Invasive Species Management Association (NAISMA) 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 NAISMA 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/yd^2 and a limiting shear stress of 0.45 lb/ft^2.

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/yd^2.

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, barley, or other approved grain crops that are 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), and in conjunction with North American Invasive Species Management Association (NAISMA) standards, and free of mold, or other objectionable materials detrimental to plant life. 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 products manufactured in Alaska 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. Non-certified straw or straw products manufactured in another state, country, or territory shall not be used. ECB may contain coconut or fiber to reinforce 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/yd^2 and a minimum limiting shear stress of 1.5 lb/ft^2. 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.

2. Compost Filter Berms and Filter Socks. Standard Practice for Compost for Erosion/Sediment Control (Filter Berms and Filter socks) R 51.

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 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.

C727-12.0508-2

SECTION 730
SIGN MATERIALS

730-2.04 SIGN POSTS.

Add No. 7:

7. Structural Tubing and W-Shape Beams.

   a. Structural tubing shall conform to ASTM A500, Grade B, or ASTM A501. The tubing shall be square and of the dimensions called for in the Plans with 0.2 inch thick walls. 0.4 inch diameter holes shall be drilled as required to permit mounting of the sign.

   b. W-shape beams shall conform to ASTM A36.

   c. Structural tubing and W-shape beams shall be hot dip galvanized according to 1.b. of this subsection. Damaged and abraded tubes and beams shall be repaired according to 1.c. of this subsection.

C730.1-04.0622

Replace Subsection 730-2.05 with the following:

730-2.05 FLEXIBLE DELINEATOR POSTS. Durable fiberglass composite, polymer, or plastic material meeting the dimensions and colors shown on the Plans. Resistant to ultraviolet light, ozone and hydrocarbon damage and remain flexible at a temperature of minus 40 °F. Provide posts with reflectors that are capable of self-erecting and remaining serviceable after 5 head-on impacts at 55 mph and 10 impacts at 35 mph with an automobile at an air temperature of plus 40 °F.

Terminal Markers - Flexible (marker). The marker includes the pole/post/rod (pole), reflective and retroreflective sheeting and mounting hardware.

Provide durable markers: resistant to impact from (snow and vehicle), vandals, ultraviolet light, moisture, ozone, and hydrocarbons.

When the pole is loaded, the marker shall bend/flex, remain flexible and oriented as installed continuing to function as designed without permanent displacement along the length of the member. Provide the flexibility in the primary vertical element, a connecting device between the vertical element and connection to the support member (spring or other) or a combination.

Provide a connection sufficient to transfer the loads from the pole to the supporting member without reducing the strength, flexibility, or durability of either. The connection shall not negatively influence the performance of the guardrail. Provide approval of the

connection from the marker manufacturer and support member manufacturer (if proprietary).

- Design Loads:

  - Impact load from snow thrown by snowplows
  - Weight of snow covering the pole (snow thrown from snowplows)
  - Wind loads (100 mph, 3 sec gust)

- Service Temperature Range: -40˚ F to +140˚ F.

- Pole:

  1. Material:

     - Steel, or
     - Stainless Steel, or
     - Other Poles:
       (a) Continuous glass fiber and marble reinforced thermosetting composite, or
       (b) Engineered plastic alloy, or
       (c) Fiberglass Reinforced Polyester (FRP)
       (d) High-Impact Polyolefins

  2. Dimensions

     - Top of Pole: 60 inches to 84 inches above top of guardrail
     - Width/Diameter: minimum = 1 1/4 inches, maximum = 2 inches (steel/stainless steel not be greater than 5/8 inch diameter)
     - Thickness: as required by design

  3. Visibility:

     - Daytime: Pole - color orange
       a. Steel and Stainless Steel Poles: Applied permanent finish.
       b. Other Poles: Color pigment ultraviolet stabilized and solid through the cross section from end to end.
     - Nighttime: Added retroreflective sheeting - color white
       a. Approximately 12 square inches visible from the traveled way before and after the marker. Applied to a flag attached to the pole or as banding applied directly to the pole. (A flag is required when using steel/stainless steel poles.)
       b. Place top edge of flag/banding 1 inch from top of pole.
          (1) Flag: Single retroreflective sheet each face
          (2) Banding: Two bands completely around marker, 4 inches between bands

- Hardware and Fasteners:

  - Steel, and/or
  - Stainless Steel, or
  - Aluminum alloy (hardware only)

Manufacturers of flexible markers (snowpoles):

Manufacturer	Model	Type	Contact
Nordic Fiberglass, Inc.	FF2	Steel Pole w/ Flag	Ph: (218) 745-5095
PEXCO	Model 3639	High-Impact Polyolefins	Ph: (404) 564-8560
New Century Northwest, LLC	NCN2549	Engineered Plastic Alloy	Ph: (541) 485-5566
Carsonite Composites, LLC	SNFB	Continuous glass fiber and marble reinforced thermosetting composite	Ph: (800) 648-7916

Submit manufacturer's specifications to the Engineer for review and approval before ordering terminal markers.

C730.2-17.1222

SECTION 731
WATERPROOFING MEMBRANE

731-2.01 SPRAY-APPLIED WATERPROOFING MEMBRANE. *Replace Table 731-1 SPRAY-APPLIED WATERPROOFING MEMBRANE with the following*:

Test	Requirements	Test Method
Adhesion to Concrete	100 psi min., with failure in concrete	ASTM D7234
Tensile Strength at Break	1500 psi min.	ASTM D638
Elongation at Break	130% min.	ASTM D638
Crack Bridging	Pass at 10 cycles of 1/8 inch when tested at -15°F	ASTM C1305
Interlayer Shear Strength	30 psi min.	AASHTO TP-114

Replace Section 740 with the following:

SECTION 740
SIGNALS AND LIGHTING MATERIALS

740-2.01 GENERAL. Use electrical materials, devices, fittings, and hardware that conform to applicable NEMA and ANSI standards.
Use electrical products that are Third Party Labeled or Listed (by an approved independent electrical testing laboratory such as UL, Electrical Testing Laboratories (ETL), Canadian Standards Association (CSA), etc.), unless otherwise indicated on the Materials Certification List (MCL).
Ensure that all material and workmanship, as determined by the Department, conform to the standards of the NEC, the NESC, and local safety codes as adopted and amended by the authority having jurisdiction.

740-2.02 SIGNAL AND LIGHTING STRUCTURES.

1. Design. Design and fabricate structures to conform to:

   a. Highway Lighting Structures. 2013 Edition of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals with 2013 Errata and 2015, 2019, and 2020 interim revisions and the highway lighting sheets in the Plans. Design must meet Fatigue Category II. Use a wind speed of 100 mph. Design each structure to support a sign with an area of 16 square feet with its centroid located 14 ft. above the pole base.

b. Breakaway Traffic Signal Structures. 2001 Edition of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals with interim revisions and Central Region Traffic Signal Details. Design must meet Fatigue Category II, a vibration mitigating device may be used in lieu of providing galloping computations, using a basic wind speed of 100 mph and Central Region standard loads.

c. Mastarm Traffic Signal Structures. 2013 Edition of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals with 2013 Errata and 2015, 2019, and 2020 Interim Revisions, and signal sheets in the Plans. Design must meet Fatigue Category I, a vibration mitigating device may be used in lieu of providing galloping computations, using a basic wind speed of 100 mph.

   A vibration mitigation device is a non-aerodynamic damper system that is purpose-built to mitigate vertical movement of signal mast arms. Effectiveness shall be proven through analytical methods approved by the engineer. The system shall be self-adapting and must not require structure specific tuning. The device must provide an 85 percent or greater vibration reduction.

A registered professional engineer shall design the structures and provide stamped shop drawings and calculations. Submit the stamped drawings and calculations for each pole to the Engineer for approval. Design for the complete-in-place structure including the supported hardware.

a. In the stamped calculations, indicate the edition of Standard Specifications to which the poles are being designed and provide the input data used to design each pole and mast arm, including: design wind speed, cross section shape, yield strengths of the component materials, dimensions of the pole components, and a summary of the loads used. For highway lighting structures, submit the actual total combined mass of luminaire supports and attached fixtures.

b. On the stamped shop drawings, provide design wind speed and the details for building the poles and mast arms, including: materials specifications, slip fit joint dimensions, pole component dimensions, welds that will be made, and the welding inspection that will be done.

Submit the mill certifications for the steel items (piles, plates, bolts, and other related items) to the Engineer for approval.

2. Fabrication. Fabricate signal and lighting structures from tapered steel tubes with a round or 16 sided cross section. Orient handholes located near the base of poles to face downstream of traffic flow.

   Furnish poles and mast arms up to 40 feet long in one piece. Poles and mast arms longer than 40 feet may be furnished in one piece or in two segments with a slip type field splice. For slip type joints, provide the minimum overlap specified in the Plans.

In mast arms, locate these splices at least one foot away from the Plan location of signal heads and signs. In signal poles, locate the edge of the female section at least 6 inches above the top of the signal mast arm connection.

Fabricate tubes with walls up to 1/2 inch thick from the prequalified base metals listed in AWS D1.1. Fabricate elements greater than 1/2 inch thick from steel that conforms to AASHTO M270 and meets the Fracture Critical Impact Test requirements for Zone 3. The Department will not accept structures that use laminated steel elements.

Fabricate the cross section of each tube from no more than 2 pieces of steel. When using 2 pieces, place the longitudinal welded seams directly opposite one another. Place the welded seams on adjacent sections to form continuous straight seams from the base to the top of the pole.

When tenons are needed to install traffic signals and luminaires, make them from two inch nominal schedule 40 pipe that conform to ASTM A 53 Grade B.

Fabricate breakaway signal poles in accordance with the Pole Sheet in the Plans. Fabricate signal poles 10 to 16 feet long from 7 gauge (US Standard) sheet steel. Fabricate each post with a minimum inside diameter at the base plate as shown in the Plans. Use 4 inch diameter by 4 inch Schedule 40, ASTM A53, Grade B pipe as a post-top adapter.

The Department does not allow holes made for lifting purposes in the ends of tubular segments, except in the free ends of luminaire mast arms. To add lift points, weld them to the tube opposite the longitudinal seam weld on the outside of female segments and on the inside of male segments. Before shipment, remove lift points added to the outside of the tubes, grind the area smooth with the base metal, and hot stick repair the finish according to Subsection 660-3.01.8.a. Lift points added to the inside of tubes in place may be left in place.

Hot-dip galvanize lighting and signal structures to meet AASHTO M 111 and these specifications. Galvanizing kettles will be large enough to completely submerge each element, the mast arm, and the pole. Submerge the complete/whole element in the galvanizing process. An element galvanized in sections will not be accepted. Galvanize bolts and fasteners to meet AASHTO M 232.

After the poles and mast arms are galvanized, remove all excess zinc from all drip lines and points and surfaces of all tube ends that form slip type joints to provide a smooth finish.

The Department will reject poles and mast arms that are:

a. Not fabricated according to these specifications or the approved shop drawings,
b. Bowed with sweeps exceeding 1 inch throughout the length of the pole, mast arm, or segment, if furnishing a 2-piece pole or mast arm,
c. Out of round. Sections are out of round when the diameters of round members or the dimension across the flats of multisided members exceed 2 percent of the dimension specified on the shop drawings.

Fabricate pile cap adapters from Grade X52 steel line pipe that conforms to API 5L and from steel plate that conforms to ASTM A 709 Grade 50. Attach the anchor plate to the pile section with a complete joint penetration (CJP) weld. Fabricate the anchor plate to match the base plate of the lighting standard.

3. Welding. Perform welding to conform to Subsection 504-3.01.7 and the 2013 Edition of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, the Central Region Traffic Signal Details, and the following:

   a. Make welds continuous. Grind exposed welds flush with the base metal at slip fit joints for the length of the slip fit joint plus one half the diameter of the female section.

   b. On steels 5/16 of an inch thick and thicker, inspect 100 Percent of CJP welds by either radiography (RT) or ultrasound (UT).

   c. Inspect a random 25 percent of PJP and fillet welds by magnetic particle (MT). If a defect is found, inspect 100% of the PJP and fillet welds made to fill the order. In steels less than 1/8 inch thick, complete the tests according to AWS D1.1.

   d. Only visually inspect welds made on luminaire mast arms.

4. Anchor Rods & Bolts. Furnish 2 inch diameter (nominal) anchor rods for signal poles that meet ASTM F1554 Grade 105, are 96 inch minimum length and conform to Supplemental Requirements; S2, Permanent Manufacturer's Identification, S3, Permanent Grade Identification and S-5 Charpy Impact Requirements. Hot dip galvanize according to AASHTO M232. Use nuts that conform to AASHTO Specification M292 of the grade, surface finish, and style for 2 inch diameter anchor rods. Washers shall conform to AASHTO M293.

5. Miscellaneous. Finish the edges of poles and mast arms to conform to the following requirements. Before hot dip galvanizing, neatly round the following features to the radius specified.

   a. On holes through which electrical conductors pass, provide a 1/16 inch radius on both the entrance and exit edges,

   b. On pole base plates, provide a 1/8 inch radius on edges along which plate thickness is measured and a smooth finish on all other exposed edges,

   c. On the ends of tubes that form slip type joints, complete the following tasks on the two surfaces that contact one another. First, provide 1/16 inch radii on the inside and outside edges of the female and male segments, respectively. Then for the length of the joint plus one half the diameter of the female section grind down welds until they feature a radius concentric with the mating surface and remove material protruding from the two surfaces.

Provide caps to cover the free ends of poles and mast arms.

Identify critical information for poles and arms with visible permanent aluminum tags that contain the information shown in Table 740-1. The measurements shown are for illustration purposes only. Use tags large enough to include required information using 1/4 inch high text, 3/8 inch of space between successive lines of text, and at least 3/8 inch of space between the edges of the tag and the text. Secure the tags with two 1/8 inch blind rivets at the base of poles and the underside of mast arms. If furnishing a two piece signal mast arm with slip type joint, mark both pieces with the same message. Provide the holes for the blind rivets before galvanizing.

TABLE 740-1

POLE MARKINGS

Note: Italic type indicates additional Tag Markings if poles have 2 luminaire or 2 signal mast arms.

POLES (Including Mast Arms)	**MEASUREMENTS**	**TAG MARKINGS**
Signal Poles		
Signal mast arm length	45 ft./55 ft.	SMA 45/*SMA 55*
Luminaire mast arm length	22 ft./18 ft.	LMA 22/*LMA 18*
Pole height	36 ft.	PH 36
Intersection number (if more than one) -pole number		1 - P 4
Sum of signal mast arm moments about centerline of signal pole		SM 4000/*SM 3200*
Design wind speed	100 mph	DWS 100
Light Poles		
Luminaire mast arm length	15 ft./15 ft.	LMA 15/*LMA 15*
Pole height	37 ft.	PH 37
Signal Mast Arm		
Mast arm length	40 ft.	SMA 40
Intersection number (if more than one) -pole number		1 - P 4
Sum of signal mast arm moments about centerline of signal pole		SM 3740
Design wind speed	100 mph	DWS 100
Luminaire Mast Arm		
Mast arm length	18 ft.	LMA 18
Pole number (if unique arm design)		P 4

740-2.03 WOOD POLES. Use wood poles for service or temporary installations of the class shown on the Plans or as specified in the Special Provisions.
Use 45-foot poles, except for service poles use 25-foot poles.

Use mast arms and tie rods for wood pole installations that conform to Subsection 740-2.02, and to the details shown on the Plans. Provide each mast arm with an insulated wire inlet and wood pole-mounting bracket for mast arm and tie rod crossarm.

Use structural timber meeting Section 713. Do not use poles that have more than 180 degrees twist in grain over the full length. Ensure that the sweep is no more than 4 inches. Pressure-treat wood poles, that are not to be painted, after fabrication. Meet Section 714.

740-2.04 RESERVED.

740-2.05 CONDUCTORS. Use conductor sizes based on the American Wire Gauge (AWG). Use sizes that conform to the Plans or, when not shown, to this subsection.

Use insulated conductors made of uncoated, stranded copper that conforms to the specifications of ASTM B8. Use grounding conductors that are bare copper of the gauge required by the NEC. They may be stranded, solid, or braided.

Provide the following markings on the outer coverings of conductors and cables on intervals of 2 feet or less: manufacturer, the number of conductors or pairs in cables, conductor size, 600V, the conductor or cable type and environmental conditions for which the conductor or cables are listed, and the symbol of an approved independent testing laboratory.

Use conductors meeting the referenced specifications for the following purposes:

1. Power Conductors. For individual conductors, install general-purpose building wire manufactured according to UL Standard 44, and NEMA No. WC7. Furnish conductors insulated with cross-linked polyethylene listed as type XHHW-2 and rated for 600 volts AC operation.

TABLE 740-2
CONDUCTOR TERMINATION TABLE

CONDUCTORS PER CABLE	CIRCUIT	WIRE COLOR	AWG. NO.	BAND LEGEND
7	Vehicle Red	Red	14	Head No.
	Vehicle Yellow	Orange		
	Vehicle Green	Green		
	Common Neutral	White		
	Spare	White/Black		
	Spare	Black		
	Spare	Blue		
7	Vehicle Red Arrow	Red	14	Head No.
	Vehicle Yellow Arrow	Orange		
	Vehicle Green Arrow	Green		
	Common Neutral	White		
	Spare	White/Black		
	Spare	Black		
	Spare	Blue		
7	Vehicle Red	Red	14	Head No.
	Vehicle Yellow	Orange		
	Vehicle Green	Green		
	Common Neutral	White		
	Spare	White/Black		
	Vehicle Yellow Arrow	Black		
	Vehicle Green Arrow	Blue		
5 MOA Ped Signals	Pedestrian Don't Walk	Red	14	Head No.
	Pedestrian Walk	Green		
	Common Neutral	White		
	Spare	Orange		
	Spare	Black		
4 SOA Ped Signals	Pedestrian Don't Walk	Red	14	Head No.
	Pedestrian Walk	Green		
	Common Neutral	White		
	Spare	Black		
4 SOA Ped Buttons	Pedestrian Pushbutton	Black	14	Head No.
	Neutral	White		
	Spare	Red		
	Spare	Green		
3 MOA Ped Buttons	Pedestrian Pushbutton	Black	14	Head No.
	Neutral	White		
	Spare	Red		

TABLE 740-2
CONDUCTOR TERMINATION TABLE
(Continued)

CONDUCTORS PER CABLE	CIRCUIT	WIRE COLOR	AWG NO.	BAND LEGEND
3	Flashing Beacon	Black	14	Head No.
	Neutral	White		
	Spare	Red		
3	Per Manufacturer Installation Instructions	Orange	20	"PRE"
		Blue		
		Yellow		
3	Preemption Confirmation	Black	14	"PRECON"
	Neutral	White		
	Spare	Red		
3	Highway Luminaire	Black	8 or 6	Circuit No.
	Highway Luminaire	Red		Circuit No.
	Highway Luminaire Spare	White		
5	Photo Electric Control	Black	14	PEC
	Load to Contactor	Red		
	Neutral	White		
	Spare	Orange		
	Spare	Green		
3	Service to Controller	Black	6 or 4	"SIG"
	Neutral	White		No Band
	Spare	Red		No Band
3	Sign Luminaire	Black	8	SIGN
	Sign Luminaire	Red		SIGN
	Sign Spare	White		

Use size 10 AWG wire for illumination tap conductors. In an electrolier, the illumination tap conductors run from the fused disconnect kit to the ballast in the luminaire. Furnish conductors with black, red, or white colored insulation as required to identify the two phase and neutral conductors, respectively.

If conductors in controller cabinets carry the full signal load circuit, use size 10 AWG or larger conductors. Use orange-colored conductors from the flash transfer relay to program emergency flashing operation.

2. Illumination Cables. For cables that consist of three size 6 or 8 AWG conductors, furnish power cables that feature three conductors, each insulated with cross-linked

polyethylene, and a black, low density, high molecular weight polyethylene jacket. Use insulated conductors listed as type XHHW-2. Furnish these cables with one black, one white, and one red colored conductor and no grounding conductor. Use cables rated for 600 volts AC operation.

Use insulated conductors meeting UL Standard 44. The jacket must also meet NEMA No. WC70.

3. Power Cables. For cables that consist of three size 4 AWG and larger conductors, furnish tray cables that feature three conductors, each insulated with cross-linked polyethylene that meets the requirements of XHHW-2, and a polyvinyl chloride (PVC) jacket. Furnish these cables without an integral grounding conductor. Use cables manufactured according to UL Standard 1277, ICEA S-95-658, and NEMA No. WC70. Provide cables listed for direct burial and resistance to sunlight and rated for 600 volts AC operation.

   Furnish these cables with black conductor insulation with one printed number (1, 2, or 3) identifying each conductor.
4. Control Cables. Wire with signal cable meeting IMSA 20-1 all vehicular signal heads, pedestrian signal heads, pedestrian push button detectors, flashing beacons, hardwired local coordination and preemption devices, and photoelectric controls.

5. Detector Loops. Use No. 14 AWG conductors for detector inductive loops that meet IMSA Specification 51-3, Type RHW/USE, or IMSA Specification 51-5, when called for on the Plans or specified in the Special Provisions.

6. Loop Lead-In Cables. Unless otherwise specified, use a tray cable that conforms to the following specifications to connect the loop detectors to the terminal blocks in the controller cabinet. Furnish this cable, also known as Snyder Cable; manufactured according to UL Standard 1277. Supply these cables third party certified as Type TC and certified for use in underground conduit or as an aerial cable supported by a messenger and rated for 600 volts AC operation.

   Use size 18 AWG, 16 strand, tinned copper conductors per ASTM B33 insulated with wet-rated, cross-linked polyethylene similar to XHHW. Furnish conductors with insulation colors that match Table 660-1 twisted into pairs.
   Provide each twisted pair with an overall aluminum foil coated mylar shield that provides 100% coverage and a 20 AWG tinned copper drain wire that is in constant contact with the foil side of the shield. Apply a tight-fitting polyvinyl chloride jacket over the conductor assembly.
   Only use the following loop lead-in cable, also known as shielded data cable, to rewire existing traffic signals when specified. Use cables that consist of 7 twisted pairs that consist of stranded, size 18 AWG tinned copper wire and polyethylene or polypropylene insulation. Furnish each pair covered with an aluminum foil shield, stranded copper drain wire, and an overall PVC or PE jacket. Use cable rated for 300 volts and whose colored pairs match those specified in Table 660-1.
7. Telemetry Cable. Use interconnect cable that consists of solid copper conductors of the number of pairs called for in the Plans meeting the requirements of Rural Utilities

Service (formerly the Rural Electrification Administration (REA) specification PE-39 for filled telephone cables. The shield may be either copper or aluminum.

8. **TABLE 740-3**
9. **INTERCONNECT TERMINATION TABLE**

TELEMETRY CABLE: Type PE-39, No. 19 AWG, Solid Copper, as noted on the Plans or in the Special Provisions					
Pair No.	**Tip**	**Ring**	**Pair No.**	**Tip**	**Ring**
1	White	Blue	14	Black	Brown
2	White	Orange	15	Black	Slate
3	White	Green	16	Yellow	Blue
4	White	Brown	17	Yellow	Orange
5	White	Slate	18	Yellow	Green
6	Red	Blue	19	Yellow	Brown
7	Red	Orange	20	Yellow	Slate
8	Red	Green	21	Violet	Blue
9	Red	Brown	22	Violet	Orange
10	Red	Slate	23	Violet	Green
11	Black	Blue	24	Violet	Brown
12	Black	Orange	25	Violet	Slate
13	Black	Green			

10.

HARDWIRE CABLES: IMSA Type 20-1, (2) 7 conductor No. 14 AWG			
Cable No. 1		Cable No. 2	
Circuit	**Color**	**Circuit**	**Color**
Cycle 2	Green	Offset 1	Green
Cycle 3	Orange	Offset 2	Orange
Cycle 4	Red	Offset 3	Red
Free	Blue	Split 2	Blue
Common	White	Common	White
Spare	Black	Spare	Black
Spare	White/Black	Spare	White/Black

740-2.06 ELECTRICAL CONDUIT. Unless specified otherwise, use rigid metal conduit and fittings for raceways. Furnish galvanized rigid type conduit and elbows conforming to UL Standard 6 and are manufactured of mild steel according to ANSI C80.1. Furnish third party certified fittings designed for rigid metal conduit.

For loop detectors, use Schedule 80 polyvinyl chloride (PVC) conduit that conforms to UL Standard 651. Use PVC fittings meeting NEMA TC 3.

When polyethylene conduits are specified in the Plans, use a smooth wall, schedule 40, high-density polyethylene (HDPE) pipe that conforms to UL Standard 651 B and NEMA TC-7-2000.

Furnish insulated throat grounding bushings made of malleable iron or steel with a mechanically galvanized or zinc plated finish. Grounding lugs shall either be an integral part of the bushing or consist of an attached tin-plated copper saddle. Grounding lugs shall feature a stainless-steel screw, the centerline of which falls within 20 degrees of conduit centerline. The bushings furnished shall also feature a stainless steel or brass mounting screw that locks the bushing onto the conduit end.

Furnish conduit outlet bodies and their covers with a hot dip galvanized finish and stainless-steel screws. For loop detectors, furnish Type X bodies and, for photoelectric control installation, furnish Types C and LB conduit bodies.

When Myers hubs are specified, furnish rain tight, grounding type hubs made of malleable iron with a hot dip or mechanically galvanized finish.

At expansion joints, provide watertight expansion fittings capable of the following movements without damaging the conduits attached to it or the conductors that pass through it. The movements include: axial expansion or contraction to 3/4 inch, angular misalignments in any direction to 30 degrees, and parallel misalignment of the conduits to 3/4 inch. The fittings shall also include a braided copper bonding jumper equal to an 8 AWG conductor, bushings to prevent scraping the conductors, and a smooth inner sleeve that maintains a constant diameter regardless of conduit alignment.

740-2.07 FUSED SPLICE CONNECTORS. Use fused, quick disconnect, splice connector that is weather tight and has two halves: a single-unit line side socket and a load-side plug. For LED fixtures, use fuses that are 5 amperes, midget (13/32” x 1-1/2”) ferrule type with a time delay (slow blow) type design. For all other fixtures, use 10 amperes, midget (13/32” x 1-1/2“) ferrule type with a fast acting current limiting design.

740-2.08 SIGN SWITCHES. Provide a NEMA 3R non-fused disconnect switch as shown on the Plans for each sign illumination installation.

740-2.09 CONTROLLER ASSEMBLIES. Provide solid state, traffic controller assemblies having level 2 conformance to NEMA Standard Publication TS 2-2003 V02.06, Traffic Controller Assemblies with the National Transportation Communications for Intelligent Transportation Systems Protocol (NTCIP) Requirements as defined in NTCIP 1202.

Traffic Controller Assemblies must meet or exceed the Environmental Requirements of Section 2 of the NEMA TS2-2003 V02.06 document. The Original Equipment Manufacturer (OEM) and its manufacturing and testing facilities shall be ISO 9001:2000 certified for processes involving the Traffic Controller Assemblies.

Use traffic control equipment that is compatible with the existing traffic signal monitoring system. Compatibility must be 100% at the cabinet level to include inputs, outputs, telemetry protocol, and block upload and download of RAM data.

In addition, features of the existing local controllers and controller modules must be functionally duplicated to meet or exceed the performance of the existing equipment.

The existing local controller cabinets at other intersections include the following equipment:

1. Econolite ASC/3-2100

Use LED indicators for all electronic devices covered under Subsections 740-2.09 through 740-2.13.

740-2.10 CONTROLLER UNIT.

1. Actuated Controller Unit (CU). Provide solid state, Type A2N CU meeting the requirements of Section 3 of the NEMA Standard Publication TS 2-2003 V02.06, Traffic Controller Assemblies with NTCIP Requirements.

    a. The CU must meet the referenced National Transportation Communications for Intelligent Transportation Systems Protocol (NTCIP) and comply with publication TS 3.2 the Simple Transportation Management Framework, and shall meet the requirements for Conformance Level 2.

    b. The software shall comply with NEMA TS 3.3, the Class B Profile, and shall include both an EIA/TIA 232-E and an FSK modem interface for NTCIP based communications.

    c. The CU shall implement conformance groups and optional object groups as defined in NEMA TS 3.4 and TS 3.5 for A2N level 2.

    d. Provide controllers with display heaters or enhancements to improve viewing in temperatures below 0°F.

    e. Provide controllers having an interface compatible with SYNCRO-7 traffic modeling software.

Furnish Econolite Cobalt ATC Touch 2100 controller unit with the following optional features:

1. User interface Advanced Display with graphics and touch-screen

2. TS2 Type I connector
3. Data Key 3.3V, 8MB

740-2.11 CONTROLLER CABINET. Provide a controller cabinet that meets the requirements of NEMA Standard TS 2-2003 V02.06 Traffic Controller Assemblies with National Transportation Communications for Intelligent Transportation Systems Protocol (NTCIP) Requirements (NEMA TS-2), Section 5 Terminals and Facilities and Section 7 Cabinets.

1. Standard Features. Supply the following standard features:

   a. Materials

      Unless otherwise designated in the Plans, provide cabinets constructed of sheet Aluminum.

   b. Cabinet Dimensions and Bracing

      Unless otherwise designated in the Plans, provide a size 7 cabinet as defined in NEMA TS-2 Table 7-1.

      The cabinet shall include 1.0” x 0.25” diagonal aluminum cross bracing welded to the back door frame of the cabinet.

   c. Doors

      Provide a cabinet with full size lockable front and rear doors meeting the requirements of NEMA TS-2 Section 7.5. The locks must accept a Best CX series core that will be installed by the Department after the Contract is complete.

      The front and rear doors shall be provided with top and bottom catches to hold the door open at both 90 and 180 ± 10 degrees. The catches shall be capable of holding the doors open at 90 degrees in a 60-mph wind acting at an angle perpendicular to the plane of the door.

   d. Shelves

      Provide shelves meeting the requirements of NEMA TS-2 Section 7.6.

      Shelves shall have a 3/8” lip on the front and back while not limiting access to equipment. Top shelf shall be braced to support additional weight of uninterruptable power supply (UPS) battery up to 150 lbs. Provide a restraint at the front and back.

      Provide additional laptop computer shelf mounted approximately 30” above cabinet floor. The laptop shelf must accommodate a standard 17" computer and be retractable below one of the cabinets’ shelves.

   e. Finish and Preparation

Unless otherwise designated in the Plans, provide unpainted Aluminum Cabinets with a "natural" brushed appearance.

f. Cabinet Mounting

(1) Provide cabinet mounting features as defined NEMA TS-2 Section 7.8.

(2) The cabinet manufacturer is responsible for providing a cabinet that will mount without modification on the foundation detailed in Alaska Department of Transportation Central Region, Regional Detail, Controller Cabinet Foundation.

g. Cabinet Ventilation

Furnish a cabinet that fully meets the requirements of NEMA TS-2 Section 7.9 and the following:

(1) Furnish the fan and cabinet vent with internally mounted metal covers that are fabricated to close off the flow of air during winter operation.

(2) Equip the cabinet with a selectable, 750/1500 watt cabinet heating device. The heating device must have a remote air sensing thermostat. The contacts must be rated 20 amps, 120 volts, 60 hertz.

(a) Construct the thermostat so that contacts close on descending temperature and are adjustable between 0 and 30 °F ±5 °F. The contacts must open on rising temperatures of 15 °F above the closing temperature. The adjustment must have an indicating pointer.

(b) Connect the thermostat in series with an electrical resistance heater and blower fan. The blower fan must be rated for continuous duty. The heater and fan must be connected in parallel and rated 120 volts, 60 Hertz. Mount the unit in the vertical position on the cabinet door. The thermostat shall be mounted immediately to the left of the heating device on the cabinet door.

(c) Do not block the air intake or outlet. Provide the unit with a SPST manual override switch that bypasses the thermostat to enable the fan and heater to operate at warmer temperatures.

h. Auxiliary Cabinet Equipment

(1) Mount a 4000K LED strip lighting fixture on the inside of the cabinet near the top front edge and under the controller shelf. The lighting fixture "ON-Off" switch must be a toggle switch mounted on an inside control panel. Include in the circuit a door actuated switch that turns the light ON when the door is open and OFF when the door is closed.

(2) Provide three (3) paper sets of complete and accurate cabinet drawings with delivery of each cabinet. Make cabinet drawings available electronically in

DOT&PF's current version of AutoCAD and deliver with paper set, along with a ".pdf" copy.

(3) Provide one (1) paper set of manuals for the controller and Malfunction Management Unit with each cabinet. Make said manual available in electronic Adobe ".pdf" format and deliver with paper set.

i. Cabinet Wiring

Neatly arrange the wiring within controller cabinets to conform to the requirements of Subsections 660-3.05 and 740-2.05. Furnish controller cabinets wired to accommodate:

(1) Configuration #4 in Table 5-2 of the NEMA Standards Publications No. TS 2-2003 V02.06, Traffic Controller Assemblies with NTCIP requirements with two each Type 2 detector racks.

(a) Equip the cabinet with required control and auxiliary equipment connecting cables to operate the phases and detection indicated on the Plans, including future use.

(b) Size wiring, switches, surge protectors, flash relays, and flashers to handle the necessary amperage required under full cabinet use. Use orange-colored wires to run from the flash transfer relay used for emergency flash programming.

(c) Wire the cabinet to accommodate 6 unique preempt sequences as defined by NEMA TS-2 Section 3.7 and 2 auxiliary preempt sequences. Configure each detector rack to accommodate 4 unique sequences.

j. Field Terminal Blocks

Provide Terminals and Facilities meeting the requirements of NEMA TS-2 Section 5, Configuration #4 (Table 5-2) and the following:

(1) Provide 2 or more insulated terminal blocks to terminate field conductors. Provide each block with 12 poles with 10-32 screw type terminals. Use a terminal block that is a barrier type with removable shorting bars in each of the 12 positions and with integral type marking strips. Terminate conductors to a terminal block.

(2) Terminate conductors from the controller unit in ring type terminal lugs or solder them to a through panel solder lug on the rear side of the terminal. Terminate other conductors in spade type terminal lugs.

(3) Do not bring more than 3 conductors to any one terminal. Two flat metal jumpers, straight or U shaped, may also be placed under a terminal screw.

Fully engage at least 2 full threads of terminal screws when the screw is tightened. Do not extend live parts beyond the barrier.

(4) Terminals must be provided to terminate a future 25 pair interconnect cable with each conductor terminated on individual terminals. Terminate interconnect cable conductors on individual terminals.

(5) On the right side of controller cabinets, install three (3) 16 position bus bars, for terminating the equipment grounding and neutral conductors used inside the cabinets. On the left side of the controller cabinets, install one (1) 32 position bus bar and one (1) 16 position bus bar for terminating the equipment grounding and neutral conductors from field wiring.

k. Cabinet Accessories

See NEMA Standard TS 2-2003 V02.06, Section 5 Terminals and Facilities, Figure 5-4 Cabinet Power Distribution Schematic for Items (1) through (6).

(1) Disconnecting Means

(a) Main circuit breaker must be a single pole, 20 ampere, 10,000 amperes interrupting capacity for each cabinet.

(b) Auxiliary circuit breaker(s) must be single pole, 20 ampere, 10,000 amperes interrupting capacity to protect fan, heater, light, and convenience outlet(s).

The rating of the main disconnect means with overcurrent protection must be not less than 125% of the maximum anticipated continuous load. When using disconnecting circuit breakers, use "trip indicating trip free," Type.

(2) Signal Bus. Connect the signal bus to the incoming AC line through a signal bus mercury contactor and an overcurrent protection device. Energize the signal bus mercury contactor to provide power to the signal bus. The current rating of the signal bus mercury contactor must be at least the current rating of the main overcurrent protection device.

(3) AC Service Transient Suppression. Connect the transient suppression device for the primary feed of the cabinet on the load side of the cabinet overcurrent protection device. The transient voltage suppression device connected to the controller power circuit must provide protection against voltage abnormalities of 1 cycle or less duration.

(a) The suppressor must be solid state high energy circuit containing no spark gap, gas tube, or crow bar component. The current rating of the device must be 15 amps minimum. The device must provide transient protection between neutral and ground, line and ground, as well as line and neutral. If the protection circuits fail, they must fail to an open circuit condition. The device must meet requirements of UL Standard 1449.

(b) The suppressed voltage rating must be 600 volts or less when subject to an impulse of 6,000 volt, 3,000 amp source impedance, 8.0/20 microsecond waveform as described in UL Standard 1449. In addition, the device must withstand, without failure or permanent damage, one full cycle at 264 volts RMS.

(c) The device must contain circuitry to prevent self-induced regenerative ringing. There must be a failure warning indicator light that must illuminate when the device has failed and is no longer operable. The transient suppression device must withstand a 20,000 ampere surge current with an 8x20 microsecond (time to crest x time to second halfcrest) waveform 20 times at 3 minute intervals between surges without damage or degradation to the suppressor. Output voltage must not exceed 500 volts at any time during the test. Use a device that is a solid state, high energy circuit with no spark gap, gas tube, or bar component.

(4) Radio Interference Suppression. Equip each traffic cabinet, flasher, and other current interrupting device with a suitable radio interference suppressor installed at the input power point. Install the radio interference suppressor after the AC service transient suppression unit described in Subsection 740-2.11.1.k (3). It must provide a minimum attenuation of 50 decibels over a frequency range from 200 kilohertz to 75 megahertz, when used with normal installations.

(a) The interference suppressor must be hermetically sealed in a substantial metal case filled with suitable insulating compound. Terminals must be nickel plated, 10-24 brass studs of sufficient external length to provide space for connecting two No. 8 conductors and must be so mounted that the terminals cannot be turned in the case. Ungrounded terminals must be properly insulated from each other and must maintain a surface leakage distance of not less than 1/4 inch between any exposed current conductor and any other metallic part, with an insulation factor of 100 to 200 megohms dependent on external circuit conditions.

(b) The radio interference suppressor must have a minimum current rating equal to the rating of the main disconnect means as specified in Subsection 740-2.11.1.k (1) (a). It must be designed for operation on 120 volts, 60 hertz, single phase circuits and be UL and EIA compliant.

(c) Connect the ground connection of the radio interference suppressor only to AC neutral. Do not connect to Earth Ground directly.

(5) Communications Transient Suppression. Provide a transient suppressor for the system interface communications lines when used. This suppressor must withstand a 100 ampere 10 x 700 microsecond waveform 20 times at 30 second intervals between surges without damage or degradation to the suppressor. Apply the transient surge both line to line and line to ground. Output voltage must not exceed 8 volts line to line and line to ground. Output

voltage must not exceed 8 volts line to line or 250 volts line to ground at any time during the test.

(6) Control Panel. Provide and label a control panel assembly that is readily accessible from the front of the cabinet. The control panel assembly must consist of:

(a) "controller power" switch to energize the controller while the signal lights are off or are being operated by the flasher. Label and rate the switch for load current.

(b) An electrical outlet. It must be a duplex, 3 prong, NEMA Type 5-20R grounding type outlet with independent ground fault circuit protection.

(c) "auto/flash" switch that when placed in the "flash" position provides flashing operation without interrupting the controller unit power. When the switch is placed in the "auto" position the controller unit must provide normal operation.

(d) "stop time/off/on" switch that when placed in the "stop time" position causes the controller unit to stop time. In the "off" position, the controller unit must be active regardless of external commands. In the "on" position, the timing must be normal but subject to external command interruptions.

(e) momentary contact test switches to place calls on each vehicle and pedestrian phase. Switches must provide tactile feedback and be rated at 1 ampere, minimum, for a resistive load at 120 VAC and at 28 VDC. Contacts must be coin silver or gold plated and be enclosed and labeled as to their function.

(f) Tamper-proof toggle covers on door control switches.

(7) Police Panel Assembly. Provide a Police Compartment meeting the requirements of NEMA TS-2 Section 7.5.7. The Police Compartment shall include a Universal Serial Bus (USB) port allowing connectivity with the controller when the door is closed and house the following switches with permanent labels:

(a) "flash/automatic" switches that when placed in the "flash" position causes the intersection displays to go into the flashing mode. When placed in the "automatic" position, the signal system must resume normal operation.

(b) "signals on/off" switch that when placed in the "off" position removes power from the signal bus. Do not allow power on the bus when either "automatic" or "flash" operation is selected by any means.

(8) Power panel cover. Provide a clear plastic cover over the power panel and Utility power terminal block. Cover shall be a minimum thickness of 0.1” and

firmly attach at four points. Holes shall be slotted for easy removal and replacement.

(9) Power Input Module. Provide an Econolite Zinc Blue Power Input Module (PIM).

(a) Separate the power circuit for auxiliary equipment not intended to be powered by UPS or generator per plans and specifications.

(b) Wire signal equipment to be powered by UPS or generator through existing individual breaker, filters, sine wave trackers, surge protector, and PIM or size new breaker, if required.

(10) Power outlet strips. Provide filtered aluminum power strip(s) as listed in the Plans. Power strips shall have 125 volt receptacles and 15 amp thermal-type circuit breakers with resets.

2. Special Features. Provide special features if called for in the Plans or as specified in the Special Provisions.

Coordination "Remote/Time of Day/Free" Switch. When the switch is in the "Remote" position, supervisory functions performed on the controller unit from a master coordinator or central computer must operate normally.

When the switch is in the "Time of Day" position, the local controller must use the local coordinators time of day plan. When the switch is in the "Free" position, it must be possible to remove any or all coordination devices and maintain normal, non-coordinated controller operation without wire jumpers, jumper plugs or other special devices. Provide this switch if a local coordination or system modem/interface unit is shown on the Plans.

740-2.12 STANDARD AUXILIARY EQUIPMENT.

Provide equipment meeting the requirements of Section 6 of the NEMA Standard Publication TS 2-2003 V02.06, Traffic Controller Assemblies with the National Transportation Communications for Intelligent Transportation Systems Protocol (NTCIP) Requirements (NEMA TS-2).

1. Three Circuit Solid State Load Switches. Use load switches conforming to NEMA TS-2, Section 6.2 Three Circuit Solid State Load Switches and as a minimum include Light Emitting Diode indicators on the DC input circuitry. The load switch must have three independent switching circuits, each being an individually replaceable solid state module.

2. Solid State Flasher. Use a NEMA Type III flasher unit that conforms to NEMA TS-2, Section 6.3 Solid State Flashers.

3. Malfunction Management Unit (MMU2). Provide Type 16 MMU2 to be fully compliant with the requirements of NEMA TS-2, Section 4. In addition, the MMU2 shall have a

full intersection LCD back lighted signal on the front panel and shall be downward compatible with TS-1 CMUs.

4. Flash Transfer Relay. Use flash transfer relays that meet the requirements of NEMA TS-2, Section 6.4 Flash Transfer Relays.

5. Load Switch Test Socket. Provide 120V AC receptacle to allow for bump testing of indications.

740-2.13 SPECIAL AUXILIARY EQUIPMENT. Use the following special auxiliary equipment when called for on the Plans and/or Special Provisions:

Provide equipment meeting the requirements of the cited Sections of the NEMA Standard Publication TS 2-2003 V02.06, Traffic Controller Assemblies with National Transportation Communications for Intelligent Transportation Systems Protocol (NTCIP) Requirements (NEMA TS-2).

1. Local Coordination Units. Provide actuated coordination that conforms to the requirements of NEMA TS-2, Section 3.6 Actuated Coordination.

2. System Modem/Interface Unit. Supply a system modem/interface unit assembly that is compatible with the existing computerized traffic control system.

3. Preemption Units. Provide preemption that conforms to the requirements of NEMA TS-2, Section 3.7 Preemption and the following:

   Install the following components of the GTT Company's Opticom Priority Control System according to GTT's written installation instructions at the signalized intersections listed on the Plans.

   a. The system must be capable of sending a signal to the controller when an Opticom signal from a vehicle mounted "GTT OPTICOM Emitter" has been received and maintained for a period of 1.7 seconds.

   b. Unless otherwise shown on the Plan, use Opticom Traffic Control Systems Opticom Detector Model 721 preemption detectors for infrared detector units and Opticom Model 3100 Global Positioning System (GPS)/Radio Unit containing a GPS receiver with Antenna and a 2.4 GHz spread transceiver with antenna for GPS detector units.

   c. Furnish the appropriate number of Opticom Traffic Control Systems 764 Phase Selectors to meet the number of channels of detection for each intersection. Use rack mounted phase selectors.

   d. The controller cabinet shall be wired with a Model 768 Auxiliary Interface Panel for the full utilization of all auxiliary detector and green sensing operations of the 764 Phase Selectors. Wire the cabinet with a Model 757 Auxiliary harness for interface between cabinet terminal blocks and Model 768 Auxiliary Interface panel.

e. Install Model 138 detector lead in cable between the end of each signal mast arm and the controller cabinet for infrared detector units. Install Model 1070 GPS Installation cable when GPS units are specified. Furnish enough slack in these cables for them to extend 2 feet beyond the end of each signal mast arm and to leave 10 feet of slack in the controller cabinet. Seal both ends of each lead in cable with mastic lined, heat shrink tubing end caps.

f. The controller, rather than the phase selector or auxiliary logic, must perform interval timing, signal sequences, and phase skips.

g. Mount detectors according to manufacturer recommendations or as approved by the Engineer. Mount and aim detectors to provide maximum emergency vehicle recognition. Detector locations shown on the Plans are approximate and subject to change as directed by the Engineer.

h. When emitters are required, provide GTT Opticom Priority Control System, Model 794HM Emitter with Model 2100 High Priority Radio/GPS Vehicle Control Unit and 210 Vehicle Interface Cable. The Emitter shall be factory programmed to the class and vehicle identification numbers assigned by jurisdiction as shown in the Plans and the following:

   (1) Class 0 and Vehicle ID. Number 0 (Zero) shall be disabled for Emitters.

   (2) Vehicle ID. Numbers shall be sequential, beginning with the lowest number in the EVP Emitter table for the appropriate class.

   (3) Provide one copy of 790IS Emitter Software Kit including "Y" cable.

   (4) One GTT Opticom Portable Emitter Kit with 794HM emitter on a magnetic base, 2100 Control Unit and cigarette lighter adapter power cord in a "Camera Bag" case.

i. Manufacturer Assisted Start up. The Contractor shall retain the services of a representative from the GTT Opticom GPS equipment manufacturer and the controller equipment manufacturer Econolite (collectively Manufacturer's Representative), subject to the approval of the Engineer. The Manufacturer's Representative shall have previous experience with either the Central Region DOT&PF or Northern Region DOT&PF in assisting with traffic signal controller testing, field testing and turn on. Submit name(s) and professional credentials at least 30 days before beginning this work. When required, work on, and connections to, the Opticom GPS preemption system, vehicle equipment, and related equipment shall be performed by or directly supervised by a qualified person serving as the Manufacturer's Representative.

   On-Site manufacturer assisted startup will be required for all intersections scheduled for GPS Opticom installations shown in the Plans. Red-lined cabinet

prints shall be altered electronically and provided in hard copy, ".pdf", and AutoCAD format for each cabinet receiving GPS Opticom installation.

Telephonic manufacturer assisted start-up required for all intersections that do not require on-site manufacturer assisted start up as indicated above.

(1) Required Credentials of Manufacturer's Representative

(a) 10 years experience working in the traffic controller industry, 5 years of that must have been as a signal technician.
(b) Must have IMSA Traffic Signal Technician, Level II certification
(c) Experience assisting with the Northern Region DOT&PF, or the Central Region DOT&PF
(d) Familiarity with both the NEMA TS1 and TS2 specifications
(e) Competent to read cabinet wiring diagrams and troubleshoot cabinet components
(f) Competent to troubleshoot Preemption issues
(g) Competent to test and Install GPS Preemption components
(h) Competent to conduct training on installed components

(2) Training Except as otherwise noted, immediately preceding or following the Manufacturers Startup of the GPS Opticom System, the vendor shall provide training. All training is to be provided by a representative of the original equipment manufacturer. Training may be attended by any number of DOT&PF personnel from any of its three regions. Required training includes:

(3) Provide 7.5 hours of instruction on the proper setup of the Radio/GPS Opticom Emergency Vehicle Preemption system. Training is to include all information necessary to properly set up and operate the Radio/GPS Opticom system as well as instruction on integration or use of the Opticom equipment/software with the Traffic Management system software, Centracs. The training audience is DOT&PF & MOA traffic Engineers. Deliver training time, day and location mutually agreeable to the contractor and the Traffic Design or Operations Engineer.

(4) When emitters are included in the project provide two (2) 4.0 hour sessions of instruction on the proper use of the Radio/GPS based Opticom emitter. Training must be provided by a representative authorized by the original equipment manufacturer. Training is to include all information necessary to properly operate the Radio/GPS Opticom emitter. Deliver training at a time, day and location mutually agreeable to the contractor and the Traffic Design or Operations Engineer. One of the two training sessions will be delivered in the

evening between 6:00pm and 12:00 am. Note; training will not be accepted until contract required equipment is delivered.

(5) Upon completion of training the manufacturer representative shall provide two (2) copies on thumb drives and two (2) copies on CD of any software required for setup, operation of, or maintenance of the GPS Opticom system components. This includes but is not limited to On-Site Interface Software and Central Managements Software.

4. Bus Interface Unit (BIU). Provide BIU's that fully meet the requirements of NEMA TS-2 Section 8. Unless otherwise called for in the Plans provide BIU's that meet the NEMA designation BIU2.

5. Traffic Logging System. If called for in the Plans, furnish, and install in the controller cabinet, a stand-alone unit that collects, time stamps, and stores data in an unattended manner.

6. Radar Detection System. For vehicle detection, provide a complete and functional Wavetronix digital wave radar vision system including the following:

   a. Stop Bar Detector (SBD). For all intersection approaches indicated in the Plans, provide a Wavetronix SmartSensor Matrix™.

   b. Continuous Tracking Advance Detector (CTAD). For all intersection approaches indicated in the Plans, provide a Wavetronix SmartSensor Advance Extended Range™.

   c. Sensor Mount. For each detector indicated in the Plans, provide a Wavetronix SmartSensor™ Mount with Add-on Knuckle.

   d. Cabinet Interface Device. For each signal controller cabinet, provide the quantity of Wavetronix Click 650 or Click 656 devices indicated in the Plans.

   e. Configuration Software. Provide SmartSensor Manager Matrix (SSMM) software to configure and monitor the radar detectors.

   f. Cable. Provide each of the following:

      (1) SmartSensor™ 6-conductor Cable. For each radar detector, provide a sufficient length of Wavetronix SmartSensor™ 6-conductor Cable needed to connect radar detectors to mini junction boxes.

      (2) Home Run Cable. Provide SmartSensor™ system compatible UL listed 2PR or 2 triad 22AWG + PR 18AWG shielded cable consisting of stranded, tinned, copper conductors with PVC insulations in a PVC jacket. Conductors shall be identified as white or gray/orange & orange (22AWG), white or gray/blue & blue (22AWG), black & red (18AWG). Drain wire shall be minimum 22AWG.

For each radar detector, provide sufficient cable to run from the sensor cable junction box mini to the cabinet interface device inside the signal controller cabinet. Provide 15 feet of neatly coiled slack cable in the base of the signal controller cabinet foundation. Provide sufficient slack at the pole so the in-line terminal enclosure can be pulled out of the handhole for maintenance work.

g. Sensor Cable Junction Box Mini. For each radar detector, provide a sensor cable junction box mini to provide a connection between the sensor's pigtail cable and home run cable.

h. Support. The SBD and CTAD manufacturer shall provide both training and technical support services.

(1) Training. The manufacturer-provided training shall be sufficient to fully train installers and operators in the installation, configuration, and use of the SBD to ensure accurate SBD performance.

(2) Technical Assistance. A manufacturer-provided technical representative shall be available to assist with the physical installation, alignment, and configuration of each supplied SBD and CTAD. Technical support shall be provided thereafter to assist with troubleshooting, maintenance, or replacement of SBDs or CTADs should such services be required.

(3) Documentation. SBD and CTAD documentation shall include an instructional training guide, a comprehensive user guide, as well as an installer quick-reference guide and a user quick-reference guide. The SBD and CTAD manufacturer shall supply the following documentation and specification test results at the time of the bid submittal:

i. FCC CFR 47 certification
ii. IEC 61000-4-5 class 4 test report

7. Pan-Tilt-Zoom (PTZ) Camera. Furnish an Axis Q6010-E Camera with the following specifications:
   a. Furnish an Axis Q6010-E 60 Hz Camera with the following specifications:

(1) Micro SDXC card with a capacity of 1TB and speed class U3 or V30

b. Furnish an Axis Q6075-E PTZ Dome network camera 60Hz camera with the following specifications:

(1) Power with Axis High PoE midspan 1-port 100-240 V AC, max 60 W.
(2) Micro SDXC card with a capacity of 1TB and speed class U3 or V30.

c. Include T91 mounting accessories.

740-2.14 VEHICULAR SIGNAL HEADS. Provide Light Emitting Diode, (LED) Signal Heads that conform to the following publications:

- Circular Indications: *Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement*, 6/27/05 (ITE Publication ST-052). This is hereafter referred to as "VTCSH-Circular-05".

- Arrow Indications: *Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement*, 7/1/07 (ITE Publication ST-054). This is hereafter referred to as "VTCSH-Arrow-07".

"The applicable ITE Specification", as used in this specification, means VTCSH-Circular-05 for circular LED indications and VTCSH-Arrow-07 for arrow LED indications.

1. Signal Heads.

   Use signal heads that: are the adjustable, vertical type with the number and type of lights specified; provide a light indication in one direction only; are adjustable through 360 degrees about a vertical axis; and are mounted at the location and in the manner shown on the Plans. Ensure that all vehicular signal heads at any one intersection, except for programmed visibility signal heads, are of the same make and type.
   Programmed Visibility Signal Heads.

   - Indications provide a nominal 12 inch diameter circular or arrow indication. Meet the VTCSH requirements for color and arrow configuration.
   - Provide each section with a 1 inch cutaway visor.
   - Provide each signal section with an adjustable connection that permits incremental tilting from 0 to 10 degrees above or below the horizontal while maintaining a common vertical axis through couplers and mounting axis in 5 degree increments.
   - The signal must be mountable with ordinary tools and capable of being serviced without tools. Preset the adjustment at 4 degrees below the horizontal.
   - The visibility of each signal face must be capable of adjustment or programming within the face. When programmed, each signal face's indication must be visible only in those areas or lanes to be controlled. During dusk and darkness, a faint glow to each side will be permissible.
   - Program the head as recommended by the manufacturer and as directed by the Engineer.

   Provide a removable aluminum tunnel visor with an open slot at the bottom for each optical unit.
   Furnish housing, backplates and visors factory finished with a single coat of environmentally safe, ultraviolet-resistant, polyester powder coating that is applied electrostatically at 90kV and baked for 20 minutes at 400 degrees Fahrenheit per ASTM D3359, ASTM D3363 and ASTM D522. Coating to be a Dull Black finish meeting AMS-STD-595 color number 37038.

a. LED Optical Units. Use LED optical units and lenses meeting the requirement of the applicable ITE specification for all indications. Also meet the following requirements:

(1) Gaskets. Use one-piece EPDM (ethylene propylene rubber) gaskets to seal LED modules.

(2) Markings. Provide LED Signal module with manufacturer applied markings listed in Section 3.6, Module Identification, of the applicable ITE Specification. For circular indications marking shall include: “Manufactured in conformance with the ITE Vehicle Traffic Control Signal Heads: LED Vehicle Circular Traffic Signal Supplement (June 27, 2005).” For arrow indication markings shall include: “Manufactured in conformance with the ITE Vehicle Traffic Control Signal Heads: LED Vehicle Arrow Traffic Signal Supplement (July 1, 2007).”

(3) Compatibility. Use LED signal modules that are operationally compatible with currently used controller assemblies (solid state load switches, flashers, and conflict monitors).

(4) Testing Requirements.

(a) All LEDs Functional. LED modules with any non-functioning individual LEDs at the final inspection will be rejected.

(b) Burn-in. Manufacturer shall energize each new LED module for a minimum of 24 hours at operating voltage before shipment to ensure electronic component reliability.

(c) Production Testing and Inspection. Submit manufacturer’s certification that all tests in Section 6.3 of the applicable ITE Specification have been successfully completed on each LED module to be used on the project.

Show results of each individual test on the certification.

(d) Design Qualification and Quality Assurance Testing by an Independent Lab. Have ETL/Intertek or other approved OSHA “Nationally Recognized Testing Laboratory” do the following:

i. Perform an initial assessment of the manufacturer’s factory, engineering and manufacturing systems, and procedures to confirm compliance with ISO 9000.

ii. Perform initial Design Qualification Testing as specified in Section 6.4 of the applicable ITE specification.

iii. Every 6 months, conduct a factory inspection and perform Quality Assurance Tests on two samples of each certified LED module in accordance with the following sections of the applicable ITE specification:

6.4.2 Conditioning

6.4.4.1 - 6.4.4.4 Luminous Intensity
6.4.4.6 Chromaticity
6.4.6.1 Current Consumption
6.4.6.6 Power Factor
6.4.6.7 Total Harmonic Distortion

iv. Provide a certification label on each certified LED traffic signal module verifying the manufacturer's factory and modules passed the tests listed in a. through c. above.

(5) Warranty. Provide written warranty by the signal module manufacturer that covers defects in materials, workmanship, and compliance with the applicable ITE specification for a period of 60 months after the manufacture date. No new LED module will be accepted if its manufacture date is more than 12 months before the date of installation. Begin warranty period for modules that replace failed modules on the date of installation.

The warranty shall require the manufacturer to replace LED modules that fail within the warranty period with new LED modules at no cost to the Department, and to cover the cost of shipping failed modules. The warranty does not include the cost of removing failed modules or reinstalling new modules. Warranty shall require the manufacturer to send the Department prepaid authorization to return the failed module and provide a toll free telephone number for notifying them when it becomes necessary to return failed LED modules.
The warranty shall require the manufacturer to deliver replacement LED modules within 5 working days of receiving failed modules to the location specified by the Department.

b. Lens. Use only clear lenses for all green signal modules. Use lenses that meet the requirements of the applicable ITE Specification.

c. Housing.

(1) Use die cast aluminum, meeting ASTM B85, for all parts of the housing, including the doors and end plates. Ensure all parts are clean, smooth, and free from flaws, cracks, blow holes, or other imperfections.

(2) Use a one-piece housing with integral top, bottom, sides, and with square doors, for each signal section.

(3) Use stainless steel for all exposed bolts, screws, hinges, pins, and door-locking devices. Use stainless steel or approved non-ferrous, corrosion-resistant material for all interior screws and fittings.

(4) Provide an opening in the top and bottom of each housing to accommodate standard 1-1/2 inch pipe fittings and brackets.

(5) Provide the top and bottom openings of each housing with integral serrated bosses that will provide positive positioning of the signal head in 5-degree increments to eliminate undesirable rotation or misalignment of the signal head

as well as between sections. Provide a total of 72 teeth in the serrated boss. Ensure teeth are clean and sharp to provide positive position with the grooves of the mating section or framework.

(6) Fasten individual signal sections together with a cadmium-plated tri-stud connector, lock washers, and nuts with access holes for the passage of electrical conductors form one section to another.

(7) Provide 2 integral hinge lugs on the left side of each signal housing for mounting the door.

(8) Provide 2 latches with stainless steel wing nut assemblies on the right side of each signal housing to engage the door latches.

(9) Provide each signal housing door opening with a one-piece EPDM gasket around the periphery to provide a weather tight seal in a NEMA Type 3R enclosure.

(10) Provide a round opening designed to accommodate any standard traffic signal lens in each signal housing door.

d. Backplates. Backplates shall not be louvered. Install backplates around vehicular signal faces except post mounted flashers. Furnish backplates constructed of 0.100 inch minimum thickness aluminum alloy sheet meeting ASTM B209, alloy 3003-H14. For those backplates fabricated from 2 or more pieces of sheeting, furnish them fastened together with 3/16" aluminum rivets or bolts peened after assembly.

Furnish 3 inch wide backplates regardless of where the signals are installed, on mast arms, on top of posts, or on the sides of poles.

e. Signal Mounting Hardware: Furnish elevator plumbizers, elbow pipe fittings, and post top adapters (without a terminal compartment) with integral serrated contacts that feature 72 teeth.
Provide signal heads that will be mounted on mast arms or pipe tenons with ferrous or bronze elevator plumbizers.
For signal faces installed on the sides of poles, furnish signal frames that consist of watertight assemblies of 1 1/2 inch nominal diameter standard steel pipe, malleable iron or brass pipe fittings, and bronze terminal compartments. The side of the terminal compartment opposite the door shall feature a saddle shape for wobble free mounting on round poles and include a cable guide and two holes for mounting the compartment.
Furnish vehicular signal frames with a horizontal dimension between the center of the terminal compartment and the axis of the adjacent signal face of 22 inches in side mounted frames and 11 inches on double headed post top installations.
Post top adapters shall slip fit over 4 inch nominal standard pipe and feature two rows of three cadmium plated steel setscrews. Furnish post top adapters with terminal compartments, except one way signal heads may be installed on adapters without a terminal compartment provided the adapters include offset openings.

Post top adapters without a terminal compartment or compartments - provide manufactured of bronze metal.

Furnish terminal compartments with a terminal block containing 12 poles, each with two screw type terminals. Each terminal must accommodate at least three 14 AWG conductors. Provide terminal compartments with a rain tight door that provide ready access to the terminal block.

For mounting each terminal compartment, furnish (2) 1/2" x 13 hot dip galvanized bolts that conform to ASTM A325 and (2) 1/2" hot dip galvanized washers that conform to ASTM F 436.

When replacing signal heads include all mounting hardware, backplates and visors.

f. Finish. Factory finish housing, brackets, fittings, backplates, and visors, each face, with a single coat of environmentally safe, ultraviolet-resistant, polyester powder coating that is applied electrostatically at 90kV and baked for 20 minutes at 400 degrees Fahrenheit per ASTM D-3359, ASTM D-3363, and ASTM D-522. Coating to be a Dull Black finish meeting AMS-STD-595 color number 37038.

740-2.15 PEDESTRIAN SIGNALS. Use LED Pedestrian Countdown modules that use the international "HAND/WALKING PERSON" symbols. Except for the countdown indication and as otherwise noted in this specification, use modules that conform to “Pedestrian Traffic Control Signal Indications - Part 2: Light Emitting Diode (LED) Pedestrian Traffic Signal Modules” Institute of Transportation Engineers, 3/19/2004, (hereafter referred to in this document as “PTCSI-04”) and to the applicable Sections of the current Alaska Traffic Manual.

Provide pedestrian signal heads according to the following:

1. Pedestrian Signal Modules: Provide Portland Orange “HAND” and “COUNTDOWN DIGITS” and lunar white “WALKING PERSON.” Locate COUNTDOWN DIGITS adjacent to the associated UPRAISED HAND. Make “HAND” and “WALKING PERSON” symbols a minimum of 11 inches high and 7 inches wide and COUNTDOWN DIGITS a minimum of 9 inches high and 7 inches wide. Provide incandescent looking WALKING PERSON, HAND and COUNTDOWN DIGITS. Ensure the WALKING PERSON, UPRAISED HAND and COUNTDOWN DIGITS are not readily visible when not illuminated. Provide “AlInGaP” Portland Orange LEDs or equivalent, rated for 100,000 hours or more at 77ºF and 20 mA. Provide “InGaN” White LEDs.

   Make all exposed components of modules suitable for prolonged exposure to the environment, without appreciable degradation that would interfere with function or appearance.

   Provide modules with an installed gasket to seal the junction with the signal housing.

   a. Lens. Use modules with internal masks to prevent the icons and digits from being visible when not in operation. No external silk-screen is permitted. Provide a smooth or textured lens of transparent polycarbonate material, frosted to prevent sun phantom. Use lenses that will not crack, craze or yellow due to solar UV exposure typical for a south-facing Arizona desert installation, after a minimum of 60 months in service.

b. Retrofit. When a module will replace an existing module in an existing signal housing, furnish signal modules designed as retrofit replacements for existing neon type pedestrian signals (ICC 4090 and/or 4094). Provide modules that do not require special tools for installation. Provide modules that fit securely into existing pedestrian signal housings without any modification to the housing, connect directly to existing electrical wiring, and form a weather-tight seal. Provide modules and components constructed so each retrofit of existing pedestrian signals only requires the removal of the existing neon message module, gasket, and power supply and installation of the new LED pedestrian countdown module. Provide all necessary components to complete conversion including a one piece gasket.

c. Photometric Requirements. Meet the following requirements:

(1) Minimum Luminance. Maintain the following minimum luminance values for at least 60 months, under the operating conditions defined in Sections 3.3.1 and 5.2.1 of PTCSI-04 (when measured normal to the plane of the icon surface):

(a) WALKING PERSON 2,200 cd/m2,

(b) UPRAISED HAND 1,400 cd/m2,

(c) DIGITS 1,400 cd/m2 (when “88” is displayed).

(2) Maximum Luminance. Provide modules for which the actual luminance of a module does not exceed three times the minimum maintained luminance, as defined in Section 4.1.1 of PTCSI-04, when operated within the temperature range -40°F to +165°F

(3) Uniformity: Provide modules for which the uniformity of the signal output across the emitting section of the module lens (i.e. icons or digits) does not exceed a ratio of 5 to 1 between the maximum and minimum luminance values as measured in 0.5 in. diameter spots.

(4) Markings. Permanently mark the back of each LED signal module with:

(a) Manufacturer’s name, trademark, and other necessary identification

(b) Warranty information

(c) Rated voltage and power consumption in volt-amperes

(d) An up arrow or the word “UP” or “TOP” for orientation within a signal housing.

d. Electrical. Provide LED pedestrian countdown signal modules that:

(1) Are operationally compatible with currently used controller assemblies (solid state load switches, flashers, and conflict monitors).

(2) Have a maximum of 4 each secured, color coded, 36 inches long, 600V, 18 AWG minimum, jacketed wires, conforming to the National Electrical Code, rated for service at +221ºF for electrical connection.

(3) Operate from a 60 ±3 Hz AC line over a voltage range of 80 VAC to 135 VAC. Test voltage for all photometric performance measurements shall be 120 ±3 volts rms.

(4) Use LED circuitry that prevents perceptible flicker over the voltage range specified above.

(5) Include voltage surge protection against high-repetition noise transients and low-repetition noise transients as stated in Section 2.1.8, NEMA Standard TS-2, 2003. Module must meet the following test requirements: Section 8.2 IEC 1000-4-5 & Section 6.1.2 ANSI/IEEE C62.41.2, 3kV, 2 ohm and Section 8.0 IEC 1000-4-12 & Section 6.1.1 ANSI/IEEE C62.41.2, 6kV, 30 ohm.

(6) Have a current draw sufficient to ensure compatibility and proper triggering and operation of load current switches and conflict monitors in signal controller units. When the module is switched from the On state to the Off state the terminal voltage shall decay to a value less than 10VAC RMS in less than 100 milliseconds when driven by a maximum allowed load switch leakage current of 10 milliamps peak (7.1 milliamps AC).

(7) Have a maximum power consumption at 77°F of: Hand 11.0 watts, Walking Person 10.0 watts, Digits 8.0 watts (when display shows “88”)

(8) Have waterproof strain relief and anti-capillary wires or have electrical wires that do not penetrate the LED module housing. This is intended to prevent water seepage between the back cover and the electrical wires, or between the copper and insulation of the wires (Connection may be made by use of an over molded connector).

(9) Will default to the hand symbol for abnormal conditions when nominal voltage is applied to the unit across the two phase wires (rather than being applied to the phase wire and the neutral wire).

(10) Have three separate power supplies: one each for the Walking Person, the Upraised Hand and the countdown digits. Use separate circuitry to power the LED Walking Person icon and the LED Upraised Hand icon, in order to virtually eliminate the risk of displaying the wrong icon.

e. Testing Requirements.

(1) All LEDs Functional. LED modules with any non-functioning individual LEDs at the final inspection will be rejected.

(2) Burn-in. Manufacturer shall energize each new LED module for a minimum of 24 hours at operating voltage before shipment to ensure electronic component reliability.

(3) Production Testing and Inspection by Manufacturer Submit manufacturer's certification that all tests in Section 6.3 of PTCSI-04 have been successfully completed on each LED module to be used on the project. Show result of each individual test on the certification.

(4) Design Qualification and Quality Assurance Testing by an Independent Lab. Have ETL/Intertek or other approved OSHA "Nationally Recognized Testing Laboratory" do the following:

(a) Perform an initial assessment of the manufacturer's factory, engineering and manufacturing systems, and procedures to confirm compliance with ISO 9000.

(b) Perform initial Design Qualification Testing as specified in Section 6.4 of the PTCSI-04.

(c) Every 6 months, conduct a factory inspection and perform Quality Assurance Tests on two samples of each certified LED module in accordance with the following sections of PTCSI-04:

6.4.2 Conditioning
6.4.4.1 - 6.4.4.4 Luminous Intensity
6.4.4.6 Chromaticity
6.4.6.1 Current Consumption
6.4.6.6 Power Factor
6.4.6.7 Total Harmonic Distortion

(d) Provide a certification label on each certified LED traffic signal module verifying the manufacturer's factory and modules passed the tests listed in a. through c. above.

f. Warranty. Provide a manufacturer's written warranty that covers defects in materials, workmanship, and compliance with PTCSI-04 for a period of 60 months after the manufacture date. No new LED module will be accepted on a project if its manufacture date is more than 12 months before the date of installation. Begin warranty period for modules that replace failed modules on the date of installation.

The warranty shall require the manufacturer to replace LED modules that fail within the warranty period with new LED modules at no cost to the Department, and to cover the cost of shipping failed modules. The warranty does not include the cost of removing failed modules or reinstalling new modules. Warranty shall require the manufacturer to send the Department prepaid authorization to return the failed module and provide a toll free telephone number for notifying them when it becomes necessary to return failed LED modules.
The warranty shall require the manufacturer to deliver replacement LED modules within 5 working days of receiving failed modules to the location specified by the Department.

g. Countdown Module Functions.

(1) General. Begin the countdown at the beginning of the FLASHING HAND indication. End the countdown at "0" at the end of the FLASHING HAND indication. Make the countdown display dark from the end of one FLASHING HAND indication until the beginning of the next. Display steady, not flashing, countdown digits. Do not provide user accessible switches, controls, or options that would allow modification of cycle time, icons, digits or that would allow the countdown to operate while the WALKING PERSON or STEADY HAND is displayed.

(2) Learning Cycle. At power on, make the countdown display dark for one learning cycle in which it will determine the duration of the FLASHING HAND indication.

(3) Normal Operation. Display the countdown/FLASHING HAND for the duration measured in the learning cycle for every cycle until the module measures a different FLASHING HAND duration.

(4) Countdown Duration Modification. When a different duration is measured, make the countdown dark for the next cycle, and enter a Learning Cycle as previously described. Resume Normal Operation with the new FLASHING HAND duration if the measured FLASHING HAND duration for the next cycle is the same as for the first cycle when a change was detected. Continue Learning Cycles, if the duration is different, until the measured FLASHING HAND duration is the same for two cycles. Resume Normal Operation with the new duration when that happens.

(5) Countdown Truncation. Make the digits dark if the controller output displays a STEADY HAND or if both the HAND and WALKING PERSON go dark, regardless of whether the countdown to zero has been completed.

(6) Preemption. Handle preemption events as described under Countdown Duration Modification and, if necessary, Countdown Truncation.

(7) Recycling. Allow for consecutive cycles without display of the STEADY HAND.

(8) Power Outage. Maintain an uninterrupted countdown during short power failures (<1.5 seconds). Make the digits dark after a loss of power of more than 1.5 seconds and enter a Learning Cycle when the power is restored.

2. Housing
   a. Provide signal housings that have a maximum overall dimensions of 18-1/2 inches wide, 18-3/4 inches high, and 9 inches deep.

   b. Provide a dustproof and weatherproof housing that allows easy access to and replacement of all components.

   c. Provide a one-piece, corrosion-resistant, aluminum-alloy die-cast case complete with integrally cast top, bottom, sides and back. Provide 4 integrally cast hinge lug

pairs, 2 at the top and 2 at the bottom of each case, for operation of a swing-down door.

d. Provide 1 of the following 3 versions of the case, according to project specifications:

(1) Clamshell mount, with hardware, for “pole left of message” installation. These need not include upper and lower openings, but when provided the openings must be plugged to be weather-tight. No other openings are allowed. Clamshell mounting bracket shall be capable of swinging open more than 90 degrees when mounted on a pole.

(2) Clamshell mount, with hardware, for “pole right of message” installation. These need not include upper and lower openings, but when provided the openings must be plugged to be weather-tight. No other openings are allowed. Clamshell mounting bracket shall be capable of swinging open more than 90 degrees when mounted on a pole.

(3) Make suitable for either post top or bracket mounting with upper and lower openings to accommodate standard 1-1/2 inch pipe brackets. Plug unused openings to be weathertight. This case is only allowed when called for in the plans. Integrally cast a shurlock boss into the bottom opening of the signal case. Make the dimensions of the shurlock boss as follows: outside diameter, 2-5/8 inch; inside diameter, 1-31/32 inch; number of radial teeth, 72; and depth of teeth, 5/64 inch. Use clean and sharp teeth that provide full engagement to eliminate rotation or misalignment of the signal.

e. Make the door frame a one-piece, corrosion-resistant, aluminum-alloy die-casting, complete with 2 hinge lugs cast at the bottom and 2 latch slots cast at the top of each door. Attach the door to the case by means of two Type 304 stainless steel spring pins. Attach 2 stainless steel hinged bolts with captive stainless steel wing nuts and washers to the case with the use of stainless steel spring pins. Provide a door that will latch and unlatch without the use of tools.

3. Conductors: Meet IMSA specifications 20-1 with No. 14 AWG or larger.

4. Load Switches: Place all load switches for operation of pedestrian signals in the controller cabinet.

5. Fasteners. Use machine screws, studs, and washers that are stainless steel.

6. Gaskets: Use gaskets that conform to ASTM D1056, Grade 2C2.

7. Terminal Blocks: Provide a rain tight terminal compartment with a 12 position terminal block.

8. Finish. Factory finish the outside of pedestrian signal head housings and visors and signal visor interiors with a single coat of environmentally safe, ultraviolet-resistant, polyester powder coating that is applied electrostatically at 90kV and baked for 20

minutes at 400 degrees Fahrenheit per ASTM D3359, ASTM D3363 and ASTM D522. Coating to be a Dull Black finish meeting AMS-STD-595 color number 37038.

740-2.16 PEDESTRIAN PUSH BUTTONS. Push buttons shall be Tamper proof with a 2 inch minimum diameter convex 316 stainless steel actuator button.

Construct a weatherproof assembly designed to prevent an electrical shock under any weather condition and grounded per the NEC.

Push Button Switch. Furnish Polara model RBDL3-B-4H or approved equal with the following features. Provide a solid state electronic piezo type, switching unit, with screw type terminals, rated 15 amperes at 125 VAC. Must have the following characteristics:

1. Switching unit that is solid state electronic piezo rated for 100 million cycles.

2. Sealed to prevent ice from impeding function.

3. Must hold the call for a minimum of 5 seconds.

4. Switch operating force of 3 pounds or less with no moving plunger or moving electrical contacts.

5. Provide an LED indication and an audible tone or beep within the button when pushed, at a minimum 68 db. at 1 meter.

6. Must have a raised rim or ridges to protect the button from side impacts.

7. Powder coated cast switch housing.

Where a pedestrian push button is to be mounted on top of a 2-1/2 inch diameter post, provide the housing with a slip-fitter with screws for securing to the post.

Factory finish pedestrian push button housings, mountings, brackets, and fittings with 2 coats of dull black enamel or powder coat. Painting/powder coating is not required where the color is an integral part of the component material.

740-2.17 FLASHING BEACONS. Furnish beacons that consist of one or more traffic signal sections meeting the requirements of Subsection 740-2.14 Vehicular Signal Heads. See the Plans for the number, size and color of the signal sections required for each beacon.

Use the flasher in signal controller cabinets to energize beacons that flash continuously and are installed near traffic signals. Otherwise, each flashing beacon controller assembly consists of the following 120 VAC equipment housed in a NEMA 3R enclosure: a circuit breaker, a radio interference suppressor, a transient voltage suppressor, a NEMA Type 3 flasher, neutral and ground busses, and terminal blocks. The cabinet assembly shall contain a thermostatically controlled incandescent cabinet light with a door activated bypass switch. The cabinet light fixture shall be an incandescent type porcelain lamp

holder rated for 660W-250V AC/CA. the lamp shall be 75W.

Controller assemblies for school zone speed limit sign beacons shall also include a time switch.

The NEMA 3R enclosure shall feature a hinged door. Hinge shall run the full length of the enclosure and shall be attached to the left side of cabinet. The door locking mechanism shall contain a Best CX series lock with a Best blue construction core lock. Provide two keys for lock.

The AC transient voltage and radio interference suppressors shall meet the requirements of Subsections 740-2.11.1.k. (3) and (4), respectively.

Use a solid state NEMA Type 3 flasher meeting the requirements of NEMA Standard TS 1-1989, Traffic Control Systems.

Use 20 ampere, 600 volt barrier type phenolic terminal blocks with plated brass screw type terminals. Field wiring termination blocks shall be sized to accept No. 8 AWG conductors. Power feed termination block shall be a single three (3) position box lug type terminal block capable of accepting up to No. 6 AWG conductors for terminating power feed cable.

Furnish an RTC Manufacturing model AP22 time switch complete with wiring harness, or an approved, calendar programmable, solid state time switch with liquid crystal display, keyboard, input/output port, and wiring harness. The approved time switch shall:

1. Operate on line voltages from 95 to 135 VAC, operate in temperatures from -22° F to 165° F, and include a capacitor that provides 48 hours of backup power to retain programming and time when the unit is disconnected from AC voltage.

2. Include a backlit display and provide 2 lines of alphanumeric legend with 16 characters per line. The display shall automatically prompt the operator while programming the device through the keyboard for ease of use.

3. Include an input/output port and keyboard activated special functions that transfer the program to other units and download the program to a printer for a hard copy record of the program.

4. Automatically compensate for changes in Daylight Savings Time and leap years and include a keyboard activated special function to quickly change the dates for the begin and end of Daylight Savings Time.

5. Provide at least 10 basic plans for daily and/or weekly use and at least 200 program steps that are equally divided amongst the actual number of basic plans. Each program step shall be assignable to a single day, weekend, weekday, or every day. The time switch shall also include 20 plans that activate the basic plans to provide one year of time based control.

6. Include 2 single pole double throw, relay controlled outputs rated for 15 amperes of resistive load at 115 VAC. Each pole shall be independently activated for steady on or momentary on and be manually switched on through the keyboard.

7. Provide a 9 pin RS232 serial I/O port connector on the unit for programming via laptop, Ethernet, or cellular.

When a signal controller cabinet flasher is used to energize a beacon, furnish a two pole, fused block with built in fuse pullers to protect the flasher. Furnish third party certified blocks that hold 13/32" x 1-1/2" midget ferrule fuses, are rated for 30 amperes, and feature tubular screw terminals that accommodate conductors to 8 AWG. Furnish blocks with two fast acting, 3 ampere (BAF-3) fuses, and flat bases that can be directly mounted on a dead panel.

740-2.18 LUMINAIRES. Furnish roadway and intersection luminaires that conform to the following specifications and provide the light distributions specified. When luminaire performance criteria are specified, luminaires shall also:

1. Meet or exceed the minimum initial light levels indicated.

2. Provide light distribution uniformity ratios and veiling luminance ratios equal to or less than the maximums indicated.

When luminaire performance criteria are specified, submit the following information for each luminaire type and light distribution type specified: luminaire specifications, the lumen output of the lamps that will be furnished, and current electronic photometric data to the Engineer for approval. Furnish the photometric data in Illuminating Engineering Society (I.E.S.) format. The Engineer will use software that calculates light levels and uniformity ratios according to the American National Standard Practice for Roadway Lighting, A.N.S.I./I.E.S. RP-8 to verify each luminaire provides the light levels, uniformities, and veiling luminance ratios specified.

When cut off distributions are specified, furnish luminaires with flat glass lenses (when used) and a full cutoff light distribution as defined in the American National Standard Practice for Roadway Lighting, A.N.S.I./I.E.S. RP-8, dated 2014.

The following luminaires are proven to meet A.N.S.I/I.E.S. RP-8-14 light levels, uniformities, and veiling luminance ratios as specified in the plans, but are still subject to verification:

1. <u>Roadway luminaire</u>

   a.

2. <u>Intersection luminaire</u>

   a.

Luminaires General

Install luminaires that feature:

a. Corrosion resistant enclosures with gray painted finish, cooling elements not required to be painted, and space for the ballast.

   (1) Painted or finished luminaire surfaces exposed to the environment shall exceed a rating of six (6), after 1,000 hours or four (4) of 5,000 hours salt spray test according to ASTM D1654 and ASTM B117 testing. The coating shall exhibit no greater than 30% reduction of gloss, according to ASTM D523, after 500 hours of ASTM G154 Cycle 6 QUV® accelerated weathering testing.

b. All luminaires shall have ANSI C136.15 external labels and ANSI C136.22 internal labels. The luminaire shall be listed for wet locations by a nationally recognized testing laboratory (NRTL) as defined by OSHA and shall be in compliance with UL 8750 and UL 1598. It shall be identified as such by a tag/sticker on the inside of the luminaire.

c. All hardware shall be stainless steel or suitably corrosion resistant to match the 20-year expected life of the fixture. Captive screws are required on any component that requires maintenance after installation.

d. Glass lenses, unless polycarbonate resin refractors are specified.

e. Terminal blocks for attaching the illumination tap conductors.

f. Aluminum reflectors with an ALZAK or ALGLAS finish when using HPS fixtures.

g. Optical components free of substances that affect photometric performance, paint.

h. Housings cast with no provision for a photoelectric control receptacle.

i. For HPS fixtures; airtight reflector and lens units that breathe through activated charcoal filters and include elastomer gaskets to seal the gap between the two components, gasket material must withstand the temperatures involved and be securely held in place.

j. For HPS fixtures include plug in starting aids with lamps through 400 watts.

1. Luminaires – High Pressure Sodium; Cobrahead and Offset/Turnpike.

   Furnish HPS fixtures that feature a rated life of 40,000 hours based on 10 hours per start and ballasts that conform to Subsection 740-2.21. Each cobrahead or offset luminaire shall also include:

   a. An easily removed hinged door used exclusively for mounting the ballast.

b. A second door that frames the lens (for HPS), hinges on the house side, and fastens on the street side with an automatic type latch.

c. A two (2) or four (4) bolt mounting brackets that is designed to fit a 2-inch nominal diameter standard pipe and feature a center pivot for leveling the luminaire.

Offset luminaires shall also include knuckle style pole top adapters that are sized to fit 2 inch nominal diameter standard pipe and feature a wire way meeting NEC requirements for installing three size 10 AWG conductors between the pole and the terminal block located in the luminaire.

2. Luminaires – LED.

a. General. The luminaire shall be assembled in the United States and shall be assembled by and manufactured by the same Manufacturer. For easy removal, quick-connect/disconnect plugs shall be supplied between the discrete electrical components within the luminaire such as the driver, surge protection device, and optical assembly. The quick-connect/disconnect plugs shall be operable without the use of tools and while insulated gloves are worn. The luminaire shall be in compliance with ANSI C136.37 LED light source(s), and driver(s) shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU.

(1) Manufacturer Experience. The luminaire shall be designed to be incorporated into a lighting system with an expected 20-year lifetime. The luminaire Manufacturer shall have a minimum of 20 years' experience manufacturing high-intensity discharge (HID) roadway luminaires and shall have a minimum of 5 years' experience manufacturing LED roadway luminaires. The Manufacturer shall have a minimum of 5,000 total LED roadway luminaires installed on a minimum of 30 separate installations, all within the United States.

b. Housing. The housing shall be designed to ensure maximum heat dissipation and to prevent the accumulation of water, ice, dirt, and debris. A passive cooling method with no moving or rotating parts shall be employed for heat management. The effective projected area of the luminaire shall not exceed 1.2 sq. ft. The total weight of the luminaire(s) and accessories shall not exceed 55 lb.

c. Optical Assembly. The LED optical assembly, consisting of LED packages, shall have a minimum ingress protection rating of 66 (IP66) as defined in ANSI/IEC 60529. Circuiting shall be designed to minimize the impact of individual LED failures on the operation of the other LEDs.

The optical assembly shall utilize high-brightness, long-life LEDs with a minimum color rendering index (CRI) of 70, 3000 K (+/- 200 K) color temperature, and binned according to ANSI C78.377. Lenses shall be UV-stabilized acrylic or glass. Provisions for house-side shielding shall be specified along with means of attachment.

Lumen depreciation at 50,000 hours of operation shall not exceed 15% of initial lumen output at the specified LED drive current and an ambient temperature of 77°F (25°C).

The assembly shall have individual serial numbers or other means for Manufacturer tracking.

(1) Photometric Performance Testing. Luminaires shall be tested according to IES LM-79. The laboratory performing this test shall hold accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) under NIST. Submitted reports shall have a backlight, uplight, and glare (BUG) rating according to IESNA TM-15, including a luminaire classification system graph with both the recorded lumen value and percent lumens by zone.

Lumen maintenance shall be measured for the LEDs according to LM-80, or when available for the luminaires according to LM-84. The LM-80 report shall be based on a minimum of 6000 hours; however, 10,000-hour reports shall be provided for luminaires in cases in which tests have been completed.
Thermal testing shall be provided according to UL 1598. The luminaire shall start and operate in the ambient temperature range specified. The maximum rated case temperature of the driver, LEDs, and other internal components shall not be exceeded when the luminaire is operated in the ambient temperature range specified.
Mechanical design of protruding external surfaces such as heat sink fins shall facilitate hose-down cleaning and discourage debris accumulation. Testing shall be submitted when available to show that the maximum rated case temperature of the driver, LEDs, and other internal components are not exceeded when the luminaire is operated with the heat sink filled with debris.

(2) Calculations. Complete point-by-point luminance and veiling luminance calculations as well as listings of all indicated averages and ratios as applicable shall be provided according to IES RP-8 recommendations. Lighting calculations shall be performed using AGi32 software with calculations performed to two decimal places (i.e., x.xx cd/m2). Calculation results shall demonstrate that the submitted luminaire meets the lighting metrics specified in the plans. Scotopic or mesopic factors will not be allowed.

(3) Lumen Maintenance Projection. The LEDs shall have long-term lumen maintenance documented according to IESNA TM-21, or when available for the luminaires according to IESNA TM-28. The submitted calculations shall incorporate an in situ temperature measurement test (ISTMT) and LM-80 data with TM-21 inputs and reports according to the TM-21 calculator, or when available an ISTMT and LM-84 data with TM-28 inputs and reports according to the TM-28 calculator. Ambient temperature shall be 77°F (25°C).

d. Driver. The driver for the luminaire shall be integral to the unit. It shall be mounted in the rear of the luminaire on the inside of a removable door or on a removable mounting pad. The removable door or pad shall be secure when fastened in place, and all individual components shall be secured upon the removable element. Each

component shall be readily removable from the removable door or pad for replacement.

The driver shall be installed in a manner to keep it mechanically separated from the LED array heat sink.

(1) Circuit Protection. The driver shall tolerate indefinitely open and short-circuit output conditions without damage.

(2) Ingress Protection. The driver itself shall have an IP65 or IP66 rating, not the housing. Do not gasket the driver door or seal in order to prevent condensation and allow for draining.

(3) Input Voltage. The driver shall be suitable for operation over a range of 120 to 277 V or 347 to 480 V as required by the system operating voltage.

(4) Operating Temperature. The driver shall have an operating ambient temperature range of -40°F to 131°F (-40°C to 55°C).

(5) Driver Life. The driver shall provide a lifetime of 100,000 hours at an ambient temperature of 77°F (25°C).

(6) Safety/UL. The driver shall be listed under UL 1012 or UL 1310.

(7) Power Factor. The driver shall maintain a power factor of 0.9 or higher and total harmonic distortion of less than 20%.

(8) Driver Efficiency. The driver shall have a minimum efficiency of 90% at maximum load and a minimum efficiency of 85% for the driver operating at 50% power, with driver efficiency defined as output power divided by input power.

(9) Electrical Interference. The driver shall meet the electromagnetic compatibility (EMC) requirements for Class A digital devices included in the FCC Rules and Regulations, Title 47, Part 15.

(10) Thermal Fold Back. The driver shall reduce the current to the LED module if the driver is overheating as a result of abnormal conditions.

(11) Dimming. The driver shall have 0 to 10 V dimming capability.

(12) Leakage Current. The driver shall comply with safety standards according to IEC 61347-1.

e. Surge Protection Device (SPD). SPD shall be labeled as Type 4 in accordance with UL 1449 and be an integral part of the luminaire. It shall provide a minimum system protection level of 10 kV, 10 kA. To protect for a 10 kV, 10 kA surge the required clamping voltage of the external metal oxide varistor (MOV) or other SPD shall be lower than 1 kV at 8 kA {(10 kV – 2 kV)/1 ohm = 8 kA}.

The SPD shall comply with the following standards:

(1) IEEE C62.41.1, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits,

(2) IEEE C62.41.2, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits,

(3) IEEE C62.45, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits, and

(4) ANSI C136.2, American National Standard for Roadway and Area Lighting Equipment — Luminaire Voltage Classification.

The SPD and performance parameters shall be posted at www.UL.com under category code VZCA2.

f. Photoelectric Control. Furnish fixtures with a built in ANSI C136.41 7-pin twist type photo cell receptacle. Receptacles shall be provided with shorting caps.

g. Failed Equipment and Workmanship. The luminaire and all of its components, for the term of the Contract, from initial installation through final acceptance 105-1.16, when directed, promptly replace failed equipment and repair failed workmanship.

(1) Negligible light output from more than 10% of the LED packages,

(2) Moisture inside the optical assembly,

(3) Driver that continues to operate at a reduced output, and/or

(4) Other failed conditions that do not meet specifications.

h. Submittal Requirements. The Contractor shall submit, for approval, an electronic version of all associated luminaire IES files, AGi32 files, and the TM-21 or TM-28 calculator spreadsheet with inputs and reports associated with the project luminaires. The Contractor shall also provide an electronic version of each of the following Manufacturers' product data sheets for each type of luminaire.

(1) Descriptive literature and catalog cuts for luminaire, LED package, driver, and surge protection device;

(2) LED drive current, total luminaire input wattage, and total luminaire current at the system operating voltage or voltage range and ambient temperature of 77°F (25°C);

(3) Luminaire efficacy expressed in lumens per watt (lpw) per luminaire;

(4) Initial delivered lumens at the specified color temperature, drive current, and ambient temperature;

(5) Computer photometric calculation reports;

(6) TM-15 BUG rating report;

(7) Certification of Manufacturers' experience and certification that luminaires were assembled in the United States;

(8) Supporting documentation of compliance with ANSI standards, as well as listing requirements;

(9) Supporting documentation of laboratory accreditations and certifications for specified testing;

(10) Thermal testing documents;

(11) IES LM-79, LM-80 (or LM-84), and TM-21 (or TM-28) reports;

(12) Salt spray (fog) test reports and certification;

(13) Vibration characteristics test reports and certification;

(14) IP test reports;

(15) Manufacturer written warranty; and

(16) Luminaire installation, maintenance, and washing instructions.

3. Lenses.

When polycarbonate resin lenses are specified, the fabricator shall furnish certified lenses conforming to the following criteria:

a. The lenses are molded in a single piece from virgin polycarbonate resin.

b. The lenses are free from cracks, blisters, burns, and flow lines, and furnished with the natural molded surface.

c. The lenses are of uniform density throughout and free from air, gas, or moisture pockets, and uncured areas.

d. The lenses are transparent with a clear bluish tint, produced from ultraviolet stabilized resin to reduce the effects of ultraviolet radiation on their color properties.

e. The resins used meet the requirements for the self-extinguishing classification of ASTM D 635 and feature a minimum impact strength, Izod notched of 12 foot pounds per inch when tested according to ASTM D 256, Method A, using a 1/8 inch by 1/2 inch bar molded according to ASTM recommended practice.

740-2.19 SIGN LIGHTING FIXTURES.

1. Incandescent Down Light. Provide the type of sign lighting fixture, with incandescent lamp, shown on the Plans or as specified in the Special Provisions.

a. Hood. Cadmium plated, finished with aluminum paint, and side outlet tapped for conduit.

b. Reflector. Symmetrical 8-inch steel. Porcelain enameled green finish on the outside and white on the inside.

c. Lamp. Provide 2,900 lumen.

2. Mercury Vapor. Fully enclosed, rain-tight, dust-tight, and corrosion-resistant. Design each fixture for mounting at the bottom of the sign on an overhead sign structure as shown on the Plans. Painting of fixture is not required.

a. Housing. Cast aluminum alloy or other non-corrosive material conforming to the Plans. Finish all housings in a workmanlike manner with no exposed burrs or sharp edges.

b. Refractor. Glass having inner prisms with a smooth exposed face. Mount the refractor in a door frame assembly which is hinged to the body of the fixture and fastened with an automatic type latch.

c. Gaskets. Made of a material capable of withstanding the temperatures involved, and securely held in place.

d. Light Distribution. Light distribution over the sign face must conform to the isolux distribution patterns shown in the Plans. Accomplish light distribution entirely by refraction through the lens with no additional refractors or reflectors.

e. Miscellaneous. All ballasts, lampholders, lamps, terminal blocks, and necessary fuses must conform to applicable requirements of Subsection 740-2.21 or to the Plans.

f. Lamps. Color-improved to provide good color rendition of signs.

740-2.20 ILLUMINATION CONTROL.

When indicated in the plans, provide a GE LightGrid™ ELWC-Cellular node for each load center. Prior to installing the nodes, the Contractor shall deliver them to DOT&PF M&O for programming. After the nodes have been programmed, the Contractor shall retrieve and install them. For each node, attach the barcode sticker from the manufacturer to the inside of the load center door.

Otherwise, provide each load center with photoelectric controls capable of directly switching multiple lighting systems. Furnish photoelectric units designed for pole top mounting which include a slip-fitter, terminal block, and cable supports or clamps to support pole wires.

1. Photoelectric Unit. A light sensitive element connected directly to a normally closed, single-pole throw control relay without intermediate amplifications. Plug the unit into a phenolic resin twist lock receptacle set in a cast aluminum mounting bracket with a

threaded base. Screen photoelectric units to prevent artificial light from causing cycling.

Use either horizontal sensing or zenith sensing type units meeting the following:

a. A supply voltage rating of 60 Hz, 105-277 volts

b. A maximum rated load at a minimum of 1,800 volt-amperes

c. An operating temperature range from -40 °F to +150 °F

d. A power consumption of less than 10 watts

e. A unit base with a 7-pin, EEI-NEMA standard, twist-lock plug mounting

Furnish units for highway lighting that have a “turn-on” between 10.8 and 54 lux and a “turn-off” at between 1.5 and 5 times “turn-on.”
Furnish units for illuminated signs that have a “turn-on” level of between 215 and 270 lux. (“Turn-on” level specified above corresponds to a switching level of approximately 430 to 540 lux measured in the horizontal plane.) "Turn-off" level must not exceed 3 times “turn-on” level.
Measurements must meet the procedures in EEI-NEMA *Standards for Physical and Electrical Interchangeability of Light-Sensitive Control Devices Used in the Control of Roadway Lighting*.

2. Temperature Switch. When mercury vapor sign lighting fixtures are used, provide a temperature switch in each photoelectric control circuit for lighting systems which will:

   a. bypass the photoelectric unit when the ambient temperature drops to -13 °F, and energize the mercury vapor light circuits;

   b. return switching functions to the photoelectric unit upon a temperature rise of 5 to 10 °F above the turn-on temperature; and

   c. have a minimum range of (-40 °F to +40 °F), and be setable in increments no greater than 5 °F.

740-2.21 BALLASTS. Include ballasts for high intensity discharge lamps as an integral part of each luminaire and design for the voltages and lamp types specified in the Plans or Special Provisions. Ensure that the current needed to start the lamps is less than the operating current.

Furnish regulator-type ballasts with copper windings electrically isolated from each other, which will start and operate the lamps in temperatures down to -40 °F. The allowable line voltage variation is plus and minus 10%.

Equip high-pressure sodium luminaires, except those with 1000 watt lamps, with magnetic regulator ballasts with the following additional operating characteristics:

1. The lamp wattage regulation spread at any time over the life of the lamp must not exceed 18% of nominal lamp watts at plus and minus 10% line voltage variations.

2. With nominal line and lamp voltages, the ballast must regulate the lamp output to within 5% of the ballast design center, and sustain lamp operation with a minimum 60% voltage drop lasting 4 seconds or less.

Equip luminaires with 1000 watt high pressure sodium lamps with auto-regulator ballasts that provide a maximum 30% lamp regulation spread, a minimum 35% voltage dip tolerance, and with nominal line and lamp voltages regulate lamp output to within 5% of the ballast design center.
Furnish ballasts, for soffit luminaires, with mounting brackets attached and equip with terminal blocks for primary connections and lamp socket preconnected to the secondary for flush mounted luminaires and with terminal blocks for both primary and secondary connections for use with suspended luminaires.
Submit the ballast manufacturer's specification sheets for review and approval.

740-2.22 RESERVED.

740-2.23 UNDERPASS LIGHTING SYSTEM. Use underpass luminaires that have vandal-resistant surface-mounted fixtures installed in a galvanized welded steel enclosure as detailed on the Plans. The lamp must be a mogul based 150-watt, clear, ANSI/NEMA C78.42, horizontal mount, high pressure sodium type. The lamp must provide a minimum of 15,000 initial lumens with a rated life of 24,000+ hours based on a minimum burn period of 3 hours.
Mount the ballast within the body of the fixture with a constant wattage autoregulator CWA type meeting ANSI/NEMA C78.1355 operating characteristics. See Plans for input voltage.

Provide a square lens that is semi-recessed, extra thick, injection molded polycarbonate prismatic type, with internal specular aluminum reflector. The lens must provide the uniformity specified in the Plans or Specifications with a minimum spacing to mounting height ratio (S/MH) of 3.5:1, in the plane defined by the axis of the lamp, and a minimum S/MH ratio of 1:1 in the plane passing vertically through the length of the lamp axis.
Provide a lens frame and side housing made of ASTM B209, alloy 6061-T6 tempered aluminum a minimum of 0.177 inch thick, or equivalent stainless steel, secured with tamper proof screws requiring a special manufacturer's tool to remove.
Provide fixtures that are Third Party listed for wet, damp, and dry locations. Fasten the fixture into the mounting enclosure with stainless steel screws accessible only from within the fixture housing.

Fabricate the mounting enclosure from 0.138 inch thick mild steel with continuous welded seams and hot-dipped galvanized, as detailed on the Plans. Use wiring within the enclosure that might come in contact with the ballast rated at 390 °F [type SR-2]. Provide a grounding screw or lug within the enclosure for a maximum No. 8 AWG ground conductor.

Submit the manufacture's fixture specifications, photometric data, and a computer-generated lighting layout for approval prior to ordering. Calculate, by the point-to-point method, the light level on the walkway surface through the underpass with no wall, ceiling, or walkway reflectances. The calculated light level on the walking surface and the calculated average-to-minimum uniformity ratio may not be worse than the light level and

uniformity ratio noted on the drawings. Center the calculation area on the light fixtures and base it on the width of the walkway less 12 inches, and the length of the walkway equal to the distance between the first and last fixtures plus a distance equal to 50% of the spacing between the fixtures added to each end of the walkway. You may substitute fixtures having similar construction, electrical, and light distribution characteristics, if approved. In the case of a substitution, construct the enclosure shown on the drawing to match the mounting requirements of the submitted fixture. Submit shop drawings for the enclosure for approval along with the fixture shop drawings.

APPENDIX A
PERMITS

PERMIT DESCRIPTION	ISSUE DATE	EXPIRE DATE
Alaska Department of Fish and Game (DFG) Title 16 Fish Habitat Permit	**TBD**	
KPB Planning Department 50-foot Habitat Protection Area Permit	**TBD**	
KPB Conditional Use Permit	**TBD**	
U.S. Army Corps of Engineers (USACE) Section 404 Nationwide Permit	**TBD**	
Alaska Department of Environmental Conservation (DEC) 401 Water Quality Certification	**TBD**	
City of Kenai (COK) Conditional Use Permit	**TBD**	

APPENDIX B
SURVEY REQUIREMENTS

1. Alaska Construction Surveying Requirements (US Customary Units)

APPENDIX C
EROSION AND SEDIMENT CONTROL PLAN (ESCP)

The Department of Natural Resources (DNR) Division of Parks and Outdoor Recreation (DPOR) has created this Erosion and Sediment Control Plan (ESCP). This ESCP shall be amended by the Contractor to incorporate the projects material source sites, HMCP, SPCC, and any other modification the contractor determines is necessary.

The Contractor shall use the attached ESCP to meet Alaska Department of Environmental Conservation requirements for construction.

APPENDIX D
SIGN SHOP DRAWINGS

APPENDIX E
MASTER MATERIAL CERTIFICATION LIST (MCL)