MEMORANDUM State of Alaska

Department of Transportation and Public Facilities

TO: Distribution DATE: March 2, 2026

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

SUBJECT: **Seward Highway: MP 25.5-36 Trail River to Sterling Wye Rehabilitation**
Program No. 0311(031) / Z586590000
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\LIB\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. Z546590000
IRIS Activity: _ _ _P (input your own activity code in the blank spaces)
IRIS Phase: TC2000
IRIS Template: TTPJ001

Seward Highway: MP 25.5-36 Trail River to Sterling Wye Rehabilitation
Program No.: 0311(031) / Z586590000

PS&E Review

PS&E REVIEW COMMENTS are due on Wednesday March 25, 2026. The review meeting will be held at **9:00 AM** on Wednesday April 1, 2026 in the **Construction Conference Room**. **Please E-mail comments, using the comment form, to Claire Ellis (claire.ellis@alaska.gov) and CC 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/Z546590000/

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

Microsoft Teams:	**(907) 202-7104**
Conference ID:	**878 082 94#**

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

* Luke Bowland, Pre-Construction Engineer

Highway Design

Sean Baski, Highway Design Group Chief
Chris Bentz, 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
Laura Mann, Construction Group Chief
Jacob Gondek, 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
Isaac Kelsey, 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
Romorenzo Marasigan, Area Planner
* Justin Zarr, Hwy Data Supervisor

Surveys

* Travis Test, Survey Manager

Project Control

* Jennifer Coisman, Project Control Group Chief

* Electronic (email) Only

Additional Distribution (without Engineer's Estimate):
Robert Ruffner, KPB Planning Director, 144 North Binkley Street, Soldotna, AK 99669 rruffner@kpb.us **(2)**
Evan Dodd, Division of Mining, Land, and Water, Alaska Dept of Natural Resources, 550 W. 7th Ave, Suite 1360, Anchorage, AK 99501-3577 evan.dodd@alaska.gov **(3)**
Kate Dueber, ROW & Public Projects, AK Railroad, PO Box 107500, Anchorage, AK 99510-7500 dueberk@akrr.com **(2)**
* 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:

Seward Highway: MP 25.5-36 Trail River to Sterling Wye Rehabilitation
Program No. 0311(031) / Z546590000

AS ADVERTISED: TBD, 2026
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"

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5. Federal Wage Rates

   Federal wage rates can be obtained at https://sam.gov/content/home for the State of Alaska. Use the federal wage rates that are in effect 10 days before Bid Opening. The Department will include a paper copy of the federal wage rates in the signed Contract.

6. State Wage Rates

   State wage rates can be obtained at http://www.labor.state.ak.us/lss/pamp600.htm. Use the State wage rates that are in effect 10 days before Bid Opening. The Department will include a paper copy of the State wage rates in the signed Contract.

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

INVITATION TO BID

for Construction Contract

Date TBD, 2026

Seward Highway: MP 25.5-36 Trail River to Sterling Wye Rehabilitation
Program No. 0311(031) / Z546590000

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 TBD day of Month 2026.** 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:	Moose Pass, Alaska
Contracting Officer:	Katherine Keith, PMP, PMI-ACP, Acting CR Director, Deputy Commissioner
Issuing Office:	Central Region

State Funded ☐ Federal Aid ☒

Description of Work:
This federally funded project will include restoring, resurfacing, and rehabilitation (3R) of the Seward Highway, from MP 25.5 to 36, Trail River to the Sterling Wye, to preserve and extend the service life of the highway, enhance safety, and provide passing lanes. The project also includes pedestrian amenities and traffic calming in the community of Moose Pass.

Project DBE Utilization Goal: ☒ Race-Neutral

The Engineer's Estimate is between **$90,000,000** and **$100,000,000**

All work shall be completed by **TBD, 2026.**
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: **Seward Highway: MP 25.5-36 Trail River to Sterling Wye Rehabilitation** **Program No. 0311(031) / Z546590000**	**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 **Chris Bentz, P.E.**

Email: chris.bentz@alaska.gov Phone: (907) 707-1912

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

SPECIAL NOTICE TO BIDDERS

The Department hereby notifies bidders that information to assist in bid preparation is available from the Department of Transportation and Public Facilities, Anchorage office, located at 4111 Aviation Avenue.

1. **Publications**. The following are available from the Plans Room, download online, or as noted:

   a. Standard Specifications for Highway Construction, 2020 Edition comb bound ($25.00), download at: www.dot.state.ak.us/stwddes/dcsspecs/assets/pdf/hwyspecs/sshc2020.pdf, or order bound book from LuLu at: https://www.lulu.com/en/us/shop/state-of-alaska-dept-of-transportation/2020-alaska-standard-specification-for-highway-construction/paperback/product-1gq9j9qk.html
   b. Alaska Test Methods Manual (Lab & Field), May 15, 2023 Edition ($25.00). Available online at: www.dot.state.ak.us/stwddes/desmaterials/mat_waqtc/testman.shtml
   c. Alaska Storm Water Pollution Prevention Plan Guide, March 2021. www.dot.state.ak.us/stwddes/desenviron/resources/stormwater.shtml
   d. Utility facility clearance requirements. Available online at:
      - Chugach Electric Association, Inc. (CEA) Electrical Facility Clearance Requirements https://www.chugachelectric.com/system/files/Electrical%20Facility%20Clearance%202020.pdf
      - ENSTAR Natural Gas Company (ENSTAR) https://www.enstarnaturalgas.com/wp-content/uploads/2023/04/2023-Contractor-Excavation-Safety-Letter-with-attachments.pdf
   e. Quantity Computations
   f. Roadway Cross Sections
   g. Geotechnical Report. Seward Hwy: MP 25.5-36 Rehabilitation, Project No. 0031131/Z546590000, April, 2022, By DOT&PF
   h. Erosion, Sediment Control Plan (ESCP). Seward Hwy: MP 25.5-36 Rehabilitation, Project No. 0031131/Z546590000, December, 2025 By DOT&PF
   j. Traffic Control Plan (TCP). Seward Hwy: MP 25.5-36 Rehabilitation, Project No. 0031131/Z546590000, December, 2025 By DOT&PF
   k. Original Ground Surface data (.XML file).The Department expressly states that these CAD files are for informational purposes only. The Department makes no representation, warranty, or guarantee, expressed, implied, or statutory, as to the accuracy, reliability, suitability, functionality, or results derived from the use of the information contained therein. The Department shall not accept, review, hear, or consider any bid protest or construction claims arising from use of the information. arising from use of the information.

2. **Materials Certification List (MCL)**. The MCL provides the Engineer with the appropriate approving authority. Contractor, submit certification for each material to the Engineer. The MCL is included in Appendix C.

3. **Environmental Documents**. The Department has approved an environmental document addressing concerns and environmental commitments. This document is available for review in the Department Section of Preliminary Design and Environmental. (907) 269-0542.

4. **Section 120, Disadvantaged Business Enterprise (DBE) Program**. The U.S. Department of Transportation issued an Interim Final Rule (IFR) on October 3, 2025 with an immediate effective date. The rule removes race- and sex-based presumptions in Disadvantaged Business Enterprise (DBE)/Airport Concessions DBE (ACDBE) qualifications and requires the Alaska Unified Certification Program (AUCP) to recertify all applicants based on evidence of social or economic disadvantage.

   Until this recertification process is complete for all firms, the Department cannot count DBE participation toward overall DBE goals. In anticipation of recertification, the Department is still requiring submission of DBE paperwork for all projects, to include Good Faith Effort (GFE) and DBE Utilization Forms with the following guidance:

As a result:

- There are no mandatory DBE contacts required for Good Faith Effort (GFE) documentation.
- DBE Commitment Forms may be marked as "Not Applicable".
- Any submitted DBE Utilization Forms should reflect $0.00 DBE participation.

The Interim Final Rule is available here:
https://www.federalregister.gov/documents/2025/10/03/2025-19460/disadvantaged-business-enterprise-program-and-disadvantaged-business-enterprise-in-airport

5. **Cargo Preference Act Requirements**. The provisions of the Cargo Preference Act (CPA) must be physically incorporated into all Federal-aid Projects awarded after February 15, 2016, and must be physically incorporated in all agreements with subcontractors and lower tier subcontractors.

   Form 25D-55 (2/16) is revised to include the CPA provisions to the Required Contract Provisions for Federal-Aid Construction Contracts. See the last page of Form 25D-55 for the CPA requirements.

   For additional details, please visit: https://www.fhwa.dot.gov/construction/cqit/cargo.cfm

6. **Buy America Provision**. Effective for Federal award obligations after October 23, 2023, meet the requirements at 2 CFR 184 for construction materials.

   Iron products, steel products, and predominantly iron or steel manufactured products remain subject to the requirements of 23 CFR 635.410 and related FHWA Interpretations and waivers.

   Manufactured products that are not predominantly iron or steel continue to be waived under FHWA's 1983 waiver of manufactured products.

   On August 16, 2023, USDOT issued a waiver at 88 FR 55817 applicable to construction materials on FHWA funded projects.

   HSP20-7A revises the specifications in 106-1.01 to incorporate these new requirements.

   2 CFR 184:
   https://www.federalregister.gov/documents/2023/08/23/2023-17724/guidance-for-grants-and-agreements
   23 CFR 635.410:
   https://www.govinfo.gov/content/pkg/CFR-2022-title23-vol1/xml/CFR-2022-title23-vol1-sec635-410.xml
   USDOT waiver at 88 FR 55817:
   https://www.federalregister.gov/documents/2023/08/16/2023-17602/waiver-of-buy-america-requirements-for-de-minimis-costs-and-small-grants
   FHWA interpretations, waivers, regulations, policy and guidance on Buy America:
   https://www.fhwa.dot.gov/construction/cqit/buyam.cfm

7. **Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment**. 2 CFR 200.216, as amended effective August 13, 2020, Federal Register, Vol. 85, No. 157, 49506 – 49582, Prohibition on certain telecommunication and video surveillance services or equipment. Refer to Subsection 106-1.01.

8. **Alaska DOT&PF Bidders List Form.** All bidders on federally funded projects must submit the Alaska DOT&PF Bidders List Form with their Bid submittal at the time of bid opening. This is a federal requirement of all bidders, but is not a condition of responsiveness.

   Fill out the Alaska DOT&PF Bidders List Form for all subcontractors contacted for quotes regardless of whether they are the successful subcontractor. Ensure the NAICS codes submitted in the Alaska DOT&PF Bidders Form align the subcontractor scope for the work requested with the appropriate federal code. This may result in multiple NAICS codes for each subcontractor.

   Vendor IDs are available at https://dot.alaska.gov/procurement/awp/vendorcheck.html
   If a subcontractor does not have a Vendor ID in AASHTOWare, leave that field blank but fill in the Vendor Name and applicable NAICS codes.

For electronically submitted bids, attach a copy of the completed Excel file as an attachment in BidX. If submitting a manual bid, email the Excel file to the regional contracts office conducting the procurement prior to the bid opening.

Central – crdotpfcontracts@alaska.gov
Northern – dot.nrconracts@alaska.gov
Southcoast – srdotpfcontracts@alaska.gov

The collection of this information is a requirement of 49 CFR 26.11(c) and is required of all bidders at the time of bid to ensure DOT&PF's compliance with Federal Regulation.

9. **Utilities**.

   a. **Agreements and Dispositions**. Utility Agreements and dispositions are available for review at the office of the Utilities Engineer, (907) 269-0644. Copies may be available, coordinate with the Utility Engineer.

   b. **Utilities, and Erosion, Sediment and Pollution Control.** Utilities will be relocated by others concurrently with construction of this project. The Contractor is responsible for the coordination with Other Contractor's and for control of erosion, sediment and pollution including stabilization of areas disturbed during utility relocation, as described in Section 105-1.06.

      The Contractor will identify, in their SWPPP, other work that is or will occur inside or adjacent to the project limits during the contract period.

10. **Certified Payroll**. Certified payroll must be submitted electronically through AASHTOWare for contracts awarded after January 1, 2021.

    In order to submit certified payroll, Contractors, Subcontractors, and lower tier Subcontractors must be active in AASHTOWare, which requires they have a valid Vendor ID with a 913 commodity code.

    To obtain a Vendor ID, register with the State of Alaska via the Vendor Self-Serve (VSS). Instructions for creating a new account in the VSS system can be found under Reference Guides and Forms at the following link:
    https://iris-vss.alaska.gov/PRDVSS1X1/Advantage4

    For information on certified payroll, contact the Department of Labor and Workforce Development, Wage and Hour Administration:

	Juneau	(907) 465-4842
	Anchorage	(907) 269-4900
	Fairbanks	(907) 451-2886

    DOT&PF AASHTOWare Project guidance, including schedule, FAQs, training options:
    http://dot.alaska.gov/aashtoware/

11. **Laborers Mechanics Minimum Rate of Pay**. The current Laborers Mechanics Minimum Rate of Pay contains information on remote sites and per diem. The Department of Labor has issued WHPL #197, which further clarifies this requirement. See pay item 640.0004.____.

12. **Asphalt Material Price Adjustment**. The unit price adjustment for asphalt material will be combined and paid under one Pay Item. Refer to Sections in Division 300 and 400 that include an "Asphalt Material Price Adjustment" Pay Item.

13. **Escrow of Bid Documentation Declaration**. Refer to Subsection 103-1.11 Escrow of Bid Documentation. The form "Escrow of Bid Documentation Declaration" is included at the end of Subsection 103-1.11 and is required as part of this Contract.

14. **Escrow of Proposal Documentation Declaration.** Refer to Subsection 103-1.11 Escrow of Proposal Documentation. The form "Escrow of Proposal Documentation Declaration" is included at the end of Subsection 103-1.11 and is required as part of this Contract.

15. **Limitation of Operation**. Limit disturbed unstabilized ground. Refer to Subsection 652-1.04 Limitation of Operation for further information.

16. **Contract Price Adjustment(s)**. The Department will not provide cost escalation or de-escalation price adjustment for this contract, except for specific items described in the bid package at the time of bid opening.

CSNtB-25.1001-1_SSHC20

PART 4

STANDARD MODIFICATIONS AND SPECIAL PROVISIONS

To the **STATE OF ALASKA**

STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION

2020
EDITION

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DIVISION 100 — GENERAL PROVISIONS

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SECTION 102
BIDDING REQUIREMENTS AND CONDITIONS

Standard Modification

102-1.05 PREPARATION OF BID.

In the third paragraph, replace the fourth sentence with the following:

If the bidder is a joint venture, the bid must be signed by an officer or agent with authority to bind the joint venture.

HSM20.42-22.0430

SECTION 103
AWARD AND EXECUTION OF CONTRACT

Special Provisions

Add the following Subsection:

103-1.11 ESCROW OF BID DOCUMENTATION. Furnish a legible copy of your bid documentation and declaration, as instructed in writing by the Contracting Officer. Bid documentation consists of written documentation of all quantity takeoffs, construction schedules on which the bid is based, cost estimates, rates of production and progress, assumptions, calculations, quotes from subcontractors and suppliers, and other information used to prepare your bid for this project.

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

Meet the following requirements:

1. Submitting Bid Documentation. Place bid documentation in a sealed container clearly marked "Bid Documentation" and labeled with the bidder's name and address, submission date, and project name and number. Deliver the sealed container to the Department-designated document Depository for safekeeping.

2. Declaration. As instructed in the Intent to Award, submit directly to the Contracting Officer a signed and certified declaration attesting that:

   a. The declarant has examined the bid documentation and that the sealed container marked "Bid Documentation" includes all documents used to prepare the bid;

   b. The sealed container contains all bid documentation submitted;

   c. The escrow materials were relied on to prepare the bid; and

   d. Should a dispute arise, the Contractor's rights to use bid preparation documentation other than those in escrow are waived.

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

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

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

   Notwithstanding requirement 5 below, the Department will be allowed: to make copies of any and all escrow documentation (whether hard-copy, electronic, or otherwise); to use and review any copies made whether in the presence of the Contractor, or not; and to share copies with staff and consultants directly involved in the subject dispute.

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

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

4. Failure to Provide Bid Documentation. Refusal or failure to provide your bid documentation or declaration renders your bid nonresponsive.

5. Confidentiality of Bid Documentation. Materials held in escrow are your property. Except as otherwise provided herein, the escrow materials cannot be released without your approval.

6. Cost and Escrow Instruction. The Department pays to store all escrowed materials and instructs the Depository regarding escrow.

7. Payment. Include within the overall Contract bid price all costs to comply with this subsection.

8. Return of Escrow Documentation. The original escrow documents will be returned to you once litigation is concluded, outstanding claims are resolved, you have completed the Contract, and the Department receives an executed Contractor's Release (Form 25D-117) with no exceptions listed.

HSP20.10-25.0528

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ESCROW OF BID DOCUMENTATION AFFIDAVIT

THE UNDERSIGNED HEREBY CERTIFIES THAT THE ESCROW OF BID DOCUMENTATION CONTAINS ALL OF THE INFORMATION THAT WAS USED TO DEVELOP THE BID AND THAT I HAVE PERSONALLY EXAMINED THESE CONTENTS AND THAT THE DOCUMENTATION IS CORRECT AND COMPLETE IN ACCORDANCE WITH SUBSECTION 103-1.11. **SUBMITTAL BY THE CONTRACTOR OF A CLAIM, WHICH IS NOT CONSISTENT WITH THE CONTENTS OF THESE BID PREPARATION DOCUMENTS, SHALL RESULT IN DENIAL OF THE CLAIM.**

By:_____

Title:_____

Firm:_____

Date of Submission:_____

Project Number:_____

CREscrowBidAffidavit-050509

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SECTION 104
SCOPE OF WORK

Standard Modification

104-1.01 INTENT OF CONTRACT.

Replace the second paragraph with the following:

The Contractor is responsible for the means, methods, techniques, sequence, and procedures of construction, safety, and quality control. This includes ensuring safety and overseeing the safety of all personnel and Subcontractors. In the event of a multi-employer site, the Contractor is the controlling employer responsible for coordinating site-wide safety efforts, ensuring compliance with applicable safety regulations, and mitigating potential hazards across all employees, Subcontractors or suppliers on the site, consistent with any applicable federal, state, and local laws, rules, regulations, and ordinances.

HSM20.53-25.0610

104-1.06 VALUE ENGINEERING CHANGE PROPOSALS BY CONTRACTOR.

Replace 104-1.06.3.e with the following:

e. The Contractor may submit VECPs for an approved subcontractor. If the Contractor elects to submit a VECP for an approved subcontractor and it is subsequently accepted by the Department, the Department will reimburse the Contractor per 104-1.06.5.

HSM20.2-20.1130-1

SECTION 105
CONTROL OF WORK

Special Provisions

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

Standard Modification

105-1.05 COOPERATION BY CONTRACTOR.

Replace the second paragraph with the following:

Either the Contractor's Superintendent or an acting Superintendent with authority to represent and act for the Contractor shall be available on-site, or within a reasonable distance to ensure timely response and oversight of the project whenever work is occurring. The Contractor shall employ, as its agent, a competent superintendent thoroughly experienced in the work being performed and capable of reading and thoroughly understanding the Plans and Specifications.

The Contractor shall be responsible for maintaining a safe work environment, ensuring compliance with all applicable safety regulations, and overseeing the safety of all work being performed. The Superintendent shall have the Contractor's authority to stop work and implement immediate corrective action if safety concerns arise, or if the work is not being performed in accordance with the Contract documents.

The Contractor shall provide 24-hour contact information for the Superintendent. The Contractor shall ensure that the superintendent is available at all times to receive and execute Directives and other instructions from the Engineer, to supervise personnel and to coordinate the work of subcontractors. The Contractor shall give the superintendent full authority to supply the resources required. The Contractor shall furnish superintendence regardless of the amount of work sublet.

HSM20.52-25.0610

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.

C105.6-23.0601

SECTION 106
CONTROL OF MATERIAL

Special Provision

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 106-105 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.

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 articles, 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 enclosure.

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-bases products, or any others.
   e. Optical Fiber. All manufacturing process, 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.

De Minimis Waiver:
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 non-compliant products" does not include the value of those products subject to a separate Buy America Waiver.
2. "Total applicable project cost" (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.

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

HSP20.7B-25.1030

Standard Modification

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

106-1.05 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 fully complies with all Contract requirements including for domestic materials preference.

HSP20.7B-25.1030

SECTION 107
LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

Special Provisions

107-1.02 PERMITS, LICENSES, AND TAXES.

The Department will: Add No. 3:

3. The Department has received the following permits on the Contractor's behalf:

    a. ADFG Fish Habitat Permit(s)
    b. USACE Nationwide # 23 (includes ADEC 401)
    c. KPB 50ft Habitat Protection District Permit
    d. ADEC Non-domestic Wastewater Approval
    e. ADEC APDES
    f. ADEC Contaminated site coordination & approvals

C107.4-17.1201-2

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 F, 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.

C107.5-17.12011-1

Standard Modification

107-1.06 SANITARY, HEALTH, AND SAFETY PROVISIONS.

Replace the fourth paragraph with the following:

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

1. A Site Specific Safety Plan(s) (SSSP) prior to the commencement of work. This plan must outline the safety measures and procedures to be followed on-site, ensuring compliance with all applicable federal, state, and local safety regulations.

2. The SSSP shall be accessible to all contractor personnel and subcontractors, and provided to the Department upon request.

3. A hazard analysis prior to the commencement of work. It must specifically focus on the job functions and the hazards associated with performing them. The contractor is responsible for ensuring that all necessary personnel are informed of and follow the hazard analysis guidelines.

4. New employee training and periodic worker training regarding safety and health.

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

6. The Contractor shall implement a comprehensive Safety Program to oversee site safety, including the development and maintenance of the SSSP, hazard analysis, employee training, and safety meetings. The program must ensure compliance with safety regulations and promote a proactive safety culture. For specific tasks, refer to Subsection 108-1.03.

HSM20.49-25.0610

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.

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

Standard Modification

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

Special Provision

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

C108.3-16.0128-1

108-1.03 PROSECUTION AND PROGRESS.

Replace item 9. with the following: The Contractor shall provide a letter designating a Safety Officer, and designating that person's responsibilities and authority. The Safety Officer is responsible for the Safety Program. The Safety Officer must be familiar with the project plans, specifications, and proposed operations and have the necessary experience and training to assess and address safety elements associated with the project.

Add the following:

10. The Contractor shall implement a comprehensive Safety Program for the Project to ensure all safety measures are met throughout the duration of the project and that the program complies with all applicable federal, state, and local safety regulations.

Requirements. The Safety Program shall include the development, implementation, and ongoing maintenance of the Site-Specific Safety Plan (SSSP), along with the preparation and regular updating of hazard analyses to identify and mitigate risks associated with specific construction activities. It shall ensure that the site complies with project-specific safety requirements, OSHA/AKOSH regulations, and oversees the appropriate use of personal protective equipment (PPE) on-site.

The program will involve routine safety inspections to identify hazards, site-specific safety orientations, and ensure all personnel and Subcontractors receive the necessary training in accordance with AKOSH/OSHA standards. It will also establish procedures for investigating incidents, injuries, and near misses, with corrective actions implemented as needed. Detailed records, such as safety meeting minutes, training logs, incident reports, safety audits, and inspections shall be maintained. Safety reports shall be submitted to the project manager, engineers, or clients as requested.

The Safety Program shall have clear procedures for halting work and implementing immediate corrective actions if safety concerns arise, or if the work is not being conducted in compliance with the Contract documents, safety standards, or applicable federal, state, and local laws.

HSM20.50-25.0610

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

Special Provision

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

109-1.05 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

Standard Modification

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

Special Provisions

Delete Section 120 Disadvantaged Business Enterprise Program:

C120.1-17.0301-1

Standard Modification

120-1.01 DESCRIPTION.

In the first sentence of the second paragraph, delete “8.83 percent" and substitute the following: “9.39 percent”.

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

DIVISION 200 — EARTHWORK

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SECTION 201
CLEARING AND GRUBBING

Special Provisions

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

201-5.01 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

SECTION 202
REMOVAL OF STRUCTURES AND OBSTRUCTIONS

Special Provisions

202-1.01 DESCRIPTION. Add the following:

Property Owner Fence: salvage and neatly stack in the owner's yard.

C202.6-20.0401

Fugitive Materials: remove and dispose of fugitive materials from under guardrails, around luminaire bases, and as specified. Conduct a pre-construction inspection of the project area with the Engineer to determine the limits of the fugitive material removal and disposal work.

C202.4-20.0401/Z546590000

Ground Water Wells: decommission.

C202.8-20.0401-1/Z546590000

Septic System: remove and dispose.

Z546590000

202-2.01 MATERIALS. Add the following:

Fugitive Materials: including but not limited to organic matter (peat, roots, sticks, sod or other), muck, earth (where not part of surface material) rocks, gravel, sand, silts and debris (trash and similar) and as identified by the Engineer.

C202.4-20.0401/Z546590000

Replace Subsection 202-3.01 with the following:

202-3.01 GENERAL.

Demolish and remove indicated improvements located at the listed addresses below. See respective estimated number of permanent structures to be removed. These include, but are not limited to:

1) 34740 Seward Highway
   a) 1500 SF Home. Parcel ID 12536020

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

Remove the utility lines, sidewalks, and other attached appurtenances from the buildings, foundations, and structures.

Buildings may contain asbestos.

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

Topsoil, seed, mulch and fertilize all disturbed ground in accordance with Section 618 and 620.

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

Burning and use of explosives will not be permitted on the project.

Non-combustible debris, construction and demolition waste materials, with written approval, may be placed in embankments under the provisions of Subsection 203-3.03 for placing rock in embankments (No metal pipes, wires, or cables may be placed in any embankment). Maximum allowed dimension of broken material is 6 inches.

Dispose of waste material outside of the project right-of-way limits according to Subsection 202-3.06.

Z546590000

Add the following:

Property Owner Fence: carefully remove fences, designated by the Engineer, to the right-of-way limit, or to the end of the span beyond the right-of-way limit. Fence materials belong to the property owners. Salvage and stack fence materials neatly in the property owner's yard. If a noise barrier or separation fence is constructed, with the owner's permission, use salvaged fencing to fill fencing gaps behind the property line. Use salvaged fencing according to Section 607, for reconstructed fences.

C202.6-20.0401

Replace Subsection 3.04 with the following:

202-3.04 REMOVAL OF PIPE. When the bid schedule contains an item for the “Removal of Culvert Pipe”, the removed pipe becomes the property of the Contractor.

Existing culverts scheduled to be abandoned in the plans, shall be abandoned in place. The Contractor shall empty the culvert of all water, fill the pipe with Controlled Low-Strength Material meeting Section 205, and plug the ends. The Contractor shall demonstrate the entirety of the pipe to be abandoned has been filled prior to the installation of end caps. Validation shall include placement of a predetermined volume of cement slurry into the pipe to be abandoned.

Culverts that intersect the side-slopes shall be removed to a depth of not less than 3 feet, measured normal to the plane of the finished side slope, before being abandoned.

All excavation, shoring, dewatering, disposal of unsuitable material, backfilling, and compactive effort required for completion of abandonment shall conform to the requirements of Division 200 – Earthwork.

Culverts shall not be abandoned until their use is no longer required. The Contractor shall notify the Engineer in advance of any intended culvert abandonment.

Z546590000

Replace Subsection 3.05 with the following:

202-3.05 REMOVAL OF PAVEMENT, SIDEWALKS, AND CURBS. In removing pavements, curbs, walks, driveways and similar structures, make all cuts clean, vertical, and true to designated lines where an abutting structure or a part of a structure is to be left in place.

Pavement materials, base course, sidewalks, curbs, gutters, etc., designated for removal may be placed in the embankment in accordance with 203-3.03 with written approval. Maximum allowed dimension of material is 6 inches.

Dispose of materials, not placed in the embankment, outside the right-of-way project limits according to Subsection 202-3.06.

C202.2-20.0401

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 right-of-way 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

Add the following Subsection 202-3.08 Ground Water Well Decommissioning:

202-3.08 GROUND WATER WELL DECOMMISSIONING. Decommission the water wells according to DEC requirements conforming to 18AAC 80.015(e) Well Protection Source Water Protection, and Well Decommissioning, or a DEC approved alternate method. Develop and submit a detailed Ground Water Well Decommissioning Plan to the Engineer. Contact the ***[City]*** DEC office at (907) ###-####, for plan review requirements of alternate methods. The well casing shall be decommissioned at least five feet below the bottom of roadway structural section. The location and top elevation of the well shall be surveyed by an Alaska-Registered Professional Land Surveyor (PLS) prior to backfilling the excavation for as-built purposes.

Backfill all trenches, holes, and pits flush to the surrounding finish grade with Select Material, Type C outside of the roadway structural section. Topsoil, seed, mulch and fertilize all disturbed ground in accordance with Section 618 and 620.

C202.8/Z546590000

Add the following Subsection 202-3.09 Removal of Fugitive Materials:

202-3.09 REMOVAL OF FUGITIVE MATERIALS. Remove fugitive materials from in front of, under, and for a width of 10 ft behind sections of guardrail, measured from the roadside face of guardrail, or as directed by the Engineer. Provide positive drainage away from the roadway. Slope edges of sand removal at 3:1 or flatter.

Clean around the base of a luminaire when the base falls within the 10 ft. The 10 ft width is measured from the roadside face of the guardrail toward the shoulder to the closest point of the luminaire base plate, or as directed by the Engineer. Remove fugitive materials from around the base to a level flush with surrounding ground - or as directed by the Engineer.

Remove disturbed materials in the same work shift the disturbance occurred. Do not reuse these materials within the project limits without the written approval of the Engineer.

Dispose of removed materials according to Subsection 202-3.06

C202.4-20.0401/Z546590000

Add the following Subsection 202-3.10 Removal of Septic System:

202-3.10 REMOVAL OF SEPTIC SYSTEM. Remove and dispose of onsite septic systems as shown in the plans in accordance with applicable requirements. These include, but are not limited, pumping the holding tank, removing the piping from the structure to the tank, and removing the tank. All cleanouts and monitoring points shall be removed. Contractor is responsible for verifying size, location, and number of holding tanks.

Backfill all trenches, holes, and pits flush to the surrounding finish grade with Select Material, Type C outside of the roadway structural section. Topsoil, seed, mulch and fertilize all disturbed ground in accordance with Section 618 and 620.

Z546590000

202-4.01 METHOD OF MEASUREMENT. Add the following:

Removing and disposing fugitive materials along the edge of the traveled way will not be measured for payment.

Abandoning existing culvert will be measured by Controlled Low-Strength Material under Subsection 205-4.01.

CR202.4/Z546590000

Standard Modification

202-5.01 BASIS OF PAYMENT.

In the first paragraph, replace "and 22.0013.____." with the following: "and 202.0013.____."

In the fourth paragraph, replace "Items 020.0014.____" with the following: "Items 202.0014.____"

HSM20.4-20.1130-1

Add the following:

Acquiring waste disposal permits is subsidiary to 202 Pay Items.

C202.1-20.0401

Removing and disposing fugitive materials is subsidiary to Section 203 Pay Item 203.0003.____ Unclassified Excavation.

C202.4/Z546590000

Item 202.2022.____. At the Contract Unit price for the actual length of fence taken down, disposed, or delivered to the owner, regardless of the type or height.

C202.6-20.0401

Item 202.2012.____. At the Contract Lump Sum price for each well decommissioned. Payment includes full compensation for necessary excavation, backfill, disposal, cutting of the casing, recording, planning, and surveying.

C202.8/Z546590000

Item 202.2025.____. At the Contract Lump Sum price for each septic system removed and disposed. Payment includes full compensation for necessary excavation, pumping, purging, processing, or removing Septic-contaminated soils around the tanks, and backfilling the resultant hole.

Removal of end sections and inlets are subsidiary to Pay Item 202.0004.____ Removal of Culvert Pipe.

Abandoning existing culverts will be paid for under Pay Item 205.0005.____ Controlled Low-Strength Material. Removal of end section and inlets are subsidiary.

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PAY ITEM

Item Number	Item Description	Unit
202.2012.____	Ground Water Well Decommissioning	Each
202.2013.____	Remove Fugitive Materials	LF
202.2022.____	Removal of Fence	LF
202.2025.____	Removal of Septic System	Each

C202.8-20.0401-1 / C202.4-20.0401 / C202.6-20.0401 / Z546590000

Replace Section 203 with the following:

SECTION 203
EXCAVATION AND EMBANKMENT

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

Install Rock Bolts or Dowels and associated Hardware, Cement Grout as necessary to stabilize rock slopes at locations directed by the Engineer. The Engineer will determine the lengths and orientations of the rock bolts or dowels. Supply all materials, equipment, and labor necessary to install and test the rock bolts/dowels. Grout loss and encountering groundwater should be anticipated and mitigative measures implemented.

Drill drain holes to the depths and locations specified by the Engineer.

Furnish and install high tensile strength steel Wire Mesh system for purposes of slope stabilization at locations identified on the plans or as directed by the engineer. The slopes primarily occur above rock cuts and consist of any combination of soil, cobbles, boulders and mid-slope rock outcrops encountered during excavation. The contractor shall provide an experienced Supervisor on-site to direct the mesh installation process. The Supervisor shall be on-site during installation of all mesh and rock anchors.

Ditch linear grading or special ditching shall consist of the final shaping of designated ditches and slopes for drainage by grading with a small dozer, motor grader, or other suitable means approved by the Engineer.

203-2.01 MATERIALS.

1. Unclassified Excavation. All materials of whatever character encountered in the work. May include rock, common, or muck.

2. Classified Excavation.

    a. Common Excavation. Silt, sand, gravel, and granular material other than rock or muck.

    b. Rock Excavation. Rock that cannot be excavated without blasting or ripping.

    c. Muck Excavation. Soils, organic matter, and other material not suitable for foundation material regardless of moisture content.

3. Borrow. Approved material required for embankments or for other portions of the work, and obtained from sources outside the right-of-way limits for the project. Use fill material from weed-free material sites. Fill material from off project alignment shall be certified through the Kenai Soil & Water Conservation District weed-free program. All stockpiled materials shall be reviewed and certified quarterly by a weed-free specialist.

4. Rock Stabilization Materials. Rock Bolts, Rock Dowels, Cement Grout, Wire Mesh and Associated Hardware shall meet 709-2.04 requirements.

5. Slope Stabilization Materials. High tensile strength steel Wire Mesh and Associated Hardware, Boundary Ropes, Main Soil and/or Rock Anchors, Secondary Soil Nails, Splice Couplers, Centralizers, Grout, and Miscellaneous Materials shall meet 709-2.05 requirements. Ancillary parts needed for mesh installation shall be provided by the mesh manufacturer.

6. High Performance Turf Reinforcement Mats (HPTRM). The HPTRM shall meet the requirements indicated in Sections 619 and 727-2.02.

7. Crushed Glass: May be combined with soil-aggregate material to be used in embankment construction. Meet 703-2.15 requirements.

8. Stemming. Graded crushed stone between 1/8" and 3/8" diameter. Drill cuttings are not allowed.

9. Safety Gear for the Engineer and Inspectors: Provide all safety gear, including but not limited to eye protection, climbing harnesses and training for the Department's on-site personnel.

CONSTRUCTION REQUIREMENTS

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

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

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

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

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

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

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

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

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

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

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

Do not place soil-aggregate containing glass cullet:

1. Within four feet from the face of any embankment slope,

2. Within 150 feet from any surface water body,

3. In embankment areas where culvert placement is required,

4. In contact with any geosynthetic material.

5. Within 50 feet of detection loops.

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

1. Overburden Exploration. Conduct overburden exploration to determine the depth of soil overlying proposed rock cuts. Use this information to adjust the planned slope limits, and the excavation quantities. Provide the Engineer a daily report of the depths encountered during exploration. Report depths at 25-foot intervals along the cut. Include station, offset and depth at each location.

   Conduct exploration by drilling, probing, excavating test pits or any other method approved by the Engineer.

   Submit an exploration plan for the Engineer's approval prior to conducting any work. Include the station limits of the proposed exploration, the spacing between holes or pits, and the method of exploration.

2. Blasting. This work includes drilling, loading, and blasting rock, using controlled blasting, production blasting and trim blasting techniques as shown in the Plans and specifications or as directed by the Engineer.

   a. General Blasting Program and Plan. Not later than two (2) weeks prior to the commencement of any drilling and blasting operations, submit to the Engineer for his approval, a General Blasting Program Plan for the entire project. Do not commence any drilling or blasting operations until the General Blasting Program Plan is accepted by the Engineer. Include the following in the General Blasting Program Plan:

      (1) Provide required information for individuals identified in subsection b. below.

      (2) Description of the overall blasting program, including general sequence of the work and a generalized schedule showing where and when blasting and excavation is expected to be conducted.

      (3) Traffic routes and scheduled closures.

      (4) Tentative blast design details for each rock cut or sequence of cuts, rock type and tested blast parameters, including hole diameters, production and line hole spacing and depths, type of explosives and initiators, powder factors, and delay and firing sequences to be used in the test sections described below.

         Provide a results report within three (3) days of test blast, including a proposed Production Blasting Plan for the applicable rock cut(s). Allow one (1) day for Engineer review. Revise proposed Production Blasting Plan as required by the Engineer. Incorporate results into Production Blasting Plans following Engineer approval.

      (5) Provide a Production Blasting Plan prior to each production blast as set forth in Subsection g., below.

      (6) Location of explosive storage facilities.

      (7) Description of warning signals and signs and safety procedures.

      (8) Proposed measures for protection of structures, facilities, adjoining work, and sensitive fish and wildlife habitat.

      (9) Number and type of seismographs (if required) proposed for monitoring the blasts.

(10) Techniques for drilling and loading explosives in wet or water filled blast holes.

(11) Proposed Rock Bolt, Rock Dowel and Drain Hole work, where needed.

(12) Proposed measures to identify and protect existing utilities during blasting operations.

For convenience, the General Blasting Program may group together similar cuts with similar rock types, geometry and other characteristics. Conduct test blasting to establish that the General Blasting Program results in acceptable final rock slope conditions. Submit results of the test blasting for evaluation and approval by the Engineer. The General Blasting Program shall be tentative, pending the approval by the Engineer or test blasting conducted as set forth in Subsection g. below.

b. Blasting Personnel Requirements and Responsibilities. Provide individuals to fulfill the following roles. Use separate individuals for the roles of Blasting Consultant, Blasting Superintendent, Blaster in Charge and Blasting Specialist. All individuals are subject to the Engineer's approval. Approval is granted when the Engineer approves the General Blasting Program.

(1) Blasting Consultant. Employ the services of a Blasting Consultant to design and supervise the general blasting program as described above. The Blasting Consultant is responsible for preparation and quality control of the General Blasting Program. The Blasting Consultant must be on site to witness the loading and blasting of all test blasts. Problems with blasting may require additional involvement of the Blasting Consultant as required under Section 5. Blast Inspection and Tolerances.

The Blasting Consultant must possess the following minimum qualifications and experience:

- Not an employee of the Contractor, blasting subcontractor, explosives manufacturer, or explosives distributor.
- An expert in the field of drilling and blasting who, for at least the past 10 years, has derived their primary source of income from providing special blasting services, blasting consulting services, or both.
- Available for the duration of the project, as verified in a letter from the Blasting Consultant.
- Work on at least 15 projects with blasting.
- Work on at least five rock excavation projects at close proximity (<25 feet) to structures, where there were no claims to the owner for geologic problems that affected blasting.
- Responsible for at least three rock excavation projects, where each project included at least 100,000 linear feet of controlled blasting (measured as the sum of the depth of controlled blasting holes).
- The Blasting Consultant's resume shall include at least three projects including the location, duration, scope, description, geologic conditions, and the challenges that developed through the course of each project and how the challenges were resolved. Each project description shall include the names and phone numbers of the project owner or their representative who has sufficient knowledge to verify the submitted information.

(2) Blasting Superintendent. The Blasting Superintendent has direct supervision over production activities, from drilling and blasting to quality control of the product. The Blasting Superintendent shall work in coordination with the Earthwork Superintendent and Earthwork Foreman to ensure all equipment and/or materials are on site, and to coordinate daily and long-term project scheduling activities for equipment, production, and personnel. The Blasting

Superintendent is responsible for interfacing with the Project Engineer and the Blasting Consultant in all issues dealing with blasting and quality control of the Blaster in Charge's work. The Blasting Superintendent's resume shall include 7 years of progressively more difficult earthwork experience, of which two years includes blasting activities.

(3) Blaster in Charge. The Blaster in Charge is subordinate to the Blasting Superintendent. The Blaster in Charge is responsible for the design and execution of blasts. The Blaster in Charge must be present for all explosive loading and blasting operations through the duration of the project.

The Blaster in Charge must possess the following minimum qualifications and experience:

- Hold a current Explosive Handler Certificate of Fitness.
- Have at least 10 years of blasting experience utilizing controlled blasting techniques.
- Have at least five years of specialized experience with presplitting techniques, including precision presplitting, in mixed rock types similar to the bedrock strata present at the project site.
- Completed at least five days of classroom training within the last five years in current controlled blasting techniques.
- Blaster in Charge from start to finish on at least two rock excavation projects, similar in scope and complexity as this project, where there were no claims to the owner for geologic problems that affected blasting. Each project must have included at least 100,000 linear feet of controlled blasting (measured as the sum of the depth of controlled blasting holes).
- The Blaster in Charge's resume shall include at least three projects including the location, duration, scope, description, geologic conditions, and the challenges that developed through the course of each project and how the challenges were resolved. Each project description shall include photos which exhibit the Blaster in Charge's competency and ability to create the designed cut slope configuration to the specified tolerances. Each project description shall include the names and phone numbers of the project owner or their representative who has sufficient knowledge to verify the submitted information.

(4) Blasting Specialist. The Blasting Specialist is subordinate to the Blaster in Charge and is responsible for all issues dealing with blasting, quality control of the Blaster in Charge's work and preparation of submittals. During loading of a blast do not assign any duty to the Blasting Specialist except to accurately document the loading for preparation of the Blast Report.

The Blaster in Charge must possess the following minimum qualifications and experience:

- Hold a current Explosive Handler Certificate of Fitness.
- Have at least 5 years of blasting experience utilizing controlled blasting techniques.
- The Blasting Specialist's resume shall include at least three projects including the location, duration, scope, description, geologic conditions, and the challenges that developed through the course of each project and how the challenges were resolved. Each project description shall include photos which exhibit the Blasting Specialist's competency and ability to create the designed cut slope configuration to the specified tolerances. Each project description shall include the names and phone numbers of the project owner or their representative who has sufficient knowledge to verify the submitted information.

c. Pre-blast Meeting. Hold a pre-blasting meeting at the jobsite, prior to commencement of any drilling and blasting operations, with a minimum of the Contractor, Blasting Consultant, Blasting Superintendent, Blaster in Charge, Blasting Specialist and representatives of the Engineer. Discuss the General Blasting Program and Blasting Plans and visit enough specific sites as are necessary to familiarize the participants with the details of the blasting operations.

d. Safety. Submit a safety plan for approval by the Engineer that includes plans for closure of roads, warning signals, notification of affected local, state and federal agencies. Include in the plan methods used to protect life and health, public and private property, new work or existing work on the project, nearby structures, wetlands, waters and wildlife. Hold a safety meeting prior to the commencement of drilling and blasting work to address safety issues with respect to drilling and blasting.

(1) Warning Signals. Establish a method of warning all personnel on the job site near the blast of an impending blast. The warning signals shall consist of an audible horn or siren signal five (5) minutes prior to the blast and a second signal one (1) minute before the blast, at a minimum.

(2) Inspection and All Clear Signal. After the blast, the Blaster in Charge shall observe the area of the blast for five (5) minutes to guard against injury or damage due to rockfall. The Blaster in Charge shall then inspect the blast area to determine that all explosive charges were detonated. After these inspections, the Blaster in Charge shall sound an audible horn or siren as an all-clear signal to alert all personnel that the area is safe for entry.

(3) Misfires. If a misfire occurs, the Blaster in Charge shall follow appropriate procedures to handle the misfire, including, but not limited to, determining why the misfire occurred; excluding all but essential personnel from the blast area, closing nearby roads or facilities; repairing the initiation system; correcting the misfire in a safe manner; if unable to solve the problem, call consultants skilled in correcting misfires.

e. Use of Explosives.

(1) Conduct all blasting operations, including storage, transportation and handling of explosives and blasting agents in accordance with all local, State, and Federal laws and regulations, including the applicable provisions of the Standard Specifications. Submit storage plans to the Engineer for approval and confirm the Engineer's approval prior to ordering and shipping any explosive materials to the jobsite.

(2) Use caps for a specific period from a single lot number, to help ensure the accuracy of firing times.

(3) Blast hole conditions may range from dry to wet and filled with water. Describe in the General Blasting Program Plan appropriate techniques for any moisture conditions that are encountered. Use whatever type of explosives and accessories are necessary to achieve the desired result.

f. Workflow. The anticipated workflow of blasting activities is presented below. Each step consists of either a submittal, receipt of a reviewed submittal or performance of a construction activity. The following sections and related subsections will outline the requirements for each step included in the workflow sequence. The list is intended to be illustrative and does not cover all aspects of blasting or excavation activities in their entirety.

(1) Submit General Blasting Program (Including Safety Plan) and respond to comments.

(2) Submit Test Blast Plan for Test Blast and respond to comments

(3) Receive reviewed and approved General Blasting Plan and Test Blast Plan from Engineer.

(4) Conduct Pre-Blast meeting.

(5) Perform Test Blast(s) as needed to obtain satisfactory results.

(6) Submit Test Blast Report and respond to comments.

(7) Submit Production Blast Plan and respond to comments.

(8) Perform drilling, loading, and stemming of Blast.

(9) Perform Blast.

(10) Submit Blast Report and respond to comments.

(11) Perform excavation of Blast rock.

(12) Receive scaling, drain hole, and rock bolt/doweling direction from Engineer.

(13) Perform scaling, drain hole, and rock bolt/doweling work.

(14) For Blasts in a new excavation area, return to Step 2.

(15) For Blasts in the same area, return to Step 7.

g. Test Blasts and Plan. Drill, blast, excavate and scale to final finish surface short cut sections of each rock type on the project as necessary to determine appropriate methodology to achieve the desired result prior to commencement of full-scale blasting operations. The General Blasting Program Plan sets the initial methodology for the Test Blast Plan for test blast(s) The Blaster in Charge shall prepare the Blasting Plans for each full-scale blast after the results of the test blast(s) are analyzed.

Record each test blast using a digital video camera. Provide the video records to the Engineer for approval of the method prior to completion of the test blasting.

Set the controlled blast hole spacing initially to a maximum of 2.5 feet between 3 inch holes. After analysis of the initial test blast results, the Blaster in Charge or the Engineer may adjust the controlled blast hole spacing in additional test sections.

Do not commence work on any test blast until the Engineer analyzes the previous test blast and approves the next test. The Engineer will complete the analysis of each test blast within 48 hours of the shot.

The Engineer will analyze the characteristics of the blasts and the final surfaces of the test blast cut slopes with respect to criteria the Engineer deems necessary. The Blaster in Charge shall adjust the blasting methods with respect to hole spacing, hole diameter, hole loading, sequencing and other factors that may require adjustment until methods and the final product are acceptable and approved by the Engineer.

Following completion of the test blasting, revise the General Blast Program Plan and submit to the Engineer for approval. If at any time during the progress of the work, the approved methods of blasting and drilling fail to produce the desired results (a smooth, stable backslope), the Blaster in Charge shall revise the blasting methodology and submit an updated General Blast Program. Conduct additional test blasting as necessary to evaluate if the revised methods are achieving the desired results.

h. Production Blasting Plan. Submit a Production Blasting Plan to the Engineer for approval at least 24 hours prior to each blast. Include in the Blasting Plan details of the drilling and blasting pattern including, at a minimum, the following information:

(1) Station limits, number of blasts, and time of blast.

(2) Plan and section view drawings of each blast indicating sizes, depths, angles, patterns and spacing of the holes, burden thickness and expected rock types.

(3) Drill hole diameters and depths including subdrilling depths.

(4) Drill steel diameter and bit types.

(5) Stemming length and type of materials used for stemming.

(6) Loading details including trade names, types, sizes of explosives.

(7) Sizes, trade names of primers, initiators and other accessories.

(8) Proposed initiation and delay sequences of the blast holes.

(9) Weight of explosives per hole and per delay and powder factors, including weight of explosives per square meter of finished backslope.

(10) Anticipated peak particle velocities at locations specified by the Engineer.

(11) Show recreational access points and/or trail locations.

If a change in drilling or blasting methods is necessary, submit a revised Production Blasting Plan for the affected work at least one (1) week prior to commencing the change of work.

i. Blast Report. Submit a Blast Report signed by the Blaster in Charge for review. The Blast Report is to serve as the as-built of the Blast and will include detailed as-constructed loading diagrams for each Blast and analysis of blast results. Submit the Blast Report for each Blast within 24 hours of the completed blast. Include the following in the Blast Report:

(1) Blast Number

(2) Date and time of blasting.

(3) The station limits of the blast.

(4) Number of blast holes.

(5) Plan view and section view, prepared at a standard engineering scale, of each blast with notes indicating free face, burden, spacing, height of lift, hole diameter, stemming depth, hole angles, hole depths, including sub-drill depth.

(6) Drill logs including notes regarding conditions encountered in the drill holes, including soft or fractured zones, water table, alignment problems for each hole.

(7) Loading diagram indicating types and amounts of explosive, primers, initiators, stemming depth, powder factors, trade names and sizes of explosives, primers and initiators for each hole.

(8) Summary of fallout capacity compared to anticipated performance outlined in the blast plan.

(9) As-Built sequence of the blast, including surface delay times, and initiator delay times.

(10)Remarks regarding results of the blast including damage, misfires, fly rock and other unusual results or effects.

(11)Digital high-definition (720p or greater) video Report of the blast from two locations positioned at different perspectives for each blast. MPEG-4 is the preferred format.

(12)Digital high-definition (1080p or greater) photographic Report of all final slope faces that are exposed in the vicinity of the blast area. JPG is the preferred format.

(13) Signature of Blaster in Charge.

j. Blast Inspection and Tolerances. The Engineer will inspect and evaluate the blast design, execution, and results for conformance with the Contract. The inspection will result in additional actions as detailed below.

(1) Explosives. If date codes are not present on blasting products, or blasting products exceed the allowable age, all loading and blasting shall cease and remove the products from the project. The Blaster in Charge shall investigate the reason the project is being supplied with undated or out of date products. The Blaster in Charge shall provide a written report to the Engineer describing why the undated or out of date products were supplied, and what steps have been taken to ensure it will not happen again. Meet with the Engineer to discuss the report prior to resuming drilling and blasting operations.

(2) Unsatisfactory Blasting Results. Unsatisfactory blasting results include fragmentation beyond the design neat line (overbreak), uplift of the rock beyond design neat line, remnant construction benches greater than allowed in Subsection k. Controlled Blasting, flyrock, ground vibration or airblast readings exceeding specified limits, or damage to structures or utilities. If there are unsatisfactory blasting results cease all drilling and blasting and engage the Blasting Consultant. The Blasting Consultant shall review the Post-Blast Report and determine the cause of the unsatisfactory results. The Blasting Consultant shall submit a report of the findings and revise the General Blasting Program to eliminate the unsatisfactory blasting results. If flyrock occurred, in addition to changing the variables in the blast design, install blast mats on future blasts. Hold a meeting with the Engineer that includes the Blasting Consultant to review the findings and discuss the revisions to the General Blasting Program. Perform a Test Blast to demonstrate the adequacy of the revisions. The Blasting Consultant shall sign their approval on each submittal for the Test Blast.

If the results of the Test Blast are unsatisfactory, cease blasting and bring the Blasting Consultant on site. The Blasting Consultant shall inspect the site, functioning of the equipment, and quality and storage of the explosives. After the inspection the Blasting Consultant shall again revise the General Blasting Program, meet with the Engineer, and oversee the Test Blast as follows:

- The Blasting Consultant shall sign their approval for each submittal for the Test Blast.
- The Blasting Consultant shall review the blast hole layout on the ground before drilling begins.
- The Blasting Consultant shall oversee the loading of the Test Blast.
- The Blasting Consultant shall develop a checklist for the drilling and blasting crew to follow. Attach this checklist, with each item initialed by the Blaster in Charge and Blasting Specialist, to all Post-Blast Reports. The Blasting Consultant shall remain on site until the Test Blast and two sequential production blasts using the new blasting plan produce satisfactory results.

(3) Submittals. If the Engineer finds submittals are incomplete, all drilling and blasting shall cease and the Blasting Specialist shall investigate the reason incomplete submittals are sent to the Engineer. The Blasting Specialist shall provide a written report to the Engineer describing why incomplete submittals were made and what steps have been taken to ensure it will not happen again. Meet with the Engineer to discuss the report prior to resuming drilling and blasting operations.

If the Engineer finds that submittals are inaccurate all blasting shall cease and the Blasting Consultant shall investigate the reason for the inaccuracies. The Blasting Consultant shall provide a report to the Engineer describing why the inaccuracies occurred, and what steps have been taken to ensure it will not happen again. Meet with the Engineer to discuss the report prior to resuming drilling and blasting operations. If the Blasting Consultant finds the inaccuracies were a known falsification of the submittal, remove the individual responsible for completing the submittal from the project and replace them with another individual approved by the Engineer. Cease work required by the individual's role until the replacement is onsite and performing their designated role.

(4) Drill Tolerance. Drill presplit, precision presplit, trim, and buffer holes with deviation less than 6 inches parallel to the planned slope and 4 inches normal to the planned slope. Drill line drill holes within a distance of 3 inches parallel and normal to the planned slope.

Drill holes so that the elevation of the toe of hole is within 6 inches of the planned elevation at the time of loading. Where sub-drilling is planned, the planned elevation includes the sub-drilling depth. Clean out, re-drill, or add stemming to the toe of holes outside of this tolerance as is necessary for the toe elevation to fall within 6 inches of the planned elevation.

(5) Loading. Prior to loading check and measure all blast holes to ensure each blast hole is free of obstruction for their entire depth. If any blast hole is found not open to the required depth re-drill the short holes to the proper depth prior to loading the blast. The Blasting Specialist shall observe and Report the depth of all blast holes and the quantity and type of explosive charges loading into each blast hole for preparation of the Post-Blast Report.

(6) Stabilization. After mucking the Engineer will make an inspection of the finished face for potentially unstable geological features. If the features cannot be remediated by scaling, the Engineer will direct the type and location of stabilization necessary. Install stabilization in accordance with the applicable requirements of Section 211 Rock Bolts and Rock Dowels.

k. Equipment.

(1) Blasting Mats. Use mats made of rubber or metal specifically designed to control flyrock during blasting operations.

(2) Drills. Use drills sized appropriately for the width of cuts shown on the Plans and cross sections. Different drills may be required for pioneering than are used in the excavation. Use drills and drill bits that produce holes within the alignment tolerances required under Subsection j. Blast Inspection and Tolerances. Use drills with the ability to change feed, impact, and rotation pressures on demand to meet the varying rock conditions. Where multiple lifts are necessary to bring the excavation down to final grade use drills that do not leave a remnant construction bench greater than:

- Two feet wide when the design slope is vertical or 0.25:1
- Four feet when the design slope is 0.5:1.

(3) Stemming Material. Per Subsection 203-20. Submit a sample of stemming material for Engineer's approval.

(4) Video Cameras. Use high-definition (720p or greater) digital video cameras capable of annotating blast number, date, and time directly onto the video Report. If the camera can Report in multiple digital formats, MPEG-4 is the preferred format.

l. Controlled Blasting. Use controlled blasting techniques to prevent back break and produce a stable cut face sheared along the designated neat excavation line.

(1) Excavate all rock cuts over 10 feet in height using controlled blasting methods to protect the backslope. Controlled blasting holes are closely spaced holes drilled along the plane of the final design slope. Controlled blasting is either preshear blasting or cushion (trim) blasting. Where the total burden is greater than 10 feet, use preshear blasting. Where the total burden is less than 10 feet, use cushion blasting. Detonate explosives in the preshear holes before the production hole charges are detonated. Detonate explosives in cushion blasting holes after the production hole charges are detonated.

(2) Drill controlled blasting holes between 2.5 inch and 3 inch in diameter and spaced 2 feet to 2.5 feet apart as approved by the Engineer following test blasts. Do not drill controlled blasting holes deeper than 30 feet, unless the Contractor demonstrates that deeper holes can be drilled while maintaining specified tolerances and achieving the desired result. Determine the optimum spacing for controlled blast holes for each rock type and condition during the test blasting.

(3) Do not construct benches in finished rock back slopes unless approved by the Engineer or shown in the plans. Where more than one lift is required in a cut, the Engineer may allow an offset for drilling equipment clearances. In order to accommodate any necessary offsets and maintain the desired slope angle in multiple lift cuts, set the controlled blast holes for the upper lift(s) back from the design slope so that the controlled blast holes for the lowest lift are on the designed neat excavation line.

(4) Lightly load controlled blasting holes with explosives designed for the purpose and no larger than one half the diameter of the hole. Evenly distribute the explosives throughout the plane of the final slope. Load all controlled blasting holes. Do not use Ammonium Nitrate Fuel Oil (ANFO) in controlled blasting holes. Stem controlled blast holes from the top charge to the collar of the drill hole with material meeting 203-2.01 Stemming.

(5) Drill controlled blasting holes to tolerances of plus or minus 3 inch at the collar and plus or minus 9 inch along the length of the hole.

m. Production Blasting. Use methods and materials necessary to fragment and loosen the rock inside the design excavation limits, while leaving a smooth, stable back slope using the controlled blasting methods discussed above. Use appropriately designed delay sequences and allowable charge weights per delay to minimize ground vibrations and prevent damage to buildings, structures, utilities, sensitive fish or wildlife habitat and other facilities.

(1) Remove all loose rock, overhanging trees and other loose objects or dangerous conditions in or in close proximity to the cut slope area or render the condition safe prior to blasting. Remove all material loosened or render safe all conditions aggravated by blasting operations as an integral part of the excavation and scaling operations. Cease further drilling or blasting work until the Engineer approves the resolution of such conditions.

(2) Strip overburden before drilling blast holes.

(3) Locate production holes within 2 hole diameters of the blasting pattern location and drilled to the required depth inclusive of sub drill depth noted on the blasting plan. If more than 5% of production holes are drilled out of tolerance, fill the out of tolerance holes with crushed stone and re-drill or, if short, re-drill to the proper grade.

(4) Drill production holes no closer than 6 feet of the controlled blasting line. Drill the last line of production holes (or buffer holes) closest to the controlled blasting line parallel to the controlled blasting line.

(5) Design the production holes to prevent blast damage to the controlled blasting face. In order to help control the effects of vibration, flyrock, and airblast maintain a burden distance that is not more than one-half the bench height and between 25 to 35 times the diameter of the explosive charge in the blast hole. Maximum allowable bench height is 30 feet.

(6) Drill production holes shall not be greater than 6 inch in diameter, unless approved by the Engineer. Design production holes with explosive cartridges no larger than the following:

Lift Height	Cartridge Maximum Diameter
Up to 10 feet	1.25 inches
10 feet to 15 feet	1.5 inches
Greater than 15 feet	2.5 Inches

A larger charge is acceptable in the subdrilling of the production hole. Do not use ANFO or bulk explosives in Production Blast Holes. No cartridge compression is allowed where explosives maximum cartridge diameter is specified.

(7) Detonate production hole charges in a delay sequence toward the free face, with no more than 500 lb of explosive detonated per delay.

(8) Drill buffer holes, if used, from 2.5 inch to 3 inch in diameter in one line parallel to, and not closer than 3 feet from the controlled blasting line. Load buffer holes to no more than 50% of the charge that would be used in adjoining production blasting holes. Detonate the buffer hole charges toward the fee face on a delay sequence, after the production hole charges are detonated. Determine the need for buffer holes in the test blasting section.

(9) Remove material remaining more than 8 inch inside neat line rock slopes by scaling, controlled blasting techniques or other methods approved by the Engineer unless specifically exempted by the Engineer for aesthetic, geological or safety reasons.

(10) Remove loose material from rock slope failures or slides and dispose of the material at the contract price for unclassified excavation if the Engineer determines the failure did not occur as a result of the Contractor's methods.

n. Access for Inspections. Unless dangerous conditions prevent access, provide continuous access to the excavated rock surfaces for inspections by the Engineer or designated representatives. Provide all labor and equipment required by the Engineer to access the rock surfaces. Inspections shall be conducted within forty eight (48) hours following each blast.

o. Scaling. Stabilize new and existing rock slopes following completion of each shot and throughout the Contract period to ensure that rock slopes are stable by removing all loose, hanging, or potentially dangerous rock from the new face and from surrounding existing slopes, as required by the Engineer.

(1) Conduct scaling work in accordance with Section 210 of these special provisions or as approved by the Engineer.

(2) Scale following each shot as an integral part of the excavation of each lift. Do not commence drilling for the next lift until scaling is completed, inspected and approved.

(3) The Engineer may require additional scaling in accordance with Section 210 following completion of excavation, due to rebound effects, loosening caused by weather or other reasons.

p. Ditchline/Subgrade Blasting. Where rock is encountered in ditches and below the subgrade, rip or drill and blast to the depth shown on the plans or as directed by the Engineer to fracture the rock foundation. Use either procedure to provide a stable draining interlock between embankment or selected material and the rock surface. If blasting is used, space holes closer than production holes and load the holes lighter. Stem appropriately to minimize rifling. Provide an excavator / backhoe or other equipment to enable the Engineer to verify the effectiveness of ripping/blasting. Provide additional ripping or adjust the hole pattern and loading if the procedure fails to fracture the underlying rock to the depth shown on the plans. Prior to placement of embankment or selected material, compact the ripped/fluff blasted area to the satisfaction of the Engineer.

q. Drain Holes. Drill drain holes in rock slopes to relieve excess water pressure as specified or as directed by the Engineer. The Engineer will determine the location and construction details of the drain holes depending on the conditions encountered in each slope to target seepage location. Drain holes will be 2 to 4-inch diameter, unlined, inclined upward 2 to 10 percent from horizontal, and extended 30 feet into the rock slope.

r. Access Road Stabilization. Remnant access roads/trails remaining after excavation work shall be stabilized in a manner consistent with other project work (HPTRM for slopes between 2H:1V and 1.5H:1V or anchored wire mesh for slopes steeper than 1.5H:1V). Permanent over-steepened slopes will not be permitted.

3. Rock Stabilization. Stabilize new and existing rock as directed by the Engineer. Rock stabilization shall be by rock bolts, dowels, or anchored wire mesh with rock dowels in accordance with Section 211 of these special provisions.

4. Slope Stabilization. Stabilize new and existing slopes at locations shown on the plans and as directed by the Engineer.

a. High-tensile strength steel wire mesh. Install wire mesh at locations identified on the plans. The mesh is supported by boundary wire ropes secured to ground anchors installed in soil and rock at the perimeter of the installation and a pattern of grouted anchor nails and supplementary secondary nails as needed to contour the mesh to slope irregularities. The slopes primarily occur above rock cuts and consist of any combination of soil, cobbles, boulders and mid-slope rock outcrops encountered during excavation.

The Contractor performing the work shall have successfully constructed at least 3 anchored mesh projects within the last five (5) years that included patterned soil or rock anchors and steel mesh on steep slopes with a total installed area of at least 15,000 ft^2. Employ an on-site supervisor that has successfully installed at least three (3) anchored mesh systems on steep slopes within the last (3) years. Employ drill operators that have successfully installed 1,000 linear feet of ground anchors on steep slopes within the last five (5) years.

The supervisor shall be on-site during installation of all mesh and anchors. This supervisor shall be approved by the Engineer. The supervisor shall be designated the responsible person in charge of anchors, mesh and testing. The supervisor shall remain on site until the final product is accepted by the Engineer. Provide a submittal that includes the following information: resume of supervisor; three (3) successful projects in the past three (3) years; provide owners contact, address, and telephone number; and location of projects.

The Contractor shall have a representative onsite from the manufacturer of the high tensile strength steel wire mesh to train, observe and advise on proper installation of steel wire mesh on steep slopes. The representative shall be present after approximately 5% of the mesh has been installed for at least two (2) days and again for a minimum of one (1) day after approximately 75% of the mesh has been installed. This schedule will be repeated if the Contractor's personnel performing the work changes substantially during the course of the project or after seasonal shutdown.

The Contractor shall provide safety gear and training for the Department's personnel that will be on the slope inspecting and working with the Contractor. This will include all protective gear and climbing harnesses.

(1) Submittals.

a. Materials. Not later than four (4) weeks before starting wire mesh installation, submit the following information, in writing, to the Engineer for review and approval. Allow 10 days for review for the initial submittal and 7 days for any resubmittals. Do not order material until the applicable submittal for that material is approved by the Engineer:

- Identify the high-tensile strength steel wire mesh supplier. Submit written documents that demonstrates satisfactory performance of the supplier's anchored high-tensile strength steel wire mesh installed on past projects with similar conditions.

- An inclusive list with catalogue cuts for each proposed system component including: anchor nails, diamond-shaped spike plates, grout, lacing wire rope, wire rope thimbles, ferrules, and other fastening hardware.

- Mill certs for wire rope.

- Resume of steel wire mesh manufacturer's representative.

b. Wire Mesh Installation Plan. Not later than two (2) weeks prior to the commencement of any anchored wire mesh installation, submit to the Engineer for their approval, a Wire Mesh Installation Plan for the entire project. Submit the plan to the steel wire mesh manufacturer's representative for review and comment. Provide the Engineer with a copy of the representative's response. Do not commence anchored wire mesh installation until the Plan is accepted by the Engineer. The Plan shall include at a minimum:

- Choice of soil and/or rock anchor type.

- Mix design for cement grout including strength test results, additives, manufacturer's data sheets, and procedure for placing grout.

- Planned construction sequence.

- Explanation of how equipment will access the site and install the wire mesh system, including temporary anchoring that may be needed to complete the work safely. Include the steps to deliver and place wire mesh panels on slopes.

- Drilling methods and equipment required to install the self-drilling hollow-core anchor nails.

- Procedures for attaching connecting adjacent wire mesh panels vertically and horizontally, attaching panels to temporary supports and installation of spike plates over the mesh.

- Calibration records of an independent testing facility for torque-wrenches and testing jacks. Provide graphs of torque versus tension for each torque wrench to be used. Complete calibration not later than 30 days prior to the date submitted. Resubmit calibration records following seasonal shutdown, prior to seasonal restart, or if required by the Engineer.

- Testing procedures and equipment to assure the specified load is reached and is transferred to the ground without creep and without exceeding extension limits of the anchor.

- Resume of anchored wire Mesh Supervisor. Provide documentation showing the supervisor has been a foreman for anchor installation for a minimum of two years. Provide a list and location of successful projects; with owner, owner's contact, address, and telephone number.

(2) Construction Requirements.

a. Clearing. The Contractor shall remove all brush, debris and loose rock in the area to be covered by mesh. Clearing limits shall extend a minimum of 10 feet beyond the crest of the slope, or as needed to allow mesh installation. Stumps within the cleared area shall be cut off within two inches of the surrounding ground.

b. Excavation and mesh placement. The Contractor shall cut the slope flat. Request acceptance by the Engineer of the slope prior to beginning work required for anchored wire mesh slope stabilization. The slope will be acceptable if deep depressions (>1.5 feet) are corrected by re-grading the slope. If a deep depression is discovered after slope acceptance it will be corrected by the Contractor as directed by the Engineer as a subsidiary activity to Item 203. Topsoil and seeding shall be applied according to Section 618 prior to HPTRM placement. The anchored wire mesh and the underlying HPTRM shall be installed from the top down as excavation proceeds. In areas of saturated or sluffing conditions or above rock excavation, the next level of excavation shall not be exposed prior to the installation of anchored wire mesh and HPTRM on the previous level. If other methods are available that ensure safe construction of the slope with equal quality they may be considered by the Engineer.

- Excavate the slope after re-slope staking the cut based on overburden depth findings.

- Where shown on the plans or directed by the Engineer excavate approximately 18 inches of additional material and backfill with Type I rip rap (Grotto locations).

- Locate the soil and/or rock anchors on the slope nominally as shown on the design on the plans. Due to inevitable variations in overburden depth, original ground contours and convex/concave nature of the finished slopes. Resulting slope lengths and shapes will require anchor layouts that vary from the ideal layout presented in the plans. Adjustments for converging and/or overlapping layout lines will be required to provide an even distribution of load between anchors while adhering to the maximum spacing given in the plans. Install additional nails in shallow depressions (0.5 to < 1.5 feet) or other irregularities in order to pull the mesh into the shallow depressions to more closely fit the ground surface. Obtain Engineer approval for all anchor layout prior to drilling.

- After the anchors are installed and grout placed, but before the grout sets, form hollows 12 inches in diameter and 8 inches deep at each anchor location. Clean all grout from anchor bar threads within the hollow. Spread material from the hollows evenly on the slope.

- Install any required soil and/or rock anchors for boundary ropes at the locations shown on the plans.

- Install and anchor the HPTRM using methods recommended by the manufacturer. Place HPTRM after topsoil and seeding over the top of the slope as shown on the plans. Overlap the HPTRM as per the manufacture's specifications or as indicated in the Plans.

- Temporarily secure the mesh to the top of the slope to facilitate installation. Overlap adjacent wire mesh panels, as shown in the plans, to provide at least one mesh opening of overlap (two preferred). Lace or clip the panels together as recommended by the mesh manufacturer in a manner that provides no loss of strength at the seam.

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- Install required boundary ropes and fasten the mesh to them with compression claws in accordance with the manufacturer's recommendations. Tighten boundary ropes and pull tight against ground.

- Place the spike plates onto the anchors. Tighten the nuts and push the spike plates and mesh into the hollows in order to tension the mesh between 6.7 kips and 11.2 kips. Torque the nuts to the values given in Table 203-1 or as shown on the plans.

TABLE 203-1 TORQUE TIGHTENING VALUES

Anchor Diameter	Prestress Force	Required Tightening Torque
D=1-inch (25 mm)	6.7 kips (30 kN) 11.2 kips (50 kN)	221.3 ft-lbs (0.30 kN*m) 368.8 ft-lbs (0.50 kN*m)
D=1.125-inch (28 mm)		258.1 ft-lbs (0.35 kN*m) 405.7 ft-lbs (0.55 kN*m)
D=1.25-inch (32 mm)		295.0 ft-lbs (0.40 kN*m) 442.5 ft-lbs (0.60 kN*m)

- Re-seed mesh areas after successful anchor testing.

c. Anchor Nail Types.

- Type I (upper slope) anchor nails. Type I anchor nails are defined as the top two or three rows of anchors located at or near the top of the slope. The horizontal location and depths of these nails vary according to the Anchor Nail Schedule on the plans.

- Type II (mid-slope) anchor nails. Type II nails are in intermediate rows located between the Type I and III nails. Type II nails may not be necessary in some locations. They will only be used on taller/longer slopes where the spacing of Types I and III nails do not adequately cover the slope. The horizontal location and depths of these nails vary according to the Anchor Nail Schedule on the plans. Type II row spacing should be applied between the lower-most row of Type I anchors and the upper-most row of Type III anchors.

- Type III (lower slope) anchor nails. Type III nails are the last two rows of anchors on the slope. At some sites, with shorter slope heights, only a single row of Type III anchors may be required. The bottom row of nails shall be located approximately 12 inches below the soil-rock contact. The horizontal location and depths of these nails vary according to the Anchor Nail Schedule on the plans.

- Secondary soil nails. Secondary nails are defined as additional nails to be used where directed by the Engineer to keep mesh in contact with the slope across depressions or other slope irregularities or as needed to provide the approximate anchor density (anchors per square yard) for each installation site. At no cost to the Department, furnish and install additional nails for use as Secondary soil nails as directed by the engineer. Additional nail quantity will equal 5 % (rounded up to the next whole number) of planned nail quantity at each site. Adjust anchor nail patterns as directed by the Engineer to fit the slope shape and stabilization requirements. Secondary nails shall meet the requirements for the application area in which they are installed (Type I, II or III).

d. Anchor Nail Installation. Caving soils are expected due to saturated conditions at many of the installation sites. Self-drilling hollow core bars that are drilled and grouted simultaneously are the required anchor type.

- For each anchor nail, drill a nominal 3-inch diameter hole at 30 degrees from horizontal and over-drill each hole at least 6 inches beyond the required anchor length. Anchor location variation shall not exceed more than 12 inches in any column width or row height as determined by the anchor schedule shown in the plans.

- Holes for production anchor assemblies and for test anchor assemblies will be the same diameter and utilize the same installation techniques, including grout.

- Drill bit used must allow cutting through different types of soil and weathered bedrock conditions and be provided with venturi holes to allow for proper tremie grouting. Drill bits must be capable of drilling weathered bedrock with simultaneous grouting operations.

- Use drilling equipment designed to drill straight and meet required diameter holes for anchors. Methods, size and capability of the drilling equipment shall be determined by the contractor.

- Clean holes to remove material resulting from the drilling operations and to remove any other material that would impair the strength of the anchor assemblies or test anchor assemblies. Remove foreign material dislodged or drawn into the holes during construction of the assemblies.

- Centralizers are not used with self-drilling hollow core bar.

- Where soil conditions are not saturated, anchor holes can be drilled with self-drilling hollow core bars or by rock drill bit. Centralizers can be substituted for hollow core bar drill bits in dry soil conditions.

e. Grouting.

- When using threaded reinforcing steel, the length of drilled hole shall be monitored by the Inspector before and during grouting.

- When using self-drilling hollow core bars in Saturated Soil conditions, grouting shall be done continuously during the drilling operation through a rotary injection adapter attached to the end of the anchor. Grout will flow through the hollow core hole exiting through the drill bit holes.

- When using self-drilling hollow core bars in Non-Saturated Soil conditions, grouting shall be completed through an injection adapter attached to the end of the anchor within 24 hours of drilling. Grout will flow through the hollow core hole exiting through the drill bit holes.

- Saturated Soil and Non-Saturated Soil conditions shall be determined by the Engineer.

- In case of the solid reinforcing steel, grout shall be injected at the low end of the drilled hole. The grout shall fill the entire drilled hole with a dense grout, free of voids or inclusion of foreign material. When self-drilling hollow core bar is used, drill cuttings can be mixed with cement grout.

- When water in drilled holes is encountered during anchor grouting, pump grout continuously until all water is purged out the top of the hole and grout runs dense with the same consistency being pumped in.

- Anchors shall be grouted full length. Cold joints shall not be used in grout placement.

- Only clear, potable water, free of oil, acid, alkali, organic matter, or injurious quantities of chlorides, fluorides, sulfates and nitrates will be used when mixing with Portland cement.

- Use cement grout with a water/cement ratio as recommended by the manufacturer.

f. Anchor Nail Testing. Both verification and proof testing of the anchors is required. Provide all material, equipment, and labor to perform the tests. The Engineer will measure, and record all required data in an acceptable manner. No testing or stressing of anchors will be performed within 3 days of grouting anchors unless the strength of the grout has reached 50 percent of the 7 day strength.

- Testing Equipment. Testing equipment will include two (2) dial gauges, a dial gauge support, jack and pressure gauge, an electric load cell, master pressure gauge and a reaction frame.

  Use a minimum of two dial gauges capable of measuring to 0.00001-inch (0.0025 mm) to measure the ground anchor movement. The dial gauges will have a minimum stroke equal to the theoretical elastic elongation of the total anchor length plus 1-inch (25 mm). Align the dial gauges within 5 degrees from the axis of the anchor. Use a hydraulic jack and pump to apply the test load.

  Use an independent testing laboratory to calibrate the jack and pressure gauge as a unit. The pressure gauge will be graduated in 150 psi increments or less and have a range not exceeding twice the anticipated maximum pressure during testing unless otherwise approved by Engineer. Use the pressure gauge to measure the applied load. The minimum ram travel of the jack will not be less than the theoretical elastic elongation of the total anchor length at the maximum test load plus 1 inch (25 mm). The jack will be capable of applying each load in less than one minute.

  Independently support and center the jack over the anchor so the anchor does not carry the weight of the jack. Keep a calibrated master pressure gauge at the site. Calibrate the master gauge with the test jack and pressure gauge as a unit. Monitor with both a pressure gauge and electric load cell the loads on the anchors during the verification tests. Provide recent calibration curves in accordance with required submittals. Place the stressing equipment over the anchor in a manner that the jack, bearing plates, load cell, and stressing anchorage are in alignment. Position the jack at the beginning of the test such that unloading and repositioning of the jack during the test will not be required.

  Use a reaction frame sufficiently rigid and of adequate dimension such that excessive deformation of the test apparatus requiring repositioning of any components is avoided. No part of the reaction frame shall bear within 20 inches of the test anchor unless otherwise approved by Engineer.

- Verification Testing. Perform verification testing prior to production anchor installation to verify the installation methods, soil conditions, and anchor capacity. Develop and submit the details of the verification testing arrangement including the method of distributing test load pressures to the excavation surface (reaction frame), anchor bar size, grouted hole diameter and reaction plate dimensioning. Perform all anchor testing using the same equipment, methods, and hole diameter as planned for the production anchors. As determined by the Engineer, additional verification testing is required for any changes in the drilling or installation method. The anchors used for the verification tests shall be sacrificial and shall not be incorporated into the production anchor schedule.

Install a minimum of two verification anchors. Successful verification tests are required prior to production anchor installation. The locations of the verification tests will be determined by the Contractor and approved by the Engineer. Incrementally load the verification test anchors to twice the design load and movements recorded by the Contractor in accordance with the following schedule:

AL	1 minute
0.25DL	10 minutes
0.50DL	10 minutes
0.75DL	10 minutes
1.00DL	10 minutes
1.25DL	10 minutes
1.50DL	60 minutes

AL = Anchor Alignment Load (0.05DL)
DL = Anchor Design Load

Hold each load increment for a minimum of 10 minutes. Monitor the verification test anchor for creep at 1.50 DL load increment. Measure and record the anchor movements during the creep portion of the test at 1, 2, 3, 5, 6, 10, 20, 30, 50, and 60-minute increments. The Engineer may require extended creep measurements, monitoring and recording. Maintain all load increments within 5 percent of the intended load by use of the load cell. Unload the anchor in increments of 25 percent, measure and record deflections at each increment.

- Proof Testing. Perform proof testing on at least 5 percent of the production anchors, with at least 5 tests in each of the top four rows of anchors, to verify methods and the design anchor capacity. The locations and number of these tests will be determined by the Engineer.

  Perform proof tests by incrementally loading the anchor to 133 percent of the design load. The Engineer will measure and record the anchor movement at each load in the same manner as the verification tests. Monitor the load using pressure gauges with sensitivity and range meeting the requirements of pressure gauges used for verification test anchors. At load increments other than maximum test load, hold the load long enough to obtain a stable reading. Incremental loading for proof tests will be in accordance with the following schedule.

AL
0.25DL
0.50DL
0.75DL
1.00DL
1.33DL

AL = Anchor Alignment Load (0.05DL)
DL = Anchor Design Load

Maintain all load increments within 5 percent of the intended load. Depending on performance, perform either 10 minute or 60 minute creep tests at the maximum test load. The creep period starts as soon as the maximum test load is applied. Measure and record the anchor movement with respect to a fixed reference at 1, 2, 3, 5, 6, and 10 minute intervals. Where anchor movement between 1 minute and 10 minutes exceeds 0.04inch (1.0 mm), maintain the maximum test load an additional 50 minutes and record movements at 20 minutes, 30, 50, and 60 minutes. Bring to the attention of the Engineer, the anchors which fail in creep.

- Test Anchor Acceptance. A test anchor is considered acceptable when:

  - For verification tests, a creep rate less than 0.08 inch (2.0 mm) per log cycle of time is observed during creep testing and the rate is linear or decreasing throughout the load hold.

  - For proof tests where less than 0.04 inch (1.0 mm) of movement is observed between the 1 minute and 10 minute interval during the 10 minute creep test or a creep rate less than 0.08 inch (2.0 mm) per log cycle of time is observed during the 60 minute creep test and the creep rate is linear or decreasing throughout the load hold period.

  - The maximum test load is sustained without reaching the failure point (pullout). The failure point is the point where the movement of the test soil anchor continues without an increase in the load. Record the failure load corresponding to the failure point as part of the test data.

  Proof test anchors may be incorporated into the production anchor schedule provided the minimum required hole diameter has been maintained, and the test anchor length is equal to or greater than the scheduled production anchor.

- Test Anchor Rejection. Replace failed production anchors with a new anchor adjacent the failed anchor, at no additional cost. Additional proof testing for acceptance may be required as a result of the first failed anchor tests.

- Alternate Anchor Test Method. At the direction of the Engineer, the following alternate test method may be used. Apply a load of 133 percent of the design load to the anchor. Hold the load for a minimum of 10 minutes, and record the pressure on the jack pressure gauge. The test anchor is considered acceptable when there is no change in the jack pressure gauge over the 10 minute hold at 133 percent of the design load.

203-3.03 EMBANKMENT CONSTRUCTION. Prepare the areas upon which embankments are to be placed, construct dikes within or outside the right-of-way when required, place and compact approved material within the roadway areas where unsuitable material has been removed, and place and compact embankment material in holes, pits, and other depressions within the roadway area. Use only approved materials in the construction of embankments and backfills. Embankment material will be approved for gradation following placement but prior to compaction.

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

Where the plans call for placement of selected material and excavation is required, the existing material may be left in place if tests determine that it will meet the appropriate selected material requirements. Any reduction in excavation quantities as a result of this condition shall not constitute a basis for adjustment in contract unit prices except as provided for in Section 104 Scope of Work.

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

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

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

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

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

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

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

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

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

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

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

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

Repair damage to embankment caused by hauling equipment.

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

Temporary surcharging consists of two methods:

1. Static Surcharge. Leave surcharge in place until the foundation material has reached stability or the required settlement has taken place.

2. Rolling Surcharge. Construct a surcharge on top of the embankment to the specified elevation and continually advance the surcharge as the embankment is constructed ahead.

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

Furnish the materials, fabricate, install, and maintain the settlement platforms and piezometers as shown in the plans and as directed by the Engineer. Remove the settlement platforms, and piezometers, and grout solid the remaining pipe and conduit as shown in the plans when directed by the Engineer.

203-3.04 COMPACTION WITH MOISTURE AND DENSITY CONTROL. The maximum density and optimum moisture will be determined by ATM 207 or ATM 212.

Adjust the moisture content of the embankment material to within 2 percent of the optimum moisture content and compact each layer to not less than 95 percent of the maximum density. Acceptance densities will be determined by ATM 213.

Moisture content adjustment can be achieved through air drying or mixing soils to reduce average moisture content. Use of a Portland Cement admixture may be used at the contractor's option or through Change Order by direction of the Engineer.

Use Portland Cement, Type I or Type I/II meeting Section 701-2.01 to amend soils that are within 6 percent of optimum moisture content when using a Portland Cement admixture. Prepare test strips for each soil type to receive a Portland Cement admixture with 40:1, 20:1 and 13.3:1 soil to Portland Cement ratios (by weight). Additional ratios can be requested by the Engineer. Submit test strip moisture density testing results to the Engineer for Approval. Embank Portland Cement treated soils at the ratio approved by the Engineer.

Apply cement at uniform rate using equipment and methods that will ensure uniformity of distribution. Allow only equipment that is used for applying and mixing the cement to pass over the treated area until after it is mixed into the soil.

Use of Portland Cement requires submission of a narrative prior to test strip construction or use with fill materials. The narrative describes proposed equipment and methods for producing and placing cement-treated fill soil. Include description and specifications of proposed equipment. Include equipment for excavating, handling, hauling, placing, mixing, and compacting cement-treated fill soil. Specifically address techniques proposed for controlling cement percentage and mixing soil and cement to form a uniform mix. Include procedures for handling soft ground conditions, wet soil conditions, and wet weather during soil treatment and placement. Describe methods for monitoring and controlling cement content during placement. Adhere to the methods described after the narrative is approved by the Engineer.

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

Do not use this method when wet original ground is encountered. Place three lifts using the method specified in 203-3.05 or as approved by the Engineer until attempting 203-3.04 again. Continue using 203-3.05 until embankment materials are compatible with the native or placed foundation materials as approved by the Engineer.

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

Compact by routing construction equipment and/or rollers uniformly over the entire surface of each layer before the next layer is placed. Compact until embankment does not rut under the loaded hauling equipment with a minimum axle weight of 50,000 pounds. Drive the vehicle at a speed of 2-4 miles/hour over the entire compacted layer. If the layer being tested exhibits excessive yielding, deflection, reaction or pumping, rework the area to provide acceptable tests results prior to placement of any additional material. The following criteria apply:

- Embankment fill layers deeper than 20 feet below finished subgrade – maximum allowable deflection of 2-inches.

- Embankment fill layers within 5 to 20 feet of finished subgrade – maximum allowable deflection of 1/2-inch.

- Embankment fill layers within 5 feet of finished subgrade – if the layer being tested exhibits any yielding, deflection, reaction or pumping, rework the area to provide acceptable test results prior to placement of any additional material.

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

When practical and as approved by the Engineer, rock embankment makes determining standard density difficult with conventional test methods, verify compaction efforts in accordance with ATM 309.

203-3.06 CONSTRUCTION DEWATERING BY WELL POINTS OR PUMPING WELLS

Dewatering may be required to construct permanent drainage measures, muck excavation, compaction of backfill, and other features constructed below groundwater. Construction dewatering by well points or pumping wells may be necessary following dewatering attempts by trenching and dewatering by sump pumps.

Well points consist of metal or plastic pipe installed in the subsurface with screens in the water bearing zones. Groundwater is extracted by suction at the top of the pipe and discharged in approved locations. Pumping wells consist of metal or plastic well casing and screens drilled in the subsurface with sand surrounding the well screen and impervious seals near the ground surface. Groundwater is extracted by a pump installed within the well and discharged in approved locations.

Comply with 204-3.02 for construction dewatering by well points or pumping wells.

Deactivate all construction dewatering equipment following completion of adjacent features. Do not remove dewatering equipment for a period of 14 days to test satisfactory function of adjacent features or as directed by the Engineer. Remove all dewatering equipment following satisfactory performance of adjacent drainage enhancements. Abandon dewatering wells by sealing with bentonite chips, pellets, or grout according to state and local regulations.

203-4.01 METHOD OF MEASUREMENT. Section 109 and the following:

1. Items 203.0001.____ through 203.0004.____. The volume measured in original position.

2. Item 203.0006.____. By weighing.

3. Item 203.0009.____ and 203.0011.____. By the area measured before obliteration or blasting.

4. Item 203.0010.____. By adding the sum of the depths of line holes drilled and loaded.

5. Items 203.0013.____ & 203.0014.____. By each complete rock bolt or dowel.

6. Item 203.2010.____. By per well point or by per pumping well.

7. Item 203.2013.____, Contaminated Material Testing, Handling & Disposal, will be measured for payment on a time and materials basis according to Section 109, Compensation for Extra Work on Time and Materials Basis. Backfilling within the plan excavation limits will not be measured for payment but will be subsidiary to the respective items of work. Backfilling outside plan excavation limits will be measured for payment as embankment construction.

   Water sampling and contaminated material testing shall be reimbursed based on paid receipts for the\ authorized sampling and testing.

Providing an Environmental Subcontractor and associated QEP(s) to test for contaminated soils or water will not be measured for payment. Testing soils to determine contamination will be measured for payment under Item 203.2013.____, Contaminated Material Testing, Handling & Disposal.

8. Item 203.2026.____. By per scaler hour on existing rock slopes or additional scaling as directed by the Engineer following satisfactory completion of scaling performed concurrent with rock excavation. Scaling performed concurrent with rock excavation is subsidiary.

9. Item 203.2027.____. By the square yard, in final position, measured on the slope of the ground surface. The upper and lower boundary ropes will be the measurement limits, unrestrained mesh will not be measured. No allowance will be made for overlap, whether at joints or patches. Excavation of the slope and haul will be measured under Item 203 Unclassified Excavation.

10. Item 203.2035.____. By each hole drilled.

11. Item 203.2038.____. Measurement of ditch linear grading, whether flat bottom or "V" ditch, will be measured for payment by the station along the center of the ditch for each ditch so designated, constructed, and accepted by the Engineer.

12. Access road/trail stabilization will not be measured for payment.

203-5.01 BASIS OF PAYMENT. When no pay item is shown in the bid schedule for "Stripping Material Sources", removal of overburden and other unsuitable material from such Material Sources is subsidiary.

The following work is subsidiary:

1. Scarifying material in place.

2. Hauling of material.

3. Excavating overbreak material.

4. Slope rounding excavation and benching of slopes.

5. Water for compaction.

6. Placing and removing of temporary surcharge material.

7. Work required to continually advance the heading on a rolling surcharge.

8. Test pits and explorations required to evaluate the acceptability of borrow.

9. Stage construction of cuts and stage excavation of material sources.

10. Overburden investigation and reporting.

11. Stabilization of remnant access road/trails.

12. Portland cement amendment test strip preparation.

13. Portland cement is incidental to fill placement.

Removal of slides and associated work will be paid for at the contract unit price for excavation at the location of the slide or as extra work under Subsection 109-1.05.

Grading and placement of material used within 20 feet of bridge abutments will not be paid for directly but will be subsidiary to Pay Item 203.0006.____ Borrow.

Ditch linear grading or special ditching will not be paid for directly. Furnishing equipment, labor, tools, and incidentals to provide the preparation, excavation and shaping necessary to complete the work will be subsidiary to Pay Item 203.0003.____ Unclassified Excavation.

Payment for Item 203.0014.____ is at the contract unit price per each is full compensation for all resources necessary to complete this work. This includes all materials, equipment, and labor required for accessing, drilling, installing, grouting, testing, and completing rock dowels as described, and at the locations shown, or as determined by the Engineer.

Payment for authorized water sampling and contaminated material testing will be made on the receipts for authorized tests plus 15 percent, and shall be considered full compensation for the labor, equipment, and materials required to obtain samples and have tests performed. A change order will not be required to initiate water sampling or contaminated material testing.

Excavating and disposing of fuel contaminated soil will be paid under Item 203.2013.____, Contaminated Material Testing, Handling & Disposal. The Contractor will be paid on a time and materials basis for authorized Work according to Section 109. Backfilling within plan excavation limits will be paid for under their respective pay items for that work. Backfilling outside plan excavation limits will be paid for as embankment construction according to this Section.

No separate payment will be made for providing the hazardous waste professional, this will be subsidiary to Item 203.2013.____, Contaminated Material Testing, Handling & Disposal.

Payment for 203.2027.____ Stabilization, Overburden Wire Mesh - Pinned is for full compensation for furnishing all labor, equipment and materials to install anchored mesh slope stabilization. When 203.2027.____ pay item is included in the bid schedule, the following work, as necessary for this item, is subsidiary:

1. Drilling and nail installation.

2. Gathering geotechnical information for the site as needed, including overburden investigation over rock cuts.

3. Additional excavation, special grading, leveling, depression filling, and haul that is required after the cut has been completed and accepted under item 203.0003.____.

4. Backfilling to fill depressions.

5. Required anchor testing.

6. Grouting.

7. Boundary ropes.

8. Wire rope anchors, wire rope nails.

9. All hardware including compression claws, clips, lacing wire, centralizers, spike plates.

10. Secondary nails (5% of planned nail quantity).

11. Overlap.

12. Mesh manufacturer representative.

13. Mesh and Anchor Supervisor.

Placement, hauling, and production of Selected Material Type C and Selected Material Type E generated from roadway excavation will not be paid for and is subsidiary to Pay Item 203.0003.____ Unclassified Excavation.

Payment will be made under:

PAY ITEM

Item Number	Item Description	Unit
203.0001.____	Common Excavation	CY
203.0002.____	Rock Excavation	CY
203.0003.____	Unclassified Excavation	CY
203.0004.____	Muck Excavation	CY
203.0006.____	Borrow	TON
203.0009.____	Obliteration of Roadway	SY
203.0010.____	Controlled Blasting	LF
203.0011.____	Ditchline/Subgrade Blasting	SY
203.0013.____	Stabilization – Rock Bolt	EACH
203.0014.____	Stabilization – Rock Dowel	EACH
203.2010.____	Dewatering, Temporary Construction	CS
203.2013.____	Contaminated Material Testing, Handling & Disposal	CS
203.2026.____	Rockfall Mitigation, Slope Scaling	CS
203.2027.____	Stabilization, Overburden Wire Mesh – Pinned	SY
203.2035.____	Drain Hole	EACH

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Special Provision

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.

Temporary water diversion, dewatering, and rewatering are subsidiary to the conduit and minor structure Pay Items.

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

When item 204.0001.____, 0002.____, or 0003.____ structure Excavation, does not appear in the bid schedule, structure excavation required to complete other items of work is subsidiary, except that excavation and disposal of unsuitable material required from below a plane 12 inches below the invert elevation of conduits and 12 inches below the bottom of structures is paid as extra work.

Any backfill or bedding material required whose source is other than project excavation is paid at the contract unit price for the materials being used, or as extra work if no unit price has been established.

Traffic control paid under Section 643 and Erosion, Sediment, and Pollution Control paid under Section 641.

PAY ITEM

Item Number	Item Description	Unit
204.0001.____	Structure Excavation	CY
204.0002.____	Structure Excavation	Ton
204.0003.____	Structure Excavation	LS

C204-24.0501

SECTION 205
EXCAVATION AND FILL FOR MAJOR STRUCTURES

Standard Modification

205-3.05 COMPACTION.

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

HSM20.5-20.1130-1

Special Provisions

Add the following Section:

SECTION 210
ROCK SLOPE SCALING

210-1.01 DESCRIPTION. Work covered by this section consists of scaling (removing) and disposal of material from existing rock constructed rock slopes following satisfactory performance of scaling conducted concurrent with rock excavation as determined and approved by the Engineer.

Material to be removed during scaling includes loose or unstable blocks of rock or other debris that constitutes or could constitute a hazard due to their position in relation to the roadway or work area. Limits of scaling areas may change as the work proceeds as directed by the Engineer.

Supply all materials, equipment, and labor necessary to scale the identified areas in accordance with these Special Provisions, the Standard Specifications, and as detailed in the Plans.

Definitions:

a. General Scaling includes the use of handheld pry bars by workers suspended from ropes or working out of a crane or lift basket.

b. Heavy Scaling is an intensive form of general scaling that utilizes portable hydraulic wedges, air pillows, rock breaking techniques, or other means to remove or break specific rock blocks or less competent rock mass areas. Other hand tools in addition to scaling bars may be used provided the Contractor has demonstrated effectiveness to perform the required work as approved by the Engineer. Use of expansive cement or use of blasting agents are not allowed.

c. Mechanical Scaling utilizes machines such as excavators, cranes with suspended equipment, long-reach excavators, etc. to assist with removal efforts. Mechanical scaling is only allowed subsequent to blasting work with this Contract, unless approved by the Engineer.

210-2.01 MATERIALS. Furnish all equipment and materials as required to perform the general and heavy scaling work according to the proposed methods as described in the accepted Scaling Work Plan.

CONSTRUCTION REQUIREMENTS

210-3.01 QUALIFICATIONS. Provide an on-site Scaling Supervisor and Qualified Scaling personnel with experience scaling rock slopes as described below.

1. Scaling Supervisor is required to have:

   a. A minimum of 1,000 hours and no less than 3 years of documented experience in this role.

   b. Work experience on a minimum of 5 rock-fall mitigation projects of similar complexity over the past 5 years.

2. Qualified Scaler is required to have:

   a. A minimum of 500 hours and at least 1 year of documented experience on similar projects.

   b. Work experience on at least 3 rock-fall mitigation projects of similar complexity over the past 5 years.

210-3.02 SUBMITTALS. At least 10 days before starting scaling work, submit the following in a Scaling Work Plan. Work cannot proceed until the Engineer has approved the Scaling Work Plan.

1. Resumes for each worker including: Contact information, Role on the project, and Descriptions of work experience. Include project names, locations, and contact information of owners for listed work experience.

2. The proposed construction sequence and schedule.

3. The types of equipment and tools to be utilized in the work.

4. The number of rock slope Scaling Supervisors and Qualified Scalers that will be on the project.

5. Coordinate scaling work with Pay Item 203.0003____ Unclassified Excavation.

6. If rock breaking (i.e. boulder busting) is proposed, include details of the proposed techniques, methods, equipment, and sequencing. If proposed, include details of additional temporary rock-fall protection measures that will be used to control release of broken rock fragments.

7. Description of how the traffic control plan will be implemented, in conjunction with scaling work, in accordance with Section 643.

8. Methods for protecting the roadway, traffic, facilities, and existing utilities during scaling work.

210-3.03 GENERAL REQUIREMENTS.

1. Submit the work plan specified above to the Engineer for review prior to commencing this work.

2. Perform scaling only when the Scaling Supervisor is present to direct work. Replace the Scaling Supervisor if they must leave for any reason with a qualified replacement.

3. Perform scaling before any other slope stabilization work or permanent rock-fall mitigation measures are constructed, or as approved by the Engineer.

4. Work site safety is the responsibility of the Contractor. Perform all work in a manner to minimize exposure to the public, construction personnel, and equipment to hazardous and potentially hazardous conditions. Active passing traffic is not allowed in the work zone during active rock slope scaling operations. Two-way radio contact must be maintained at all times between the Scaling Supervisor, on-slope scalers, traffic control, and any equipment operators.

5. Remove all loose or unstable blocks of rock, masses of soil, and other hazardous debris that constitute a work or road hazard due to their position in relation to the roadway or work zone. Scaling areas may change as work proceeds as directed by the Engineer.

6. If scaling activities have a potential for damaging the roadway, adjacent facilities, and/or utilities provide appropriate temporary protective devices, in accordance with the Scaling Work Plan, before beginning scaling work.

7. Conduct temporary pavement repairs in damaged sections in accordance with Section 401. Temporary repairs are to be conducted after each shift to facilitate uninhibited traffic passage. Repair of damaged pavement due to Contractors equipment or neglect is the responsibility of the Contractor. Temporary pavement repair work due to scaling activities is subsidiary to Pay Item 203.2026.____ Rockfall Mitigation, Slope Scaling. Final pavement materials will be paid under their individual pay items.

210-3.04 ROCK BREAKING. The following option is available for rock breaking.

Boulder Busting: This technique is defined herein as a method of individual rock breaking that utilizes hydrostatic pressure waves to fracture rock blocks. When rock breaking is required and boulder busting is used the hydrostatic pressure must be sufficient to break and/or dislodge the rock block but not damage the surrounding rock. Drill holes parallel to the slope face and/or natural discontinuity.

Additional rock breaking options may be proposed, but are not allowed for use unless approved by the Engineer. Provide information as required in Section 210-3.02 6 for approval.

Install additional temporary rock-fall protection measures as needed when conducting rock breaking to protect against uncontrolled release of broken rock fragments. Do not conduct rock breaking activities until the additional temporary rock-fall protection measures have been installed in accordance with the Scaling Work Plan.

210-3.05 SCALING COMPLETION. Scaling areas will be inspected by the Engineer to determine if the slope, outcrop or bench has been scaled sufficiently. If additional work is identified, continue to scale the slope until it has been completed to the satisfaction of the Engineer. Additional scaling as proposed by the Contractor after a winter shutdown is to be approved by the Engineer.

210-3.06 DEBRIS REMOVAL. Remove scaled debris from the fallout area and roadside ditch prior to the end of each work shift, whenever the depth of accumulated debris exceeds four (4) feet, or as directed by the Engineer. Remove any scaled debris that reaches the traffic lanes or the railroad immediately. Scaled debris removal shall be completed before traffic operations resume in accordance with Section 643.

210-4.01 METHOD OF MEASUREMENT. Refer to Section 203 for Method of Measurement.

210-5.01 BASIS OF PAYMENT. Refer to Section 203 for Basis of Payment.

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Add the following Section:

SECTION 211
ROCK BOLTS AND DOWELS

211-1.01 DESCRIPTION. The work covered by this section consists of furnishing, staining, installing, stressing, and testing rock bolts and rock dowels at the locations, orientations, and loads designated in the Plans and as directed by the Engineer. Supply all materials, equipment, and labor necessary to install and test the rock bolts and rock dowels in accordance with these Special Provisions, the Standard Specifications, and as detailed in the Plans.

Rock bolts are post-tensioned, fully grouted, steel bars that actively reinforce a rock mass. Provide 40-kip capacity rock bolts. The contractor is responsible for achieving the required loads at the bolt locations.

Rock dowels are un-tensioned, fully grouted steel bars that passively reinforce a rock mass.

Grout loss and encountering groundwater should be anticipated and mitigative measures implemented.

Before starting the work in this Section, scale the slope area identified in the Plans or as directed by the Engineer and in accordance with Section 210.

211-2.01 MATERIALS.

Rock Bolts and Dowels	Subsection 709-2.04
Appurtenances	Subsection 709-2.04
Bond Breaker	Subsection 709-2.04
Grout	Subsection 709-2.04
Water	Subsection 712-2.01

CONSTRUCTION REQUIREMENTS

211-3.01 QUALIFICATIONS. Provide an on-site Drill Foreman and Drill Operators with experience installing and testing rock bolts and rock dowels.

1. Drill Foreman must have installed a minimum of 3,000 linear feet of rock bolts and/or rock dowels on a minimum of 5 projects over the past 5 years.

2. Drill operator(s) must have installed a minimum of 1,000 linear feet of rock bolts and/or rock dowels on a minimum of 3 projects over the past 5 years.

211-3.02 SUBMITTALS. At least ten (10) days before starting rock bolt installation, submit the following in a Rock Bolting Work Plan according to Subsection 106-1.08:

1. Resumes for each worker including: Contact information, Role on the project, and Descriptions of work experience. Include project names, locations, and contact information of owners.

2. Start date, construction sequence, and number of workers to be used for rock bolt installations.

3. Method of access and drilling including equipment and drill bit diameter.

4. Rock bolt and rock dowel types, lengths, and diameters including manufacturer's product data sheets, catalog cuts, and mill certificates. Couplers, bearing plates, washers (flat and beveled), nuts, stressing anchorages, centralizers, bond breakers, and grout socks with manufacturer's product data sheets, specifications, catalog cuts, and mill certificates. Include manufacturer's verification for the bearing plate thickness for the specified rock bolt capacities. Include staining application methods.

5. Manufacturer recommendations for bar and hardware handling, storing, and working temperature ranges.

6. Grout type, mix design, mixing equipment, placement procedures, manufacturer's product data sheets, catalog cuts, and 3-day grout compressive strength test results.

7. Means for measuring the level/extent of the first-stage grout in the hole for both rock bolts and rock dowels.

8. The methods, equipment and materials that will be used to control excessive grout injection volumes when open joints, seams or loose material is encountered, including details of grout socks if used.

9. Manufacturer certification and statement of manufacturer's compliance for galvanization and staining along with procedures and material for repairing galvanized and stained metal products in the field.

10. Details for placing, stressing and testing rock bolts. Schedule of a test location to demonstrate rock bolt and rock dowel installation, testing equipment and completion procedures.

11. Special installation methods such as upwardly inclined reinforcements, grouting across open joints, or debris-filled discontinuities used to ensure a fully-grouted, well-protected installation, when applicable.

12. Rock Bolt and Dowel Logs. Example logs for rock bolts and rock dowels are provided in Appendix G. For each rock bolt and rock dowel installation, document the bolt or dowel details, drilling log, grouting information and stressing information as outlined on the example log.

13. Testing Equipment. Provide the identification number, and calibration test certification for each jack, pressure gauge, and electronic load cell. Clearly indicate the serial number of each component of the testing assembly on calibration graphs. Include calibration data performed by an independent testing laboratory within 90 calendar days of the submittal date for each load cell, test jack pressure gauge, and master pressure gauge to be used. Recalibrate each load cell, test jack pressure gauge, and master pressure gauge every 90 calendar days from the originally submitted calibration date. Provide all calibration testing that is traceable to the National Institute of Standards and Technology (NIST).

211-3.03 GENERAL REQUIREMENTS.

1. Submit the work plan and personnel qualifications specified above to the Engineer for review and acceptance prior to commencing this work.

2. Install and test the rock bolts and rock dowels in accordance with these specifications and the details shown in the Plans and as directed by the Engineer. Locations to be determined by the Engineer as new rock cut slopes are exposed.

3. Work site safety is the responsibility of the Contractor. Perform all work in a manner to minimize exposure to the public, construction personnel, and equipment to hazardous and potentially hazardous conditions. Temporary support of rock blocks, special designs, or installation procedures that the Contractor deems necessary to safely install rock bolts and rock dowels are the responsibility of the Contractor and will be implemented at the discretion of the Contractor and subsidiary to the unit contract price for rock bolts and rock dowels.

211-3.04 MATERIAL HANDLING AND STORAGE. Handle and store the rock bolts and rock dowels in such a manner as to avoid damage and corrosion of the staining, coating and the steel. Protect the rock bolts and rock dowels from dirt, nicks, abrasions, weld splatter, rust, and corrosive substances. Damaged rock bolts and rock dowels will be rejected and replacement will be at no additional cost to the Department.

211-3.05 INSTALLATION SEQUENCES.

1. Rock Bolts

    a. Install each rock bolt within 24 hours of completing the drill hole. Check the depth of the drill hole prior to inserting the bar. Clear the hole of debris if total depth is no longer accessible.

    b. Complete first stage grouting within one week of rock bolt installation.

    c. Check grout levels within 48 hours of first stage grouting.

    d. Conduct load testing on each rock bolt within one week of completing first stage grouting.

    e. Complete second stage grouting for rock bolts within three days of successful load testing.

    f. Check grout levels in each rock bolt within one week of completing second stage grouting.

    g. Top-off grout levels as necessary to provide full encapsulation of the bar, to the satisfaction of the Engineer. Top-off grouting may need to be conducted multiple times to fully encapsulate.

2. Rock Dowels

    a. Install each rock dowel within 24 hours of completing the drill hole. Check the depth of the drill hole prior to inserting the bar. Clear the hole of debris if total depth is no longer accessible.

    b. Complete grouting within one week of rock bolt installation.

    c. Check grout levels within 48 hours of grouting.

    d. Top-off grout levels as necessary to provide full encapsulation of the bar, to the satisfaction of the Engineer. Top-off grouting may need to be conducted multiple times to fully encapsulate.

    e. Conduct lift-off testing on each rock dowel within one week of grouting.

211-3.06 DRILLING AND INSTALLATION.

1. Furnish equipment capable of drilling a minimum 3-inch diameter hole up to 40 feet in length in the rock found at the sites for installation of rock bolts and rock dowels. Install rock bolts and rock dowels with the capacities and lengths as shown in the Plans.

2. Drill and install rock bolts and rock dowels at the locations, orientations, and to the minimum lengths shown on the plans or as directed by the Engineer. Total bolt lengths may vary based on encountered subsurface conditions and may be adjusted by the Engineer.

3. Drill the rock bolts and rock dowels perpendicular to the rock face or inclined slightly downward (0 to 5 degrees) from the axis of the bolt and the rock face, if not otherwise specified in the plans.

4. Over drill the length of each hole nominally 10 inches. Flush the drill holes of all drill cuttings and debris with compressed air prior to the installation of the rock bolt or rock dowel. Re-drill holes in which bolt installation is not possible at no additional cost to the Department.

5. Install rock bolts with bond breakers through the unbonded length of the bar to prevent first stage grout from entering the second stage and anchorage bond lengths, as shown in the Plans or as directed by the Engineer.

6. Place a minimum of two (2) centralizers on each anchor. The lower centralizer should be located within two (2) feet of the end of the bar. The outer centralizer should be located within three (3) feet of the rock face. Do not place centralizers on the bond breaker.

7. Install the rock bolt/dowel and bearing plate so the axis of the bar is within 5 degrees of being perpendicular to the bearing plate so that the rock bolt or rock dowel is not bent when tested and tensioned.

8. Maintain at least three-quarters contact of the bearing plate with the rock face. Chip out surrounding rock as necessary to provide this contact and ensure that the axis of the bar is within 5 degrees of being perpendicular to the bearing plate. A bearing pad can be used to achieve the required contact and angle between the installed rock bolt/dowel and the bearing plate, or if the rock beneath the bearing plate is not sound. Allow sufficient cure time for bearing pads constructed from cement.

9. Treat all exposed parts of the rock bolt/dowel, bearing plate and nut that have damaged galvanization with an approved corrosion-protection paint.

211-3.07 GROUTING.

1. Provide grout with a minimum strength of 4,000 psi after 3-days.

2. Conduct two-stage grouting for all rock bolts and one stage grouting for rock dowels. First stage grouting will fill the rock bond length and half of the unbonded length for rock bolts and the entire bar length for rock dowels. Second stage grouting for rock bolts will fill the remaining length of the installation after successful post tensioning and lock-off.

3. Grout loss should be anticipated and accounted for in the grouting operations. Use of grout socks is recommended. Select grout socks for the appropriate drill hole diameter as recommended by the sock manufacturer. High groundwater may be encountered and should be addressed in the grouting operations as well.

4. Use mixing and pumping equipment that produces a uniformly blended grout free of lumps and undispersed cement. Size the grouting equipment appropriately to enable the grout to be pumped in one continuous operation without segregation. Inject the grout from the lowest point (distal end or bottom) of the drill hole.

5. Record the quantity of the grout placed for each rock bolt and rock dowel. The amount of grout required will be more than the neat volume represented by the annulus space between the drill hole and the rock bolt/dowel times the length of the drill hole. Allow a minimum of 3 days for the grout to fully cure before tensioning or applying any load.

6. After tensioning and lock off, encapsulate the remaining length of the rock bolt in grout.

7. Check the grout level the next day through the key-hole and top off with additional grout using a tremie tube to fill the annular space. Any time additional grouting is needed, recheck the level the following day and repeat as necessary until proper grout level is achieved.

211-3.08 ROCK BOLT PERFORMANCE TESTING.

1. Complete two (2) performance tests at each cut site where rock bolts will be installed to demonstrate the effectiveness of the construction method(s) and to verify the assumed grout-bond stress used to develop the rock bond length. Notify the Engineer of all planned performance tests prior to conducting the test so that testing can be observed. Submit test results for review and acceptance by the Engineer before commencing production rock bolting at any cut site. Performance tests can be carried out on either sacrificial or production bolts.

2. Tension performance test installations to the test load of the rock bolt and perform a 10-minute creep test. The design and test loads for the rock bolts are shown on the Plans. Tension the rock bolt with a calibrated hollow-ram hydraulic jack and gauge with graduations no larger than 50 psi. During the hold period, do not allow the load to deviate from the test pressure by more than 50 psi. Re-pump as necessary to compensate for small movements and changes.

3. Measure bolt extension during tensioning with a dial gauge capable of measuring to 0.001 inches. Bear dial gauge against a fixed plate or surface which will not move as a result of loading and so its stem is parallel with the bolt. Record performance test results and supply to the Engineer.

4. The Engineer will analyze the performance test results and determine whether the rock bolt and installation method is acceptable. A rock bolt is acceptable if:

    a. The total elastic movement obtained at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the stressing length; and,

    b. The rock bolt will carry the maximum test load with a creep rate that does not exceed 0.04 inches between one (1) and ten (10) minutes, or 0.08 inches per log cycle of time between the six (6) and sixty (60) minute readings.

5. If any test bolt fails to achieve the testing criteria, perform additional tests to demonstrate acceptable performance can be achieved to the satisfaction of the Engineer at no additional cost to the Department. Perform additional testing at no additional cost to the Department whenever a change in the construction method is proposed.

211-3.09 ROCK BOLT PROOF TESTING. Proof test all rock bolts that are not performance tested by tensioning to the test load shown in the Plans and holding that load for at least 10 minutes. If no loss of load occurs in this time period, the rock bolt can be accepted. Lower the load until the jack releases and then re-tension to the lock-off load shown on the plans per 211-3.11. If a rock bolt fails the load test, replace the rock bolt with an additional bolt installed in a separate hole at a location identified by the Engineer at no additional cost to the Department.

211-3.10 ROCK DOWEL LIFT-OFF TESTING. Test only fully grouted dowels. Conduct lift-off tests on all rock dowels. Gradually load the installations to the test load shown in the Plans. Monitor the pressure gauge to verify the anchor is holding the design load for at least 10 minutes. If pressure is lost on the pressure gauge due to anchorage movement, replace the dowel at no additional cost to the Department.

211-3.11 COMPLETION. After tensioning and achieving successful testing, lower the tension and lock off the load at 100 percent of the design load with a nut and washer (flat and/or beveled) as needed to ensure that the nut is flush against the bearing plate. Grout the remaining portion of the rock bolt. Trim the end of the completed rock bolt or rock dowel to within 6 inches of the rock face.

211-3.12 ROCK BOLT AND ROCK DOWEL LOGS. Maintain daily records of this work that are sufficient to provide Rock Bolt and Rock Dowel Logs with the following information. Submit draft logs to the Engineer weekly. Example logs have been provided in Appendix G, as described in the Special Notice to Bidders.

1. Locations of each rock bolt and rock dowel with individual designations, size of bar, bar inclination, and installation comments. Include an annotated photograph illustrating each rock bolt and rock dowel location with associated designations.

2. General drilling log with beginning and ending dates of drilling, drill hole diameter, note of drilling conditions/action, materials encountered, the location of any significant drilling changes (e.g. geologic contacts, voids, seams, open fractures, groundwater conditions, etc.).

3. Grouting information including grout mix, grout volume placed, average grout pressure, and mitigative measures implemented to assist with grouting.

4. Total anchor length with bonded, unbonded, anchorage bond lengths.

5. Testing data including date of stressing operation, identification numbers of jacking equipment, personnel conducting the testing, and testing results.

Submit as-built drawings according to Section 105-1.16 and 106-1.08 after work completion.

211-3.13 ACCEPTANCE. See Table 211-1 for sampling, testing, and acceptance requirements.

TABLE 211-1
SAMPLING, TESTING, AND ACCEPTANCE REQUIREMENTS

Material or Product (Subsection)	Type of Acceptance (Subsection)	Characteristic	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
Performance test for rock bolts	Measured and tested for conformance by contractor	Deformation	Subsection 211-3.08	First two (2) at each cut site	Installation	No	Within 24 hours after completion of test
Proof test for rock bolts	Measured and tested for conformance by contractor	Capacity	Subsection 211-3.09	Each bolt	Installation	No	Within 24 hours after completion of test
Lift-off test for rock dowel	Measured and tested for conformance by contractor	Capacity	Subsection 211-3.10	Each dowel	Installation	No	Within 24 hours after completion of test

211-4.01 METHOD OF MEASUREMENT. Refer to Section 203 for Method of Measurement.

211-5.01 BASIS OF PAYMENT. Refer to Section 203 for Basis of Payment.

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Special Provisions

Add the following Section:

SECTION 212
EXCAVATION OF CONTAMINATED MATERIALS

212-1.01 DESCRIPTION.

This work includes contaminated material testing, excavation of contaminated material, and water sampling for contaminated materials encountered during construction performed by the Contractor and by utility relocation work described in Section 651.

212-1.02 DEFINITIONS. This work shall comply with Alaska Department of Environmental Conservation (ADEC) regulations and guidance regarding contaminated material testing and handling. Applicable references include, but are not limited to the following:

1. ADEC 18 AAC 75 Oil and Other Hazardous Substances Pollution Control
2. ADEC 18 AAC 70 Water Quality Standards
3. ADEC 18 AAC 60 Solid Waste Management
4. ADEC Field Sampling Guidance
5. 25 CFR 1910.120 (HAZWOPER)

212-1.03 SUBMITTALS.

1. Sampling and Analysis Plan (SAP).
2. ADEC Excavation Dewatering Permit (if any dewatering operations are proposed within 1,500 feet of an active (open or closed with institutional controls) contaminated site.
3. Health and Safety Plan for working with contaminated material per 25 CFR 1910.120
4. ADEC Transport, Treatment, & Disposal Approval Form for Contaminated Media (prior to moving any contaminated media from the immediate vicinity of the location generated).
5. Certificate(s) of Disposal (CD) for any contaminated media removed from the project.
6. Laboratory Data Packages from any laboratory testing.
7. Copies of Environmental field notes.

CONSTRUCTION REQUIREMENTS

212-3.01 ENVIRONMENTAL SUBCONTRACTOR. The Contractor shall obtain the services of an Environmental Subcontractor with employees considered to be Qualified Environmental Professionals (QEPs) by ADEC to prepare a SAP for approval by the Engineer and ADEC and to perform on site field testing and to collect samples for laboratory analysis.

212-3.02 WATER SAMPLING. If the water table is encountered during excavation within 1,500 feet of a contaminated material area and dewatering is necessary, the Contractor shall be required to obtain an ADEC Excavation Dewatering Permit before any dewatering activities occur. An Environmental Subcontractor may be required by the ADEC Excavation Dewatering Permit to collect analytical water samples. The SAP may be designed to address any sampling required in accordance with the Permit. Samples shall be tested, or stored for future testing at the Engineer's option, according to the appropriate current ADEC analytical test methods (EPA Hazardous Waste Test Methods [SW-846]) and Alaska specific methods (e.g. AK101, AK102, or AK103). Samples not tested by two times the analytical method holding time may be disposed. Transmit the results in writing directly to the Engineer.

During excavation, field screening and laboratory samples shall be taken and tested at intervals defined in the ADEC-approved SAP.

212-3.03 CONTAMINATED MATERIAL TESTING. This work shall consist of field screening and testing soils for contaminants. Each truckload of soil imported from a suspected site or other location at the direction of the Engineer shall be examined for contamination. Any soil excavated from an area of suspected contamination shall be examined for potential contamination prior to on-site reuse or off-site export.

According to Subsection 212-3.04, Excavation of Contaminated Material, the Contractor or Environmental Subcontractor shall perform field tests and shall retain an independent analytical laboratory, approved by ADEC, to conduct laboratory tests as detailed below:

Field Tests
Photo-ionization Detector (PID) Analysis
Visual/Olfactory Analysis (Petroleum Odor, Discoloration, Sheen, etc.)

Laboratory Tests
Gasoline-Range Organics (GRO) by method AK101
Diesel-Range Organics (DRO) by method AK102
Volatile Organic Compounds (VOC) by method SW8260C
Polycyclic Aromatic Hydrocarbons (PAH) by method SW8270D SIM

A QEP shall conduct field testing using a photoionization detector (PID) with a 10.6 electron volt (eV) lamp, or other approved ADEC instrument, as approved in the SAP. The Contractor shall submit the name of the Environmental Subcontractor and any associated QEP(s) to the Engineer at the preconstruction conference. The Environmental Subcontractor shall be available at all times hauling is in progress to conduct the required field tests as specified by the SAP.

The Environmental Subcontractor shall sample and test according to ADEC approved testing procedures as specified in the approved SAP. If a PID response and/or visual/olfactory observations indicate the presence of any contamination, the soils will have failed the test and will be designated as contaminated. If no response is observed, the soil will be examined for odor or other visual signs of contamination by a QEP. If a petroleum odor is detected, the soils will fail the test and will be designated as contaminated. If no petroleum odor or visual signs of contamination are detected, the soil will be considered to have passed field criteria. These criteria shall be amended as required to receive ADEC approval of the SAP.

The QEP and Environmental Subcontractor shall be responsible for ensuring soils exhibiting a PID response that indicate the presence of any contamination, or soils exhibiting characteristics of fuel contamination (i.e. odor, sheen, or stain), are identified to the Engineer.

Contaminated material will not be accepted for borrow and shall be immediately stockpiled for characterization and removal in accordance with procedures detailed in the approved SAP. Contaminated material cannot be removed from the site without approval from the Engineer and ADEC regarding transport and final disposal or treatment of any amount of contaminated material (e.g. soil or water).

The PID calibration will be checked and re-performed if failing quality control parameters at least once per day. Calibration check readings must be within five (5) percent of the calibration gas used. Calibration shall be referenced to one hundred (100) part per million (ppm) isobutylene gas.

212-3.04 EXCAVATION OF CONTAMINATED MATERIAL. This work shall consist of removing and disposing of fuel contaminated soils encountered during the excavation. Disposal of fuel contaminated soils shall be at a location approved by the Engineer and ADEC. Contaminated areas shall not be excavated past limits required for construction of this project unless directed by the Engineer.

1. Determining Limits of Contaminated Soil. One location is identified as potentially containing contaminated soil and/or water on the ADEC Contaminated Sites Database (File Number 2105.26.001 and Hazard ID 23166). The exact limits of potential contaminated soil/groundwater within the excavation cannot be determined until the material is exposed. Once exposed, the soil shall be tested according to Subsection 203-3.08, Contaminated Material Testing and the SAP. Testing will verify the contamination levels in the soils and determine if the soils can be disposed of as unclassified excavation or if they will require special handling.

Soils that have a response from a PID or equivalent instrument above background limits defined in the SAP but not greater than 5 ppm above background shall be considered “contaminated” and will require special handling, shall be tested according to Subsection 203-3.08 and disposed of according to this Subsection and the approved SAP.

2. Worker Health and Safety. Before the excavation of any soils identified as contaminated, the Contractor shall assure the personnel working in the area of potential contamination have received State of Alaska, Department of Labor, Health and Safety Training. The Contractor shall provide the Engineer a list of the personnel and subcontractors that will be working within the area identified as being potentially contaminated. Workers directly exposed to potentially contaminated soils shall have 40-hour Occupational Safety and Health Administration (OSHA) 25 CFR 1910.120 Hazardous Waste Operations and Emergency Response (HAZWOPER) training. An OSHA compliant safety and health plan shall be provided by the Contractor to address health and safety concerns for working with contaminated materials.

   The Contractor shall notify personnel and subcontractors, before they begin work at the site, that they will be working in an area identified as being potentially contaminated with hydrocarbons.

3. Contaminated Soil Removal and Segregation. In the event the Contractor must stockpile contaminated soil, a liner, cover and temporary fencing will be required and shall meet the requirements found in 18 AAC 75.370 (Soil storage and disposal). Table D (Bottom Liner Specifications) provides minimum requirements for stockpile bottom liners.

   The size and location of the liner shall be as approved by the Engineer. The Contractor shall cover and secure the stockpile at the end of each work day with a minimum six (6) mil, reinforced polyethylene liner or its equivalent per 18 AAC 75.370. The Contractor shall be responsible for removal of the\ stockpile liner, safety fence, and cover once the fuel contaminated soil is removed. The method of treatment or disposal shall be according to ADEC regulations for fuel contaminated soils. Additional testing required at the disposal site shall be done according to Subsection 203-3.08, Contaminated Material Testing, unless otherwise directed by the Engineer or SAP.

   Before the Contractor backfills the excavation, samples from the excavation (bottom and sides) shall be taken for confirmation testing in accordance with frequencies and quantities specified by the SAP. Backfill within the limits of planned excavation shall meet the requirements for the item of work involved. Backfill outside plan excavation limits shall meet the requirements of Select Material, Type C or better.

4. Responsibility. With respect to preexisting hazardous substances or contaminated materials in the project area, nothing in this contract is intended to impose upon the Contractor, or to require the Contractor to assume, the status under state or federal environmental law of a facility owner or operator, or an owner or generator of those preexisting hazardous substances or contaminated materials. The Contractor shall assume the responsibility to obtain administrative approvals and to coordinate the activities with ADEC and/or any federal agency having jurisdiction, to carefully abide by the applicable laws, regulations, and the terms of any administrative approvals, and to otherwise use environmentally sound management practices such that the Contractor does not, as a result of its own actions, become a facility owner or operator, or an owner or generator of hazardous substances by reason of an unpermitted release of hazardous substances.

212-4.01 METHOD OF MEASUREMENT. Refer to Section 203 for Method of Measurement.

212-5.01 BASIS OF PAYMENT. Refer to Section 203 for Basis of Payment.

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DIVISION 300 — BASES

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SECTION 301
AGGREGATE BASE AND SURFACE COURSE

Special Provision

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

Standard Modification

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.

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.____ Aggregate Base Course, at the unit price shown in the bid schedule for that Item.

C301.1-07.0124-1

SECTION 318
FOAMED ASPHALT STABILIZED BASE COURSE

318-1.01 DESCRIPTION. The work consists of constructing a mixed in place foamed asphalt stabilized base. Create foamed asphalt treated base course by simultaneously injecting and thoroughly mixing metered amounts of asphalt, Portland cement, and water into the pulverized asphalt and base course. Spread, shape, and compact the mixed material according to these specifications and conforming to the dimensions shown on the Plans.

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Haul, stockpile, and place reclaimed/pulverized asphalt and base course as necessary to shape selected materials and existing subbase to proposed elevations in accordance with Section 203.

Work consists of importing aggregate surface course, grading E-1 for foamed asphalt stabilized base course to supplement available quantities of existing asphalt pavement and base course material to be reclaimed/pulverized for aggregate.

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Provide an experienced foamed asphalt technician on site to supervise the foamed asphalt process and to supervise the related process control testing.

At the Preconstruction Meeting, provide information on the equipment proposed for use, the name, and resume of the foamed asphalt technician, and the location of the demonstration site.

MATERIALS

318-2.01 COMPOSITION OF MIXTURE – JOB MIX DESIGN (JMD).

1. Sampling. Before foamed asphalt stabilized base course production, laboratory tests of materials submitted by the Contractor shall be made to determine the quantity of asphalt binder and Portland cement required in the mix. At least 15 days before the production of foamed asphalt stabilized base course, the Contractor shall furnish the following:

    a. 500-pound representative sample of in-place aggregate
    b. 200- pound representative sample of in-place asphalt concrete pavement
    c. 10-gallons of asphalt binder
    d. One sack of Portland cement

2. Job Mix Details. The Engineer will determine the JMD using procedures contained in the Wirtgen Manual Foamed Bitumen Mix Design Procedure, using the Wirtgen WLB 10 to generate foamed asphalt. The JMD will provide the following:

    a. The percent by weight of foamed asphalt binder to be added to the mix.
    b. The optimum percent by weight of water to be added to the asphalt binder for the foaming process.
    c. The minimum Foamed Asphalt Expansion Characteristics required.
    d. The temperature of asphalt binder at the time of injection.
    e. The percent by weight of Portland cement to be added to the mix.
    f. The gradation of the in place aggregate.
    g. The optimum compaction moisture content.
    h. Design dry indirect splitting tensile strength.
    i. The maximum dry density.

318-2.02 ASPHALT BINDER. Conform to subsection 702-2.01 Asphalt Binders PG 52-28. Each batch of asphalt binder shall be tested to conform to specifications before shipping. Storage tanks used for the batch shall be noted on the test report.

Provide the following shipping documents:

1. Manufacturer's certification of compliance.

2. Conformance test results of the batch

3. Manufacturer shall also document:

    a. date and time of loading
    b. batch number and storage tank
    c. type, grade, and quantity of materials loaded.

The vendor's certified test report for the asphalt binder can be used for acceptance or tested independently by the Engineer.

Excess asphalt binder shall remain the property of the Contractor. Removal of excess asphalt binder from the project area shall be incidental to the Contract and no separate payment will be made.

318-2.03 PORTLAND CEMENT. Conform to subsection 701-2.01, Type I or II meeting low alkali requirements.

318-2.04 WATER. Water shall be clean and free from sewage, oil, acid, strong alkalis, or vegetable matter. Water of questionable quality shall be tested according to the requirements of AASHTO T 26.

318-2.05 CONTRACTOR'S FOAMED ASPHALT TECHNICIAN. The Contractor shall provide an onsite technician to supervise the foamed asphalt process and the related process control of the product on the control strip and for 10 days of production. This technician shall have a minimum of 5 years supervising successful projects using foamed asphalt binder with similar base material and equipment. The technician must also be qualified to develop a foamed asphalt stabilized base course mix design and supervise the process control.

Provide a submittal that includes the following information:

1. Resume of Technician

2. A list of successful projects**;** provide owners contact, address, and telephone number**;** location of projects.

3. Description of foamed asphalt binder equipment used on the project.

318-2.06 CONTRACTOR PROCESS CONTROL AND ACCEPTANCE SAMPLING AND TESTING. The quantity of foamed asphalt stabilized base produced will be divided into lots and the lots evaluated individually.

A lot will normally be 24,000 square yards. The lot will be divided into sublots of 4,000 square yards. The Contractor shall randomly sample and test for density and Indirect Tensile Strength for each sublot. The Engineer will validate this test data for each lot through independent random testing before accepting it.

The Contractor shall provide the following:

1. Daily production records for each sublot, including the quantity of asphalt binder, Portland cement, and in place compaction moisture content.

2. Measure and report expansion ratio and half-life of foamed asphalt binder for every 4 hours of production.

3. Monitor and report in place field density of the foamed asphalt stabilized base for each sublot.

4. Provide a laboratory, test equipment and a qualified technician for ITS and density testing on the jobsite using ATM 412. Sample and perform Indirect Tensile Strength testing for each sublot according to Wirtgen Foamed bitumen mix design procedure manual, using calibrated equipment and a qualified technician. Make a minimum of 3 specimens to average for each sublot Indirect Tensile Strength test.

5. Report process control and acceptance sampling and testing data to the Engineer within 24 hours.

318-2.07 PREPROCESS MEETING. A minimum of 5 days before initiating operations, hold a meeting on the jobsite where the Contractor's technician outlines a processing plan. This plan must address the sequence of operation, equipment to be used, and process control. Outline steps to assure product consistency, conformity to strength requirements, proposed quality control testing frequency, traffic control, and public notification.

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318-2.08 IMPORTED AGGREGATE. Material imported for foamed asphalt stabilized base course aggregate shall be processed and screened to meet material specification for aggregate surface course, grading E-1 prior to being placed, graded, and shaped for asphalt foaming. Refer to Subsection 703-2.03.

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CONSTRUCTION METHODS

318-3.01 WEATHER LIMITATIONS. Foamed asphalt stabilized base course shall not be mixed while the air or surface temperature is below 40°F, or when conditions indicate that the temperature may fall below 40°F within 24 hours, or when the aggregate is above the optimum compactions moisture content, or when the aggregate or subgrade is frozen. Follow the recommendations made by the Contractor's technical representative as approved by the Engineer regarding the acceptability of the weather conditions for foaming operation.

318-3.02 CONTROL SECTION. Before full production, the Contractor shall use the equipment specified for the foamed asphalt stabilized base course operation and construct a control section at a location approved by the Engineer. Process material in the control section two passes wide, 150 feet long and to the depth shown on the Plans, and develop a density standard according to ATM 412. The Contractor's technical representative shall supervise this process.

318-3.03 RECLAIMER (RECYCLER). The reclaimer shall have the following features and capabilities:

1. A minimum power capability of 600 horsepower.

2. The capability to pulverize to the size specified, mix, and recycle material to the depth shown on the Plans.

3. Ability to increase the effective volume of the mixing chamber in relation to depth of cut.

4. Two microprocessor controlled systems, complete with two independent pumping systems and spray bars, to regulate the application of foamed asphalt binder, separate from water that is used to increase the moisture content of the mixed material. Both systems shall perform in relation to the forward speed of the reclaimer and the mass of the material being processed.

5. Two spray bars, one for foamed asphalt binder and one for compaction moisture, shall each be fitted with self-cleaning nozzles at a maximum spacing of one nozzle for each 6 inch width of the mixing chamber. Provide a way to monitor the flow rate at each nozzle to verify that all nozzles are producing foamed asphalt at the same rate.

6. The foamed asphalt binder shall be produced at the spray bar in individual expansion chambers into which hot asphalt binder, water, and air are injected under pressure through individual and small orifices that promote atomization. The rate of addition of water into the hot asphalt binder shall be kept at a constant percentage by mass of asphalt binder by the same microprocessor.

7. A system within the operator cabin to verify the foamed asphalt is being evenly distributed across the full width of the spray bar at the rate specified. The system shall be demonstrated to the Engineer to verify even spraying.

8. An inspection or test nozzle shall be fitted at one end of the spray bar that produces a representative sample of foamed asphalt binder.

9. An electrical heating system capable of maintaining the temperature of asphalt binder flow components above 300 degrees F.

10. A single asphalt binder feed pipe installed between the recycler and the supply tanker. Do not use circulating systems that incorporate a return pipe to the supply tanker.

11. The ability to print out asphalt binder quantities used during production.

12. The teeth on the mandrel mixing head form a Chevron pattern.

The reclaimer model proposed for use shall have successfully been used by the Contractor/subcontractor on other projects. Provide a submittal of the reclaimer specifications at the Preconstruction conference.

318-3.04 PORTLAND CEMENT DISTRIBUTOR. Use a cement distributor designed to spread a uniform coverage of Portland cement at a specified rate. The spread rate shall be integrated with the speed of travel to maintain a uniform coverage.

318-3.05 ROLLERS. Provide the following types of rollers as required:

1. Self-propelled vibratory pad foot roller having a minimum dynamic force of 60,000 lbs. for initial compaction.

2. Pneumatic tired roller having a minimum operating weight of 50,000 lbs. for secondary compaction and finishing.

3. Vibratory steel drum roller for secondary compaction and finishing.

318-3.06 GRADER. Grader must have calibrated automatic cross slope blade controls.

318-3.07 PREPARATION. The area to be stabilized with foamed asphalt binder may require pulverization, removal of material**,** grading, and shaping to conform to the grades and typical cross section shown on the Plans**,** then provide aggregate and pay for under a separate bid item. Soft or yielding spots shall be removed and replaced with acceptable aggregate before being stabilized.

318-3.08 PULVERIZING. Pulverize the existing asphalt pavement and base material so that at the completion of moist mixing, 100% passes a 2 inch sieve. Multiple passes may be required to size the insitu material and to adjust moisture content before applying Portland cement and injecting foamed asphalt.

318-3.09 FOAMED ASPHALT BINDER AND PORTLAND CEMENT APPLICATION, MIXING, AND SPREADING. Mix insitu material with foamed asphalt binder, Portland cement, and water in place with a reclaimer.

Measure the moisture content of insitu material before processing and adjust if necessary. The percentage of moisture in the aggregate**,** at the time of Portland cement application, shall not exceed the quantity that will permit a uniform mixture during mixing operations, and it shall not exceed the specified optimum moisture content for the foamed asphalt stabilized base course mixture.

Spread the required quantity of Portland cement uniformly on the surface to be stabilized. Pulverize to the depth required while simultaneously injecting foamed asphalt binder and compaction water. Mixing shall continue until the foamed asphalt binder, Portland cement and compaction water have been sufficiently blended with the existing material.

318-3.10 COMPACTION. Immediately upon completion of the mixing operations, the mixture shall be thoroughly compacted with the initial compaction done with the vibratory pad foot roller. The intermediate compaction shall be done with the pneumatic tired roller and the finish compaction shall be done with the vibratory steel drum roller.

Acceptable field wet density of the compacted mixture shall not be less than 98 percent of the standard developed on the control strip according to ATM 412. Determine the in place field density by direct transmission according to WAQTC FOP for AASHTO 310, Method A. The moisture content of the mixture at the start of the compaction shall not be above the optimum moisture content as determined by the foamed asphalt mix design.

318-3.11 FINISHING. The completed foamed asphalt stabilized base course shall conform to the required lines, grades and cross section. If necessary, the surface shall be lightly scarified to eliminate any deep imprints made by the compacting or shaping equipment. The surface shall then be recompacted to the required density. Seal the surface with water and a pneumatic roller. Control traffic on the finished surface for a cure period after sealing is completed, as directed by the Engineer.

318-3.12 CONSTRUCTION LIMITATIONS. When the operation, after the application of cement, is interrupted for more than 30 minutes or when the uncompacted mixture is wetted by rain so that the optimum moisture content is exceeded by 2 percentage points, the decision to reconstruct the portion affected shall rest with the Engineer. In the event the uncompacted, rain wetted mixture exceeds the specified moisture content tolerance, the Contractor shall reconstruct at the Contractor's expense the portion affected. Material along the longitudinal or transverse construction joints not properly compacted shall be reconstructed, at the Contractor's expense, with properly moistened and mixed foamed asphalt stabilized base compacted to specified density.

318-3.13 SURFACE TESTS. The finished surface shall not vary more than 3/8 inch when tested with a 10 foot straightedge applied parallel with, or at right angles to, the longitudinal axis of the pavement. Variations in excess of this tolerance shall be corrected by the Contractor, at the Contractor's expense, and in a manner satisfactory to the Engineer.

318-3.14 MAINTENANCE. Maintain, at the Contractor's expense, the entire base course within the limits of the Contract in a condition satisfactory to the Engineer from the time work starts until the work is completed. Maintenance includes immediate repairs of defects that may occur either before or after the foamed asphalt stabilized base course has been constructed. The work shall be done by the Contractor at the Contractor's expense and repeated as often as necessary to keep the area intact. Repairs shall be made in a manner that will ensure restoration of a uniform surface and the durability of the part repaired. Faulty work must be reconstructed for the full depth of treatment. Low areas shall be remedied by reconstructing the material for the full depth of treatment rather than by adding a thin layer of foamed asphalt stabilized base course to the completed work.

The Contractor is responsible for cost of road spray on vehicles and informing the public of potential hazards.

318-4.01 METHOD OF MEASUREMENT. Section 109 and the following:

1. Asphalt Binder. By the weight recorded on delivery tickets minus waste, diversion, and remnant.

2. Portland Cement. By the weight recorded on delivery tickets minus waste, diversion, and remnant.

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3. Foamed Asphalt Stabilized Mix. By area measured across top of foamed asphalted treated base course section from edge to edge as shown in the plans.

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318-4.02 EVALUATION OF MATERIAL FOR ACCEPTANCE. The Engineer must have Indirect Tensile Strength results and passing densities of the foamed asphalt stabilized base before allowing it to be covered by HMA pavement. The Engineer will calculate the lot average of the Indirect Tensile Strength results from the acceptance testing for the project. Payment shall be made at the Contract unit price per square yard for foamed asphalt stabilized base course when the lot average dry Indirect Tensile Strength is greater than 85% of the mix design. This price shall be full compensation for furnishing materials, except asphalt binder or Portland cement, and for preparation, delivering, placing, and mixing of materials; and for labor, equipment, tools, and incidentals necessary to complete the item.

If the lot average dry Indirect Tensile Strength value is less than 85% of the JMD dry Indirect Tensile Strength value, the foamed asphalt stabilized base is deemed to not meet specifications. The Contractor shall increase the thickness of the hot asphalt pavement for that lot and adjust the surface grade at the Contractor's expense to compensate for reduced dry Indirect Tensile Strength.

T = (5.5-(6.25*(lot average dry ITS/JMD dry ITS)))
T = increase in hot asphalt pavement thickness in inches
ITS = Indirect Tensile Strength

318-4.03 ASPHALT MATERIAL PRICE ADJUSTMENT. 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.

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318-5.01 BASIS OF PAYMENT

Item 318.2000.___ Foamed Asphalt Stabilized Base Course.

Payment includes reclaiming/pulverizing existing asphalt pavement and base course to full depth shown in the plans, as measured from the existing roadway surface; placement of reclaimed/pulverized asphalt pavement and base course; mixing and foaming reclaimed/pulverized asphalt pavement, base course, and imported aggregate surface course, grading E-1; and spreading, shaping, and compacting the mixed material.

Excavating, removing, hauling, and stockpile of reclaimed/pulverized materials for foamed asphalt stabilized base course operations is paid for under Pay Item 202.0002.____ Removal of Pavement. Additional material to be removed/excavated to meet final roadway elevation shown in the plans is paid for under Pay Item 203.0003.____ Unclassified Excavation.

Imported aggregate surface course, grading E-1 material for foamed asphalt stabilized base course is paid for under Pay Item 301.0003.____ Aggregate Surface Course, Grading E-1.

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Item 318.2004.____. Asphalt Material Price Adjustment.

For each Section as included in Subsection 318-4.03 Asphalt Material Price Adjustment, item 1, 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

Item Number	Item Description	Unit
318.2000.____	Foamed Asphalt Stabilized Base Course	SY
318.2001.____	Asphalt Binder, Grade PG 52-28	Ton
318.2002.____	Portland Cement, Type I or II	Ton
318.2003.____	Foamed Asphalt Technician	LS
318.2004.____	Asphalt Material Price Adjustment	CS

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DIVISION 400 — ASPHALT PAVEMENTS AND SURFACE TREATMENTS

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Special Provision

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
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, cover 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.

401-3.19 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.

401-4.01 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.

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:

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

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. 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 401.0005.____. HMA, Temporary, Type __; Class __. Removal and disposal of temporary HMA is subsidiary.

Pay Item 401.0008.____. HMA Price Adjustment, Type __; Class__. 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.____. HMA Price Adjustment, Type __; Class __, 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.____. Longitudinal Joint Density Price Adjustment. The total price adjustment.

Pay Item 401.0010.____. Pavement Smoothness Price Adjustment. The total price adjustment.

Pay Item 401.0015.____. 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 401.0016.____. Crack Repair. Cleaning loose material from cracks, and asphalt binder and HMA to fill cracks are subsidiary.

Pay Item 401.0017.____. Prelevel for Ruts, Delaminations, and Depressions. Cleaning loose material, and asphalt binder and HMA are subsidiary.

Pay Item 401.0018.____. Repair Unstable Pavement. Removal of pavement and base course, asphalt binder, and HMA are subsidiary.

Pay Item 401.2021.____. Asphalt Binder Price Adjustment. The sum of the price adjustments for each material lot.

PAY ITEM		
Item Number	**Item Description**	**Unit**
401.0001.____	HMA, Type __; Class _	Ton
401.0002.____	HMA, Leveling Course, Type IV; Class B	LnSt
401.0003.____	HMA, Leveling Course, Type IV; Class B	Ton
401.0004.____	Asphalt Binder, Grade PG ##-## X	Ton
401.0005.____	HMA, Temporary, Type II, Class B	Ton
401.0006.____	HMA, Type __, Class __	SY
401.0007.____	Liquid Anti-Strip Additives	CS
401.0008.____	HMA Price Adjustment, Type __; Class __	CS
401.0009.____	Longitudinal Joint Density Price Adjustment	CS
401.0010.____	Pavement Smoothness Price Adjustment, Method _	CS
401.0013.____	Job Mix Design	Each
401.0014.____	Joint Adhesive	LF
401.0015.____	Asphalt Material Price Adjustment	CS
401.0016.____	Crack Repair	LF
401.0017.____	Prelevel for Ruts, Delaminations, and Depressions	SY
401.0018.____	Repair Unstable Pavements	SY
401.2021.____	Asphalt Binder Price Adjustment	CS

C401-25.0101

SECTION 402
TACK COAT

Standard Modification

Replace Subsection 402-3.02 with the following:

402-3.02 EQUIPMENT. Furnish, maintain, and operate asphalt distributor to apply asphalt material uniformly at even heat on variable widths of surface up to 15 feet at readily determined and controlled flow rates. Provide an asphalt distributor capable of application rates from 0.01 to 0.11 gallon per square yard. Equip with a heater, tachometer, flow rate gauge, operable mechanical tank gauge, thermometer for measuring temperatures of tank contents, power unit for the pump and full circulation spray bars adjustable laterally and vertically.

402-3.04 APPLICATION OF ASPHALT MATERIAL.

Add the following at the end of the first paragraph:

Control deviation from any specified application rate to within 0.02 gallon per square yard.

Add the following after the second paragraph:

After application of the tack coat, the surface shall be allowed to cure without being disturbed for the period of time necessary to permit drying and setting of the tack coat. If necessary, the Engineer will determine when the tack has cured.

HSM20.6-20.1130-2

Special Provision

Replace Section 406 with the following:

SECTION 406
RUMBLE STRIPS

406-1.01 DESCRIPTION. Form a series of indentations (rumble strips) into the roadway pavement. Place rumble strips in each shoulder to the width, depth, and length as indicated in the Contract documents and/or as directed by the Engineer.

406-1.02 RUMBLE STRIP. A single uniform circular concave (cross section) indentation/depression milled into the pavement surface having a length measured perpendicular to the direction of travel, a width measured in the direction of travel and a depth measured from the surface of the pavement to the bottom of the indentation.

406-2.01 MATERIALS. None.

406-2.02 MILLING EQUIPMENT. Use equipment designed specifically for milling rumble strips into asphalt pavement. Equip milling machine with a rotary type cutting head with a maximum outside diameter of 24-inches and a minimum length of 16-inches capable of producing a depression both 12-inches and 16-inches in length by 7 1/2-inches in width to a depth shown in the Plans. Arrange the cutting tips to provide a smooth cut (approximately 1/16-inch between peaks and valleys).

Furnish the milling equipment with a guidance system, including a guide, clearly visible to the operator, to provide for consistent alignment of each rumble strip cut at the offsets from traveled way indicated on the Plans and to provide uniformity and consistency throughout the project. The equipment shall incorporate water into the cutting head to minimize dust caused by the milling operation.

Equipment Manufacture: provide training for the operators and a representative onsite during installation of the rumble strip test section(s) (Subsection 406-3.03). Representative: remain onsite until test specimen(s) satisfy the Plans and Specifications as determined by the Engineer.

CONSTRUCTION REQUIREMENTS

406-3.01 PAVEMENT SURFACE PREPARATION. Inspect roadway to receive rumble strips for acceptable pavement condition and stake locations to receive rumble strips prior to installation. Prepare the roadway for the milling operation by providing a smooth clean surface. Sweep all loose material from the roadway surface in line with the planned rumble strips and to each side of the strips for the width of the milling machine plus an additional 12” minimum per side or edge of pavement whichever is smaller, and as directed by the Engineer.

Sweep and broom as noted and with the equipment indicated in Subsection 643-3.04, No. 6, Sweeping and Power Brooming.

406-3.02 TOLERANCES FOR RUMBLE STRIPS.

1. Length: ± 1/2-inch.
2. Width: ± 1/2-inch.
3. Depth: ± 1/16-inch.
4. Spacing: ± 1/2-inch.
5. Alignment: ± 1-inch from the striping layout in the Plans; existing striping and re-established striping.

If it is determined that the rumble strips are not being placed to specification, make immediate adjustments to correct the problem.

Rumble strips are unacceptable if:

1. The strips are not straight.
2. The length or width does not meet tolerance.
3. The depth of the depression does not meet tolerance.
4. The depression/indentation concave surface is not smooth, does not meet tolerance.
5. The edge of the indentation/depression is not straight, smooth, and free of spalling.
6. Pavement surface is damaged as a result of improper rumble strip installation.

Unacceptable rumble strip installation, dimensional, alignment, surface irregularities, and surface damage shall be ground, resurfaced and the rumble strip reinstalled to the satisfaction of the Engineer and at the Contractor's expense. Perform repairs using equipment similar to the equipment initially used to mill the rumble strip. Do not perform repairs in a "patch work" manner. If more than one repair is required; in a group of rumble strips repair the entire group. Where a repair is required in a continuous run, repair the unacceptable rumble strip(s) and repair or replace the rumble strip to each side of the unacceptable rumble strip as required to provide continuity between rumble strips as originally intended. The Engineer will confirm the extent of the repair(s) required.

If during production the work becomes unacceptable the Engineer may require resumption of testing, Subsection 406-3.03. Testing in addition to the initial test for each rumble strip type will be at the Contractor's expense.

406-3.03 RUMBLE STRIP TEST SECTION. Install an initial 1/4 mile test section for each of the following rumble strip type(s):

1. Shoulder.

Demonstrate for each type of rumble strip that the equipment and method will provide the desired milled-in rumble strip, including the surface inside each depression, without damaging the surrounding asphalt pavement. If any of the initial test sections do not meet tolerances, provide new equipment, new method, or make necessary adjustments and retest. These additional test sections will be required before production runs will be allowed to begin.

Testing in addition to the initial test sections, one for the shoulder type and one for the centerline type, will be at the Contractor's expense.

Additionally, demonstrate the means and methods, including the equipment, for containing dust and waste material.

406-3.04 TRAFFIC STRIPING RE-ESTABLISHMENT. Traffic striping is required to provide guidance for the rumble strip installation operation. Contractor, where shoulder and/or centerline striping is missing to the extent that rumble strip location cannot be determined by the Engineer, re-establish the striping location prior to the milling operation. Re-establish missing striping location by measuring laterally across the roadway from adjacent visible striping. Maintain the same lane widths that exist at each end of the missing striping. Provide sufficient location marking or "rabbit tracks" to ensure an accurate milling operation. Shoulder re-striping is not required. Re-establishing roadway striping location will not be measured or paid for separately but will be subsidiary to the respective rumble strip pay items.

406-3.05 RUMBLE STRIP INSTALLATION. Install the following types of rumble strip at the locations shown in the Plans:

1. Shoulder. Do not disturb existing shoulder striping.

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In compacted pavement with a temperature below 80˚ F, mill each type of rumble strip to the dimensions shown in the Plans. Locate the inside edge of the rumble strip as shown in the Plans. The Engineer will randomly check the edge alignment of the milled pattern.

406-3.06 CLEAN UP OF MILLINGS. Handle, transport, and store, or dispose of material according to the Alaska Department of Environmental Conservation (DEC) regulations. Remove off the project, on a daily basis, waste material (millings) resulting from the operation.

Disposal: Dispose waste material outside the project limits, unless directed otherwise, in writing, by the Engineer. Obtain written consent from the property owner. Milled material not being spread on the roadway side slopes requires a Solid Waste Disposal Permit from the DEC. Obtain a permit for disposal of milled material or dispose the material in a site previously approved.

Remove millings immediately following rumble strip installation. Maintain the removal operation within 50 feet of the milling machine. Dry power brooming and power brooming without direct immediate means of collection/pickup is not permitted.

During milling operations keep the travel lanes free of milling debris. Do not berm the millings at the shoulder edge, do not allow milling debris to impede roadway drainage or enter waterways. Use a sweeper, sweeper/vacuum, (Subsection 643-3.04 No. 6, Street Sweeping, and Power Brooming), continuously removing waste material, including dust from the operation. Keep millings damp to help control airborne dust. Millings shall not enter adjacent lanes open to traffic.

Remove the waste material from the roadway surface and any adjacent pathway beyond the shoulder. Shoulder millings may be placed off of the road or pathway beyond the shoulder on the side slopes, except in areas where guardrail is present. Uniformly spread shoulder millings on the roadway side slopes; alternatively, it may become property of the Contractor and disposed of off the project as indicated above.

Milled roadway segments shall be returned to debris-free state prior to re-opening for traffic.

406-4.01 METHOD OF MEASUREMENT. Section 109 and as follows:

Measure pay units by station, foot, or mile parallel to the centerline of the highway.

Station. A single lineal measurement for every measured station for each shoulder rumble strip and centerline rumble strip installed.

Linear Foot. A single lineal measurement for every measured foot of rumble strip installed.

Mile. A single lineal measurement for every measured mile for each shoulder rumble strip and centerline rumble strip installed.

Shoulder rumble strip measurement includes gaps (provided for bicycles or other as shown in the Plans) between groups of rumble strips.

406-5.01 BASIS OF PAYMENT. Section 109.

All work, including test strips and materials, is subsidiary to 406 Pay Items, except where specified as individual Pay Items.

PAY ITEM

Item Number	Item Description	Unit
406.0001.____	Rumble Strips	LS
406.0002.____	Rumble Strips	STA
406.0003.____	Rumble Strips	LF
406.0008.____	Rumble Strips, Shoulders	Mile
406.0012.____	Rumble Strips, Centerline	Mile
406.2001.____	Sweeping and Disposal of Millings, Shoulders	LS
406.2002.____	Sweeping and Disposal of Millings, Centerline	LS

C406-12.1108_2

DIVISION 500 — STRUCTURES

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SECTION 501
CONCRETE FOR STRUCTURES

Standard Modification

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

501-3.04 PREPARATION FOR CONCRETE PLACEMENT. Add the following:

Structural fill is to be used in place of foundation fill under and around the headwall footing as show on the Alaska Standard Plans for headwalls.

501-4.01 METHOD OF MEASUREMENT. Add the following:

Headwall, all types. Measured per unit, complete in place.

501-5.01 BASIS OF PAYMENT. Add the following:

Headwall, Type I and IA. Payment shall include materials and work for the following items: Class A concrete, structural fill, reinforcing steel contained in the headwall, nuts, hook bolts, grout, and other miscellaneous steel embedded in or attached to the headwall.

Excavation, bedding, and backfill for headwalls is subsidiary.

Add the following Pay Items:

PAY ITEM

Item Number	Item Description	Unit
501.2007.0001	Headwall, Type I	EACH
501.2007.0001	Headwall, Type IA	EACH

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SECTION 505
PILING

Special Provisions

505-3.03 DRIVING PILES.

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

Drive all piles, except piles for lighting standards, to the driving resistance and minimum penetration specified in the Contract documents using the pile driving criteria provided by the Engineer.

Add No. 5:

5. Piles for Lighting Standards. For lighting standards, install piles of sufficient length to cut the pile at the required cut-off elevation and to provide the minimum installed length shown on the Plans.

   Sites for lighting standard foundations can contain subsurface soils that consist of very dense sandy gravel with cobbles and boulders.

   When the minimum pile length, shown on the Plans, for a lighting standard foundation cannot be achieved, install the pile tip to an elevation established by the Engineer.

505-5.01 BASIS OF PAYMENT.

Add the following:

Pay Item 505.2004.____ Lighting Standard Piles, Furnish and Install, includes the costs for both furnishing and installing piles for lighting standards for Pay Item 660.0003.____ Highway Lighting System Complete.

PAY ITEM

Item Number	Item Description	Unit
505.2004.____	Lighting Standard Piles, Furnish and Install	Each

C505.2-18.1001-1/Z546590000

SECTION 550
COMMERCIAL CONCRETE

Special Provisions

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

Standard Modification

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

Standard Modification

550-5.01 BASIS OF PAYMENT.

Replace the first sentence with the following:

If items 550.0001.____, 550.0002.____, 550.0003.____, 550.0004.____, 550.0005.____, or 550.0006.____ do not appear in the Bid Schedule concrete is subsidiary to other items.

Add the following pay items:

PAY ITEM		
Item Number	**Item Description**	**Unit**
550.0005.____	Class B-B Concrete	LS
550.0006.____	Class B-B Concrete	CY

HSM20.8-20.1130-1

DIVISION 600 — MISCELLANEOUS CONSTRUCTION

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Special Provision

Replace Section 602 with the following:

SECTION 602
STRUCTURAL PLATE PIPE

602-1.01 DESCRIPTION. Construct aluminum alloy plate pipes, at the locations shown on the Plans.

Construct and maintain temporary waterway (creek/stream/drainage) diversion and dewater work areas. Rewater waterway and remove temporary diversion.

602-2.01 MATERIALS. Use materials that conform to the following:

Bedding and Backfill	Subsection 204-2.01
Flexible Watertight Gaskets	Subsection 705-2.05
Corrugated Aluminum Alloy Culvert Pipe and Underdrains	Subsection 707-2.03
Structural Plate Culverts	Subsection 707-2.04
Headwalls	Section 501

CONSTRUCTION REQUIREMENTS

602-3.01 CONSTRUCTION REQUIREMENTS. Lay field-assembled plate pipes in conformance to the lines and grades approved by the Engineer. Excavation, grading, shaping, and backfill must conform to Subsection 204-3.01.

Repair damage to the zinc coating according to AASHTO M 36.

When elongated pipes are specified, form the plate sections at the factory so that the pipe's vertical dimension is increased by 5 percent of the specified diameter.

Provide the Engineer with a copy of the manufacturer's recommendations and instructions and comply with them.

602-3.02 TEMPORARY WATER DIVERSION AND DEWATERING. 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.

Comply with permit requirements. Additionally:

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

2. Do not divert water from dewatering into waterway, except if the required permits are attained from, but not limited to, Alaska Department of Natural Resources, Alaska Department of Environmental Conservation, Corp of Engineers, and the U.S. Environmental Protection Agency.

3. Provide an approved disposal site for work area excess water.

4. Prevent turbid water from directly entering the waterway.

5. Discharge work site water a minimum of 100 ft. from waterway.

6. Do not divert water onto the roadway.

7. Relocate fish contained inside the coffer/diversion dam areas before the site is dewatered. Relocate fish to the closest pool upstream of the construction area.

602-3.03 REWATERING. 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 washed into the streambed and water runs clear. Attain the Engineer's written approval before breaching the coffer/diversion dams. Slowly breach the coffer/diversion dams and rewater the waterway channel.

602-4.01 METHOD OF MEASUREMENT. Section 109, measured along the invert of each structural plate pipe of the type and size specified.

602-5.01 BASIS OF PAYMENT. Structure excavation, bedding, and backfill for structural plate pipe and structural plate pipe-arch is paid for under Section 204.

Headwalls are paid for under Section 501.

Culvert baffles, temporary water diversion, dewatering and rewatering, are subsidiary to the respective 602 Pay Items.

Traffic control paid under Section 643 and Erosion, Sediment, and Pollution Control paid under Section 641.

Payment will be made under:

PAY ITEM

Item Number	Item Description	Unit
602.0001.____	Structural Plate Pipe _____ Diameter, _____ Gauge	LF
602.0002.____	Structural Plate Pipe-Arch, ___ Span, ___ Rise, ___ Gauge	LF

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Special Provision

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.

C603-25.0201

Construct and maintain temporary waterway (creek/stream/drainage) diversion and dewater work areas. Rewater waterway and remove temporary diversion.

Construct steel pipe to the lines and grades shown on the Plans. This shall include locations within the Alaska Railroad Corporation's (ARRC) Right-Of-Way and include the removal and reinstallation of existing railroad tracks.

Construct concrete box culverts, headwalls, wingwalls, aprons, closure pours, and footings at the locations and elevations shown on the Plans. This shall include locations within the Alaska Railroad Corporation's (ARRC) Right-Of-Way and include the removal and reinstallation of existing railroad tracks.

Z546590000

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

C603-25.0201

ARRC Standard Specifications for Work on Railroad Property Section 12, Open Trenching
ARRC Standard Specifications for Work on Railroad Property Section 12, Excavations
ARRC Technical Standards for Roadway, Trail, and Utility Facilities in the ARRC Right-of-Way, Jan 2014
AREMA Manual for Railway Engineering, latest edition

603-1.03 DEFINITIONS.

Designer of Record (DOR). A professional civil engineer registered in the State of Alaska, and in responsible charge of the work described. The DOR must have adequate and relevant prior bridge or culvert design experience.

Concrete Box Culvert Package (CBCP). Design calculations, working drawings, specifications, load ratings and all items identified on Form 25D-8, for each concrete box culvert.

Inlet Charging: Placing material under, around, and adjacent to a culvert inlet and or end section to provide a hydraulic seal forcing water into the designed conduit.

Z546590000

603-2.01 MATERIALS. Use materials that conform to the following:

Bedding and Backfill	Subsection 204-2.01
Joint Mortar	Subsection 705-2.04
Flexible Watertight Gaskets	Subsection 705-2.05
Non-reinforced Concrete Pipe	Subsection 706-2.01
Reinforced Concrete Pipe	Subsection 706-2.02
Corrugated 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

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Excavation and Fill for Major Structures	Section 205
Structural Concrete	Section 501
Headwalls	Section 501
Epoxy-Coated Reinforcing Steel	Section 503
Threadbars	DYWIDAG-System International USA Inc. or approved equal.
Grout	ASTM C990
Joint Mastic	Subsection 705.2.04
Expanded Polyethylene	Subsection 705-2.06
Steel Pipe	ASTM A252 Grade 3 (mod) 50 ksi
Corrugated Galvanized Steel Duct	ASTM A653
PVC	Subsection 706-2.05
Polymer Coated Corrugated Steel Pipe	Subsection 707-2.08
Geotextile	Subsection 729-2.02

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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.

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Meet the requirements of Subsection 501-3.13 for precast concrete box culverts. Furnish and install reinforced concrete box culverts to the alignment and grades as shown on the Plans.

Backfilling of the culvert sections shall progress evenly on each side of the culverts.

Charge all culvert inlets and end sections with Select Material, Type A until all flowing water observed is flowing seamlessly into the designed conduit. Voids under, around, and adjacent to culvert inlets and end sections will not be permitted.

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603-3.02. INSTALLATION.

1. Non-Concrete Box Culverts. 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.

   Repair damaged polymer coating on polymer coated metal pipes and coupling bands according to manufacturer's recommendations.

2. ARRC Concrete Box Culverts.

   a. Geotechnical Data and Hydrology Report. Records of geotechnical investigations are available from the Department. The Contractor is responsible for obtaining all additional geotechnical data necessary for design and construction of the concrete box culverts.

      A hydrology and hydraulics report is available from the Department. The Contractor is responsible for obtaining all additional hydrology and hydraulics data necessary for design and construction of the concrete box culverts.

b. Design Requirements. Retain the services of a DOR to design the concrete box culverts, and to provide a CBCP.

The Department will provide the following in the Contract:

(1) Stations, offsets and elevations of inverts;
(2) Minimum length of culverts;
(3) Required hydraulic capacity; and
(4) End section requirements (e.g., wing walls, headwalls, footings, apron).

(1) Design concrete box culverts and associated end sections according to the following documents (as applicable):

(a) ARRC Technical Standards for Roadway, Trail, and Utility Facilities in the ARRC Right-of-Way, Alaska Railroad Corporation, January 2014.
(b) Loading to support 100% of Cooper's E-80 live loading with diesel impact (AREMA Cooper's loading Chapter 8, Part 2.2.3) or the Contractor's maximum construction load whichever is greater, without overstress.
(c) Include the capacities and demands of load-supporting members in the design calculations;
(d) Design to comply with the requirements of all permits and environmental commitments, including time windows during which work may occur. Apply for and obtain additional permits or modifications to existing permits as needed;

(2) Provide working drawings for concrete box culverts and associated end sections including:

(a) All information and details necessary to construct concrete box culverts including all items listed in the Contractor's Questionnaire on Form 25D-8.;
(b) All dimensions controlling the concrete box culvert's design and erection, including concrete thicknesses, reinforcing steel size and locations, clear opening sizes, and similar design controlling dimensions;
(c) All design loads and material properties;
(d) The soil bearing values;

c. Design Submittal and Review. Comply with the following:

(1) Retain a DOR to design and provide load ratings for concrete box culverts. The design drawings and load ratings in the CBCP must be stamped with the seal of, dated by, and signed by the DOR;
(2) Submit the CBCP to the Engineer for review and approval at least 60 days prior to beginning and fabrication or construction related to the concrete box culverts.

3. Concrete Box Culvert Approvals. Obtain the following written approvals from the Engineer:

a. CBCP prior to beginning concrete box culvert fabrication or construction;
b. Opening of concrete box culverts to traffic.

Such approvals will not relieve the Contractor of the responsibility for defective work. The Contractor shall remain responsible for all aspects of the design, and construction of the box culvert, including but not limited to materials, structural members, connections, and for satisfactory and safe construction of all work on site.

The Engineer's review and approval of the CBCP shall not be construed as a complete review, but will indicate only that the general method of construction and working drawings are acceptable to the Department, that the CBCP appears complete, and that a certification of an IDC was provided.

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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.

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4. ARRC concrete box culverts. Adjoin sections with consecutively tied together threadbars or in stages tying several together in one operation. No backfill around culvert sections will be allowed prior to installation and "tightening" of threadbars. Joint sealer shall be applied to adjoining culvert sections in accordance with manufacturer's recommendations.

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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.

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603-3.05 RAILROAD COORDINATION. The Contractor shall field survey the existing railroad track along the top of the proposed trench prior to track removal. The Contractor shall remove and reinstall the existing track material at the direction of the Railroad. The Railroad will cut and reconnect the track material at the edge of the work limits. Coordinate with the Railroad according to the requirements of section 686 and the ARRCTCP.

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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.

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3. Concrete Box Culverts. Measurement of Concrete Box Culverts shall be per linear foot and shall be along the invert, excluding the end sections.

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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.

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Repairs to polymer and metallic coatings is subsidiary to the pipe.

Inlet charging will not be paid for directly and is subsidiary to Section 603 Pay Items. Select Material, Type A used for inlet charging will be paid for under Section 203.

Temporary water diversion, dewatering, rewatering, and beveling are subsidiary to respective 603 Pay Items.

ARRC Concrete Box Culverts. The unit price shall include all labor, equipment and materials to design, furnish and install a culvert system including, but not limited to, the following subsidiary items: fabrication of the Concrete Box Culvert; delivery; assembly and installation of the Concrete Box Culvert segments including required structural steel plates, threadbars, threadbar nuts and couplers, and other miscellaneous steel embedded in or attached to the culvert sections; required joint sealers; testing; protection, bracing and/or shoring of existing utilities; removal and replacement of landscaping, and other public or private improvements or natural features impacted by the Work; finish grading; and cleanup.

The concrete box culvert end sections comprising of wingwalls, headwalls, aprons, footings and related Work, is subsidiary to Pay Item 603.2013.____. This includes all labor, equipment and materials to design, furnish and install the end sections including, but not limited to, the following subsidiary items: trench excavation including excavation required for the regrading at the inlet and outlet of each end section; trench support system; compaction of fill; formwork and placing of the cast in place concrete including reinforcing steel, forms, placement, compaction of concrete, finishing of concrete, joints, removal of forms, curing; finish grading; and cleanup.

Surveying, removal and reinstallation of the existing track, other work and items necessary to complete the installation of pipe under railroad track, and complying with ARRC requirements and work windows are subsidiary to the respective 603 Pay Items.

Contractor is required to provide support in resolving AT&T fiber-optic line conflicts within the rail bed. Trenching/excavation for adjustment of facilities, backfill, and protection and/or shoring in place are subsidiary to respective 603 Pay Items. Refer to 651 for other coordination requirements.

Existing culvert removal is paid for under Section 202.

Aggregate base course will be paid for under Section 301, ditch lining will be paid for under Section 610, riprap will be paid under Section 611, and railroad ballast is paid for under Section 617.

Traffic control paid under Section 643 and erosion, sediment, and pollution control paid under Section 641.

Materials required to ensure the drainage path to the culvert is backfilled and stable will be paid for separately under the respective items listed in the bid schedule or under 641 items.

Headwalls for culverts are paid for under Section 501.

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Payment will be made under:

PAY ITEM

Item Number	Item Description	Unit
603.0001.____	CSP ___ Inch	LF
603.0002.____	___ Inch CSP Arch	LF
603.0003.____	End Section for CSP ___ Inch	Each
603.0004.____	End Section for ___ Inch CSP Arch	Each
603.0009.____	Corrugated Aluminum Pipe ___ Inch	LF
603.0010.____	___ Inch Corrugated Aluminum Pipe Arch	LF
603.0011.____	End Section for Corrugated Aluminum Pipe ___ Inch	Each
603.0012.____	End Section for ___ Inch Corrugated Aluminum Pipe Arch	Each
603.0013.____	Reinforced Concrete Pipe, ___ Inch, Class ___	LF
603.0014.____	Reinforced Concrete End Section, ___ Inch	Each
603.0015.____	Elbow, (Type & Size)	Each
603.0016.____	Branch Connection (Type & Size)	Each
603.0017.____	Pipe ___ Inch	LF
603.0019.____	___ Inch Pipe Arch	LF
603.0020.____	End Section for Pipe ___ Inch	Each
603.2000.____	Steel Pipe, ___ Inch, Class ___	LF
603.2013.____	Box Culvert, Precast Reinforced Concrete, ___ Span, ___ Rise	LF
603.2032.____	Corrugated HDPE Pipe ___	LF
603.2033.____	End Section for Corrugated HDPE Pipe ___	Each
603.2036.____	Polymer Coated CSP ___ Inch	LF

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SECTION 604
MANHOLES AND INLETS

Special Provisions

604-2.01 MATERIALS.

Replace "Precast Concrete Manhole Sections Subsection 712-2.05" with the following:

Precast Concrete Products	Subsection 550-2.03, 712-2.05

C604.2-21.0601

604-3.01 CONSTRUCTION REQUIREMENTS.

Add the following:

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.

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SECTION 606
GUARDRAIL

606-1.01 DESCRIPTION. Construct new guardrail, terminal sections, transition rail, and permanent crash cushions.

The permanent crash cushion, hereafter referred to as, "crash cushion," includes the complete assembly (crash cushion, foundation, backstop or transition) represented in the FHWA eligibility letter(s).

Remove and reconstruct or remove and dispose of existing guardrail, terminal sections, transition rail, and crash cushions.
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Furnish and store new highway safety appurtenance essential replacement parts (replacement parts) listed in Table 606-1. Repair damage, from highway crashes, with the replacement parts.

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606-1.02 SUBMITTALS.

1. Submit the following at the preconstruction conference and receive approval before installation.

    a. Permanent Crash Cushions.

        (1) FHWA Eligibility Letter(s). Eligibility letters demonstrating each crash cushion assembly is MASH 2016 compliant with the AASHTO 2016 Manual for Assessing Safety Hardware (MASH-16) Test Level 3. Demonstrate the eligibility letter shielding widths cover the hazard widths and travel directions shown in the plans.

        (2) AASHTO Listing Category. AASHTO listing or documented updates for the crash cushion classification as listed in the 2011 AASHTO Roadside Design Guide, Section 8.4.

        (3) Manufacturers' Shop Drawings, Assembly, and Installation Instructions. Submit shop drawings and detailed assembly and installation instructions for the crash cushion as included in the FHWA Eligibility Letters.

        (4) Manufacturer Certification Letter. Certify the crash cushion(s) meet the requirements of the FHWA eligibility letter(s), are suited to the Contract requirements including the environmental conditions at the installation site.

        (5) Manufacturers' Installer Certification Letter. Certify the installation contractor is familiar with and trained to install the crash cushion.

        (6) Manufacturers' Installation Checklist. Submit a crash cushion installation checklist.

    b. Parallel Terminals.

        Manufacturer Installation Checklist. Submit an Assembly Installation Checklist.

2. Submit the following after installation.

   a. Permanent Crash Cushions.

      (1) Manufacturer Certification Letter. Certify the installed crash cushion(s) meet the requirements of the FHWA eligibility letters. Submit the certification letters(s) signed and dated no more than 14 days after installation.

      (2) Manufacturers' Installation Checklist. Submit the completed installation checklist signed by the Installer and Manufacturer no more than 14 days after installation. Complete the checklist after each assembly.

   b. Parallel Terminals.

      Manufacturer Installation Checklist. Submit the completed installation checklist signed by the Installer and Manufacturer no more than 14 days after installation. Complete the checklist after each assembly.

606-2.01 MATERIALS. Use materials that conform to the following:

Concrete, Class B	Section 550
Flexible Delineator Posts	Subsection 730-2.05
Guardrail Connection Plate	Subsection 710-2.12
Thrie-Beam Terminal Connector	Subsection 710-2.12
Guardrail Hardware	Subsection 710-2.07
Guardrail Posts and Blockouts	Subsection 710-2.06
High Strength Bolts	Subsection 716-2.03
Metal Beam Rail	Subsection 710-2.04
Terminals	Subsection 710-2.11
Terminal Markers	Subsection 730-2.05
Wire Cable	Subsection 709-2.02

Guardrail Reflector Assembly Brackets, Side-Mounted. Aluminum alloy.

Retroreflective Sheeting.

1. Post-Mounted Flexible Delineators and Guardrail Reflectors. ASTM D4956 Type XI.

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2. Terminal Markers. ASTM D4956 Type VIII, IX or XI.

Permanent Crash Cushion Assembly.

Crash cushions include the complete assembly as included in the Eligibility Letter, the crash cushion, the foundation, and rigid backup anchorage, or transition connection. Install an added Terminal Marker or other flexible delineator to the front of the crash cushions as recommended by the Manufacturer.

Design the crash cushion for the installation location environment. Snow combined with frequent freeze-thaw cycles creates significant ice buildup that may impair the performance of the crash cushion. Design to mitigate the effects from snow and ice. Crash cushions using supports that interlock and travel within fixed tracks at or below the first six inches from ground level, and crash cushions not designed to mitigate snow and Ice buildup are not acceptable for permanent use. Crash cushion covers, when available from the manufacturer, are required as part of the crash cushion installation.

Crash Cushion Classifications. 2011 AASHTO Roadside Design Guide, 4th Edition. The Engineer will determine the final classification of each materials submittal. Provide redirective and non-gating crash cushions of the type specified in the plans and matching the description noted below.

1. Sacrificial: Demonstrated designed for a single impact.

2. Reusable Crash Cushion. Demonstrated to have major components survive most impacts intact and salvageable. Some components require replacement after a crash.

3. Low-maintenance and Self-restoring Crash Cushion. Demonstrated to suffer very little, if any damage, upon impact and easily pulled back into their full operating condition. They may partially rebound after an impact and may only need an inspection to ensure that no parts have been damaged or misaligned.

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CONSTRUCTION REQUIREMENTS

606-3.01 GENERAL. Install guardrail and terminals at the locations shown on the Plans. Conform to the Alaska Standard Plans and these Specifications.

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

Start guardrail installation at the "upstream" end (the end adjacent traffic encounters first) by either installing a crashworthy terminal, connecting to an existing barrier or shielding the end with a crash cushion or truck mounted attenuator (TMA) meeting NCHRP 350, Test Level 3. Continue installation in the direction of traffic. Exception: if the guardrail run connects to existing barrier, buried in the backslope terminal, existing or new bridge railing, or other existing structure at the "downstream" end, guardrail installation may start at the point of connection.

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

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

When possible, proceed with construction of guardrails with the direction of traffic.

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

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

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

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

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

1. at intervals noted on the plans or Alaska Standard Plans, starting with the first guardrail post beyond terminal sections

2. with the retroreflective sheeting facing approaching traffic

3. with retroreflective sheeting on both sides, on two-way roadways

4. not on the terminal sections, except as shown on the plans

5. at or below 500 feet in elevation, except as noted otherwise in the Plans.

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

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

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Do not remove existing highway safety appurtenances, guardrail and similar, before mobilization of the replacement parts to the project storage location.

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606-3.02 POSTS. Set posts to accommodate the line, grade, and curvature shown on the Plans.
Use either wood or steel posts when allowed by the type of guardrail specified, subject to the following:

1. Exclusive of end treatments, use one type of post in each run of guardrail.

Set posts as follows:

1. Set posts plumb, in the location and to the depth shown on the Plans or Alaska Standard Plans.

2. Choose an installation method that does not damage the post, adjacent pavement, structures, utility conduits, and final slopes. Repair all damage to the satisfaction of the Engineer, or replace the damaged item, as per subsection 105-1.11.

3. Set wood or steel posts in dug, drilled, or pre-punched holes. Steel posts may also be set by ramming or driving if:

    a. The underlying material is no larger than six inch; and

    b. The posts are not damaged during installation.

4. Backfill and compact around posts with material as specified in the typical section to firmly support the post laterally and vertically. Compact under and around posts to the Engineer's satisfaction.

5. For placement in solid rock or broken rock embankment greater than six inch, set wood or steel posts in pre-dug, pre-drilled, or pre-punched holes.

6. In new roads, install posts before final shoulder or median compaction, surfacing, and paving.

606-3.03 BEAM RAIL. Fabricate metal work in the fabricator's shop. Bend curved guardrail elements with radii less than or equal to 100 feet in the fabricator's shop or with an approved bending apparatus.

Receive approval before field punching, cutting, or welding. Repair damaged spelter coat areas on galvanized rail elements according to AASHTO M 36 (ASTM A760).

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

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

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

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

606-3.04 CABLE RAIL. Install cable guardrail according to the Plans and Specifications. Install at the locations shown on the Plans.

606-3.05 TERMINAL SECTIONS.

Parallel Terminals.

Install terminal sections according to the manufacturer's recommendations for the entire length of the terminal then, if required, transition rail height over 25' to match guardrail height and splice location.

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

Submit the manufacturers' complete Assembly Installation Checklist signed and dated after completing installation to support acceptance for each installation, see Subsection 606-1.02 for further information.

606-3.06 REMOVAL AND RECONSTRUCTION OF GUARDRAIL. Remove and reconstruct guardrail as specified. Replace lost or damaged materials without extra compensation.

When replacing existing guardrail complete the replacement run installed within 14 calendar days after removal.

For guardrail located within 50 feet of bridge ends, remove and replace the existing guardrail in the same work shift.

606-3.07 REMOVAL AND DISPOSAL OF EXISTING GUARDRAIL. Remove the existing guardrail, including the rail, cable elements, terminal sections, hardware, posts, concrete bases, and steel tubes. Backfill resulting holes with material in 6-inch layers that is similar to the existing embankment and compact to the same approximate density.

Guardrail.

Notify the Engineer a minimum of 5 days before removing guardrail. The Engineer will notify the ADOT & PF, M & O, and have an M & O representative designate portions of guardrail for salvage. Deliver salvaged guardrail and associated hardware to the M & O station located at 30049 Seward Highway, Crown Point, Alaska 99664. Remaining items removed become the Contractor's property.

606-3.08 ADJUST EXISTING GUARDRAIL. When called for on the Plans, reset existing guardrail to the height shown on the applicable Alaska Standard Plan, measured from the top of the rail to the finished shoulder surface below the rail. Raise and lower the posts several times to prevent settlement and then re-drive them to the height shown on the Plans. Use other methods if approved.

606-3.09 INSTALL NEW GUARDRAIL. Install guardrail as shown on the Plans.

606-3.10 TERMINAL MARKERS. For each parallel rail terminal, attach a terminal marker to the extreme piece of rail.

Attach flexible markers, in a vertical position, to the terminal end directly to the backside of the rail face, the face away from the traveled way, or the first post of each parallel guardrail terminal. Provide an additional marker where the flare begins for guardrail terminal widening. Provide two markers at the end of each run of guardrail; coordinate the locations with the Engineer.

Attach the flexible markers using hardware and attachment methods recommended by the manufacturer. The connection shall not negatively influence the performance of the guardrail as noted in 606-2.01.

606-3.11 LENGTH OF NEED VERIFICATION. After shaping the slopes and staking the proposed guardrail locations, notify the Engineer to field verify the beginning and ends. The Engineer will approve the staked location of the guardrail before installation. When the Engineer determines additional guardrail is required, complete the installation immediately.

606-3.12 PERMANENT CRASH CUSHION. Install crash cushions according to the manufacturer's instructions.

Construct crash cushions to shield the hazard width and travel direction shown in the plans.

Manufacturer's Crash Cushion Installation Certification. Submit the Manufacturer's Crash Cushion Installation Certification letter signed and dated after completing installation, see Subsection 606-1.02 for further information.

Manufacturer Certified Installers. Install crash cushions using installers certified by the crash cushion manufacturer. Install Crash cushions as follows:

1. Parallel to the approach traveled way or as shown on the plans.

2. Follow Section 203 for the excavation and embankment requirements of the concrete base component of the crash cushion.

3. Follow Section 501 for a concrete pad, sized according to the manufacturer's recommendations, constructed on a minimum of 12 inches of Selected Material, Type B.

4. Cut or fill to the top of the concrete pad with Selected Material, Type B at 12:1 or shallower on installations in grass median.

5. Install top elevation of concrete pad flush to pavement edge when adjacent to or within asphalt pavement.

6. Bolt crash cushion to median barrier with manufacturer approved barrier to crash cushion connector when attached to median barrier.

7. Install a terminal marker or other flexible delineator on the nose of each crash cushion as recommended by the manufacturer. The terminal marker is in addition to, not a substitute for, the retroreflective delineation installed on the crash cushion nose.

8. Manufacturers' Crash Cushion Installation Checklist. Submit the installation checklist signed and dated after completing installation, see Subsection 606-1.02 for further information.

The crash cushion installation is not complete until the Crash Cushion Manufacturers' Installation Checklist and Installation Certification letter are submitted and the Engineer accepts the installation.

Excess excavated material is the property of the Contractor.

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606-3.14 HIGHWAY SAFETY APPURTENANCE – ESSENTIAL REPLACEMENT PARTS. Install replacement parts as directed.

Deliver the remaining new replacement parts, at time of substantial completion, to the State Maintenance and Operations Station, located at: 30049 Seward Highway, Crown Point, Alaska 99664.

Notify the Engineer no less than 7 days before delivery.

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606-4.01 METHOD OF MEASUREMENT. Section 109 and as follows:

1. Guardrail. Measured along the face of the rail or cable, from the center of the end posts.

   Short Radius Guardrail. Per each, installed in place.

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

2. Terminals. Per each, installed in place.

3. Transition Rail. Per each accepted connection.

4. Permanent Crash Cushion. Each installed and accepted.

606-5.01 BASIS OF PAYMENT.

Payment for temporary crash cushions or TMA installed to protect motorists when guardrail installations are not completed within 10 calendar days of beginning installation is subsidiary to other items.

1. Guardrail. Side-mounted guardrail reflectors, post-mounted flexible delineators, terminal markers, guardrail beam, posts, blockouts, and associated hardware are subsidiary. Installation of downstream anchors, transitions for rail height and splice locations, long span guardrail sections, and guardrail stiffening sections are subsidiary to guardrail installation.

2. Short Radius Guardrail Sections. The contract price includes all materials from the terminal anchor to and including the first wood or steel post of standard guardrail or guardrail end terminal, and including the terminal anchor assembly, in-line anchor, terminal posts, short radius guardrail posts, rail elements, terminal markers, and associated hardware required for a complete installation.

3. Terminal Sections.

   a. Parallel Guardrail Terminal. The contract price includes rail elements, posts, blockouts, pipe sleeves, cable assemblies, guardrail extruders, terminal markers, and all associated hardware required for a complete installation.

4. Transition Rail. The contract price includes all brackets, beam sections, transition pieces, and all posts and associated hardware required for a complete connection of the guardrail section to a bridge rail or barrier.

5. Permanent Crash Cushion. The contract price includes all work and materials required to install each permanent crash cushion, foundations, and connections along with the manufacturer's field support, recommendations, and shop drawings. Removal and salvage of existing crash cushions is subsidiary to Pay Item 606.2007.____ Pay Item(s).

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TABLE 606-1
HIGHWAY SAFETY APPURTENANCES – ESSENTIAL REPLACEMENT PARTS

Essential Replacement Parts	Material Specification	Unit	Quantity
W-Beam Guardrail	Subsection 710-2.04	LF	1,000
Thrie Beam Guardrail	Subsection 710-2.04	LF	
Cable Guardrail	Subsection 709-2.02	LF	
Box Beam Guardrail	Subsection 710-2.04	LF	
Wood Guardrail Post and Blockout	Subsection 710-2.06	Each	
Steel Guardrail Post and Blockout	Subsection 710-2.06	Each	150
Short Radius Guardrail	Alaska Standard Plan G-26.00	Each	1
Parallel Guardrail Terminal	Subsection 710-2.11	Each	2
Transition Rail	Subsection 710-2.04	Each	
Crash Cushion, Permanent _____	Subsection 606-2.01	Each	
Precast Concrete Barrier	Subsection 501-3.01 & 709-2.01	LF	
Rigid Delineator	Subsection 730-2.05	Each	
Flexible Delineator	Subsection 730-2.05	Each	

Replace damaged replacement parts at no additional cost to the Department.

Required post length for essential replacement parts for steel posts and wood posts are 9'-0".

Replacement guardrail post shall match the same material as guardrail installed with the project.

6. 606.2006.____ Essential Replacement Parts – Installation. Installation of the replacement parts according to the directive authorizing the work.

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

Guardrail salvage is subsidiary to Pay Item 606.0006.____ Removing and Disposing of Guardrail.

Payment will be made under:

PAY ITEM

Item Number	Item Description	Unit
606.0001.____	W-Beam Guardrail	LF
606.0002.____	Thrie Beam Guardrail	LF
606.2003.____	Box Beam Guardrail	LF
606.0004.____	Cable Guardrail	LF
606.0005.____	Removing and Reconstructing Guardrail	LF
606.0006.____	Removing and Disposing of Guardrail	LF
606.0007.____	Double-faced, W-Beam Guardrail	LF
606.0009.____	Short Radius Guardrail	Each
606.0013.____	Parallel Guardrail Terminal	Each
606.0015.____	Adjust Existing Guardrail	LF
606.0016.____	Transition Rail	Each
606.2005.____	Essential Replacement Parts	LS
606.2006.____	Essential Replacement Parts – Installation	CS
606.2007.____	Crash Cushion, Permanent _____	Each

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SECTION 608
SIDEWALKS

Special Provisions

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.

608-1.02 REFERENCES.

1. ACI 303 Cast-In-Place Architectural Concrete Practice
2. PCA PA124 Finishing Concrete Slabs with Color and Texture
3. PCA SP021 Color and Texture in Architectural Concrete

608-1.03 SUBMITTALS – EXPOSED AGGREGATE, COLORED CONCRETE, PAINTED HMA AND PATTERN IMPRINTED CONCRETE AND HMA. Provide complete submittals (3 printed copies, except samples as specified below), to the Engineer for review and approval, at least 21 days before beginning construction of concrete and asphalt items. Submittals will be returned to the Contractor within 14 days from the date submitted, marked as approved by the Department, or requiring revisions. Amend and resubmit the documents for review until approved by the Engineer. Receive approval before beginning production.

Submit shop drawings, product data, specifications, certifications; manufacturers and installer's resumes, and samples as specified in Section 401, 501, 503, 608 and herein.

1. Shop Drawings, Product Data, Specifications, and Certifications.

    a. Exposed aggregate finish: manufacturer's chemical surface retarder.
    b. Integral concrete colorant: manufacturer's color chart, and chipset. Indicate color additive numbers and required dosage rates as part of the concrete mix submittal, Subsection 501-3.01.
    c. Manufacturer's concrete pattern imprinting system.
    d. Manufacturer's fabricated HMA pattern imprinting tool - shop drawings.
    e. Methyl Methacrylate for coating HMA.
    f. Other when requested by the Engineer.

2. Resumes.

    a. Manufacturer.

        Concrete. Provide documentation for five years of successful product performance, with a minimum of five completed projects and including but not limited to:

        - Manufacturer's colorant, hardener, color cure, release agent, and sealer
        - Batch Plant's mixing of manufacturer's colorants and other additives, and product delivery
        - Manufacturer's pattern imprinting system

        HMA. Provide documentation of two years and three projects successfully fabricating pattern imprinting tools and successful product performance applying MMA in similar applications to this Project.

    b. Installer.

        Concrete and HMA. Installer(s) with 2 years' experience and 3 successfully completed projects of similar configuration and method of installation.

        In addition:

1) For projects with concrete integral colorant and or pattern imprint system, provide a minimum of one project using the proposed manufacturer's colorant and pattern imprint system.

3. Manufacturer's.

All manufacturers, listed and other, are required to submit for review and approval. Manufacturers of concrete colorant and pattern imprinting systems:

Bomanite Corporation	Brickform, *division of* Solomon Colors, Inc.	Davis Colors	L.M. Scofield Company
P.O. Box 599	11061 Jersey Blvd.	3700 East Olympic Blvd.	6533 Bandini Blvd.
Madera, CA 93639	Rancho Cucamonga, CA 91730	Los Angeles, CA 90023	Los Angeles, CA 90040
Ph: 303.369.1115	Ph: 800.483.9628	Ph: 800.356.4848	Ph: 323 720.3000
Fax: 303.291.0282		Fax: 323.269.1053	Fax: 323.720.3000
Email: bomanite.com	Email: brickform.com	Email: daviscolors.com	Email: Scofield.com

4. Pattern Imprinting, Coloring Concrete, and HMA Painting Plans.

Provide pattern imprinting, concrete coloring, and HMA painting plans to the Engineer for review and approval. Include the following, at a minimum, to achieve a final product that accurately represents, to scale, colored concrete, painted HMA and the pattern imprinted concrete and HMA (including the joints) elements:

a. the sequence and schedule of operations,
b. the proposed method of pattern imprinting,
c. the method of coloring the concrete,
d. the method of applying the MMA coating/paint to the HMA.

5. Exposed aggregate, Colored Concrete and Painted HMA and Pattern Imprinted Concrete and HMA Sample(s).

Provide one sample, equal to the width of the item, 6 ft x 6 ft maximum, 4 ft x 4 ft minimum, of each item for review by the Engineer. Demonstrate exposing the aggregate, the addition of colorant to the concrete, painting the HMA and pattern imprinting the concrete and HMA on each sample provided. Receive written approval of the sample prior to beginning production work.

Retain samples of binder(s), sand(s), aggregate(s), and color additive, used in the sample for comparison with the item production materials. Keep sample through completion of related work for use as a quality standard for finished work. Keep the sample through Project completion when requested by the Engineer.

608-2.01 MATERIALS. Use materials that conform to the following:

1. Concrete

Bed Course Material ..... Subsection 703-2.03
Joint Fillers ..... Subsection 705-2.01
Joint Sealers ..... Subsection 705-2.02
Concrete ..... Section 550, Class B
Muriatic or Phosphoric
AASHTO M 194 Chemical Admixtures†
ASTM C 494 Standard Specification for Chemical Admixtures for Concrete†
ASTM C 309, Liquid Membrane-Forming Compounds for Curing Concrete †
AASHTO M-33 Preformed Expansion Joint Filler for Concrete (Bituminous Type)
ASTM C 979 Standard Specification for Pigments for Integrally Colored Concrete
Reinforcing Steel ..... Section 503

† Compatible with colorant manufacturer.

Provide concrete for slabs according to Section 501, ACI 303R, 303.1, this specification and the material manufacturer's and supplier's written instructions.

Maximum slump 4-inch, except 8-inch maximum if using super plasticizers or mid-range water reducers. Mix used for sample(s) shall be the same as the production mix(s).

Concrete - Exposed Aggregate Finish. Provide aggregate from a single source. Keep aggregate for exposed aggregate finish separate from other project aggregate.

Concrete – Colored. Color concrete using an integral color, with a surface hardener, a color cure, a release agent, and a sealer compatible with colorant(s).

Concrete - Pattern Imprinted. Use a manufactured system designed to provide the pattern specified and a release agent compatible with the colorant.

2. Asphalt (HMA)

Bed Course Material	Subsection 703-2.03
Asphalt Binder, PG 52-28	Subsection 702-2.01
Aggregate, Type II or III	Subsection 703-2.04
Mix Design Requirements (ATM 417)	
Marshall Stability, pounds, min.	1000
Percent Voids, Total Mix	2-5
Compaction, Blows/side	50

Coating/Paint:	
Material - Methyl Methacrylate (MMA)	Subsection 712-2.17 (MMA only)
Color	Federal Standard 595, color 30111 (Brick Red)

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.

CONSTRUCTION REQUIREMENTS

608-3.01 CONCRETE SIDEWALKS. Excavate to the required depth and to a width necessary to install and brace the forms. Shape and compact the foundation to a firm, even surface conforming to the section shown on the Plans. Replace soft and yielding material with approved material. Compact bed course material according to Subsection 203-3.04.

Use full depth forms made of wood or metal. Use forms that are straight, free from warp, and strong enough to resist the pressure of the concrete without springing. Coat forms with an approved form-release agent. Brace and stake the forms so that they maintain their position until their removal.

Thoroughly moisten the foundation immediately before placing the concrete.

Finish the surface according to Section 550-3.05. Do not plaster the surface. Edge all outside slab edges and all joints to a 1/4 inch radius.

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Make expansion joints spaced every 24 feet on center, at grade breaks, or tie in locations. Expansion joints are to be a 1/2 inch wide, filled with a filler meeting Subsection 705-2.01, and sealed with a 1/2 inch thick layer of sealant meeting Subsection 705-2.02.

Divide sidewalk into sections using dummy joints formed by a jointing tool or other acceptable means. Dummy joints are to be spaced every 6 feet on center or adjusted as needed for best fit. Make dummy joints 1/3 the depth of the concrete and approximately 1/8 inch wide.

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Form construction joints around all appurtenances such as manholes, utility poles, buildings, or bridges, extending into and through the sidewalk. Install preformed expansion joint filler 1/2 inch thick in construction joints. Extend the expansion joint material the full depth of the walk.

Apply joint sealer evenly to completely seal all joints.

Cure the concrete according to Section 550-3.06. During the curing period, exclude all pedestrian and vehicular traffic. Exclude vehicular traffic for additional time as directed.

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.

Exposed Aggregate, Colored Concrete and Painted HMA and Pattern Imprinted Concrete and HMA

Match the Project work to the approved sample. Significant differences in appearance (texture, color, pattern, or other) between adjacent panels/sections of work, from the approved sample including adjacent panels/sections similar to the approved sample yet significantly different to each other, as judged by the Engineer, will result in removal and replacement of the deficient panel(s)/section(s) of work.

Take all precautions to avoid damaging new and existing, concrete and asphalt.

Prevent surrounding materials from being discolored by the concrete and HMA and the HMA MMA coating (curbs, gutters, and other). When directed by the Engineer, in writing, remove stains and coatings on other concrete and or HMA, resulting from your work.

Where HMA paving is against; exposed aggregate finish, colored, pattern imprinted; colored and pattern imprinted concrete, place the concrete prior to asphalt paving. Do not place the HMA pavement until the concrete has cured sufficiently to prevent damage from the paving operation.

Acceptance of corrective work requires the Engineer's written approval. Repair all new and existing damaged concrete and HMA, including the removal of surface contaminants, to the satisfaction of the Engineer. The Engineer will not provide written approval until all damaged concrete and HMA is repaired.

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1. Slab Types.

TABLE 608-1
Slab Type Requirements[a, b]

Type[c]	Description	Finish[d, e, f]	Added Color[g]	Added Pattern[g]	t[h] Inches	Reinforcing[i] (bar spacing each way)
a. & b.	Typical	Broom	—	—	4, 6	—
I	Broom	Broom	—	—	4	4x4 – W2.9xW2.9
					6	#5@12" O.C.
					8	#6@12" O.C.
II	Exposed Aggregate	Aggregate	—	—	4	4x4 – W2.9xW2.9
					6	#5@12" O.C.
III	Colored	Broom	Color Manufacturer	—	4	4x4 – W2.9xW2.9
					6	#5@12" O.C.
IV	Pattern Imprinted	Coordinate	—	Pattern Manufacturer	4	4x4 – W2.9xW2.9
					6	#5@12" O.C.
V	Colored & Pattern Imprinted	Coordinate	Color & Pattern Manufacturer		4	4x4 – W2.9xW2.9
					6	#4@18" O.C.

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a. Sealer and Hardener: provide for all slabs.
b. Transition the slab at approaches as shown in the plans.
c. Type a. & b.; Pay Items 608.0001.____, are the "Typical" concrete sidewalk.
d. Broom: provide a medium broom finish.
e. Aggregate: provide a uniform color slightly darker than the typical uncolored slab with a uniform reveal according to ACI 303.1.
f. Coordinate: coordinate and provide finish as required by pattern imprint system manufacturer.
g. Color and Pattern: provide color and or pattern similar to that noted and available from the listed manufacturer(s). Provide color and pattern from the same manufacturer or provide from different manufacturers with a certification from each permitting warranted use of their product with the product of the other manufacturer. Use a release agent as approved by the manufacturer(s).
h. t: provide the slab thickness, denoted as "t"
i. Reinforcing: Provide welded wire fabric in sheets not rolls. Lap joints 1 1/2 mesh minimum.

2. Joints.

Lay out joints as shown or noted in the Plans and Specifications, if not shown or noted provide:

a. Control Joints. Maximum spacing equals 12 ft. (also referred to as, "dummy joints")

(1) the joint configuration should create a square or rectangle with the long side no more than 1.5 times the short side,

(2) space the control joint matching the width of the slab,

(3) at corners and intersections, align the joints parallel to the edge(s) of the intersecting slab.

(4) locate the joints equally spaced between the: ends/edges of slab, slab corners, slab intersections or a combination of one and another.

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b. Expansion Joints. Maximum spacing equals 24 ft.

(1) expansion joints are to be a 1/2 inch wide, filled with a filler meeting Subsection 705-2.01, and sealed with a 1/2 inch thick layer of sealant meeting Subsection 705-2.02.

(2) align expansion joints parallel and uniform with the control joints (dummy joints) layout or as directed by the engineer.

Touch up pattern and finish edges with hand tools immediately after placing concrete and as directed by the manufacturer(s) and Engineer.

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608-3.02 ASPHALT SIDEWALKS. Place bed course material in layers. Compact it according to Subsection 203-3.04.

Place asphalt material on the compacted bed course in one or more courses as indicated on the Plans. Compact it uniformly to required depth. Use a power roller of an acceptable type and weight. In areas inaccessible to the roller, use other approved methods.

608-3.03 CURB RAMPS. Construct curb ramps according to the details and the locations shown on the Plans. Follow the construction requirements of Subsection 608-3.01. Install detectable warnings.

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

Provide the slab Type as identified here and elsewhere, Type **"a"**. Refer to 608-3.01.1 Slab Type, Table 608-1 Slab Type Requirements for further information.

608-3.04 DETECTABLE WARNINGS. Construct detectable warnings according to the details and the locations shown on the Plans. Install detectable warning plates by embedding plate flanges into cast-in-place concrete construction so there are no vertical changes in grade exceeding 0.25 inch or horizontal gaps exceeding 0.5 inch. Align pattern on a square grid in the predominate direction of travel. Install the same type of detectable warning plate throughout the project.

Detectable warnings shall be installed according to the 2006 U.S. DOT ADA Standards for Transportation Facilities.

608-3.05 ASPHALT – PATTERN IMPRINTED AND PAINTED. Construct pattern imprinted and painted HMA according to Subsection 608-3.02 Asphalt Sidewalks and as noted herein.

1. Pattern. Fabricate the imprint tool pattern to match standard brick dimensions in a running bond configuration with a slightly wider joint/indent spaced similar to the concrete expansion Joint.

2. Painting. Prepare the asphalt surface and apply the coating/paint according to the MMA manufacturer's instructions. Apply coating (MMA) completely covering the asphalt surface including pattern imprint. Do not fill the pattern indentation, with MMA, flush with the top surface. Leave a 1/8", smooth, concave painted/coated surface between bricks (joint).

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

Sidewalk by area of finished surface, weight of material placed, and lump sum as included in the bid schedule. Ramps are included in the measurement unless included as a separate measured and paid item.

HMA used for matching existing surfaces, such as paved parking lots behind a new sidewalk/pathway, will be included in the measurement of the related asphalt Pay Item.

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Detectable Warning Tile by each installation, complete in place.

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608-5.01 BASIS OF PAYMENT.

Subsidiary to the Pay Items: excavation, backfill, reinforcement, expansion joint material, samples, asphalt binder, corrective work, and other related miscellaneous items.

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

Curb Ramp when included in the bid schedule includes ramp runs, backing curbs, flares, landings to provide a single street-level access and detectable warnings, except detectable warnings are paid separately when included as an item in the bid schedule.

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Concrete used for detectable warning tile installation is subsidiary.

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PAY ITEM

Item Number	Item Description	Unit
608.0001.___	Concrete Sidewalk, 4 inches thick	SY
608.0001.___	Concrete Sidewalk, 6 inches thick	SY
608.0002.___	Asphalt Sidewalk	Ton
608.0006.___	Curb Ramp	Each
608.0007.___	Curb Ramp, Retrofit	Each
608.2002.___	Asphalt Pathway	Ton
608.2004.___	Asphalt Medians	Ton
608.2006.___	Asphalt Pathways and Medians	Ton
608.2007.___	Asphalt, (Sidewalk, Plaza, etc., __ Inches Thick)	SY
608.2008.___	Asphalt Pattern Imprinted and Painted, (Median, etc., __ Inches Thick)	SY
608.2010.___	Concrete Sidewalk Wall, (Type __; Slab __ in; Wall __ in; Ht __ ft)	LF
608.2011.___	Concrete Sidewalk Retaining Wall, (Type __; Slab __ in; Wall __ in; Ht __ ft)	LF
608.2012.___	Concrete Sidewalk Barrier Wall, (Type __; Slab __ in; Wall __ in; Ht __ ft)	LF
608.2013.___	Concrete, Type I, __ inches thick, Broom Finish, (median slab, etc.)	SY
608.2013.___	Concrete, Type II, __ inches thick, Exposed Aggregate Finish, (median slab, etc.)	SY
608.2013.___	Concrete, Type III, __ inches thick, Colored, (median slab, etc.)	SY
608.2013.___	Concrete, Type IV, __ inches thick, Pattern Imprinted, (median slab, etc.)	SY
608.2013.___	Concrete, Type V, __ inches thick, Colored and Pattern Imprinted, (median slab, etc.)	SY
608.2014.___	Concrete Medians	SY
608.2015.___	Concrete Stairway	LS
608.2017.___	Detectable Warning Tile	Each

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rounded stones on slopes 3:1 or flatter). The use of round stones should be rare and should include the input from the PM, the hydrology and construction Depts.

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.

610-4.01 METHOD OF MEASUREMENT. Section 109.

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

PAY ITEM

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

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SECTION 611
RIPRAP

Special Provision

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

611-3.01 CONSTRUCTION REQUIREMENTS. Replace the third paragraph with the following:

Place stones to the thickness, height, and length shown on the Plans, or as staked, in a well graded mass with little to no voids. Fill voids left during placement of riprap with Select Material, Type E (Shot Rock) by machine or hand tamping congruently with placement of stones. The use of water pressure, metal tamping rods, and similar hand operated equipment to force material into voids is permitted. Place riprap to its full course thickness in one operation. Avoid displacing the underlying material. Do not place riprap in layers or use methods likely to cause segregation.

Add the following:

Where riprap is placed under, around, and adjacent to culvert inlets or end sections, charge the riprap per Section 603. Riprap that extends beyond the inlet or end section does not need charged.

611-5.01 BASIS OF PAYMENT. Add the following:

Placement, hauling, and production of Selected Material, Type E generated from roadway excavation to be used for riprap installation will not be paid for and is subsidiary to Pay Item 203.0003.____ Unclassified Excavation.

Inlet charging is paid for under Section 603.

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SECTION 614
CONCRETE BARRIER

Special Provisions

614-2.01 MATERIALS.

Replace, "Concrete Section 550, Class B", with the following:

Concrete	Section 550
Cast-In-Place and Precast, Class B	
Precast Portable Barriers (MASH F-Shape), Class B-B	
Precast Concrete Products	Subsection 550-2.03

C614.1-21.0601

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.

      30049 Seward Highway, Crown Point, Alaska 99664.

   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 616 with the following:

SECTION 616
THAW WIRES

616-1.01 DESCRIPTION. Furnish, fabricate, and install electric thaw wire.

616-2.02 THAW WIRE. Provide materials, devices, fittings, and hardware meeting NEMA standards, listed and labeled for their specific use by an OSHA-approved Nationally Recognized Testing Laboratory (NRTL).

All electrical devices, components, and materials that will be installed in and/or around classified (hazardous) areas shall be rated for the Class, Division, Group Letter, and Temperature Code for the area in which they are installed. The electrical installation shall comply with the applicable Articles of NEC Chapter 5.

Deliver all warranties and guarantees provided by the manufacturer to the Engineer before acceptance of this work.

1. Conduit and Fittings.

    a. Use 1 inch conduit, couplings, elbows, and nipples that are rigid, hot-dip galvanized steel meeting ANSI C80.1. Install them as indicated on the applicable drawings. Use threaded type couplings, elbows, and nipples.

    b. Use 1 inch cold weather rated liquid tight flexible metal conduit where shown on the plans, leaving slack for movement. Conduit is to be Electri-Flex ATLA or approved equal.

Use fittings and miscellaneous conduit hardware that are vapor-proof, galvanized cast iron or steel meeting ANSI/NEMA FB-1 and are compatible with the rigid conduit furnished and installed. Use threaded type fittings.

2. Heat Cable.

    a. Use heat cable that meets the following standards:

        (1) Parallel-circuit, 120, 208, or 240 VAC, 16 AWG minimum copper bus wire, with self-limiting conductive core.

        (2) Fluoropolymer inner jacket, tinned copper or nickel-clad metallic braid, and fluoropolymer over-jacket.

        (3) Rated in conduit at 10 W/ft at 240 Volt AC, self-regulating type, max temperature 275 °F.

        (4) UL Listed or FM approved specifically as a culvert deicing system in conduit.

        (5) Maximum leakage current of 1.5mA per 100 feet of heat trace.

    b. All connection components shall be rated for the areas in which they are installed. Use power connections and seals specifically designed for use with the particular type and size of heat cable.

3. Controls.

    a. Use a temperature sensor that is heavy duty, single stage, line voltage type. Operating temperature range: -40 to +125 °F and rated for the environment in which it is installed.

    b. Use a contactor that is electrically held, 30 amp rated, lighting or resistive load type.

c. Use a controller that is NRTL-listed. The controller must provide ground fault protection, with an adjustable trip setting range of, at minimum, 1 mA to 30 mA in 1 mA increments. The controller must automatically self-test ground fault functionality and must also have a manual test option. Use Tracon model GPT 130, or engineer-approved equal.

d. Components listed in this section shall be provided in NEMA 4X enclosure that has a hinged cover with a window. Provide enclosures rated for the areas in which the components are to be installed. Reference NEMA enclosure types and NEC Table 110.28.

4. Conductors. Use copper conductors with insulation rated for 300 volt minimum where the impressed voltage is 100 volts or less and 600 volt where the impressed voltage is between 100 and 600 volts. Use 90°C-rated conductor insulation.

   a. Service and Feeder Cables. Unless otherwise indicated, use No. 8 AWG, or larger, with type XHHW-2 insulation.

   b. Underground Wire. Unless otherwise indicated, use No. 6 AWG with type XHHW-2 insulation where buried in conduit.

   c. Branch Circuit Wire. Unless otherwise indicated, use No. 12 AWG with type XHHW-2 insulation.

   d. 50-FT Portable Power Cord. Use #10 AWG Type SOOW extra-hard usage cord. Use an L14-30P type plug on one end of the cord and use an L6-30R type receptacle on the other end of the cord.

   e. Control Wire. Use No. 16 AWG with stranded conductor with type SIS insulation within control panels.

   f. Splices for Copper Conductors. Use solderless, pre-insulated, compression set type only with heat-shrink tubing jacket. When making splices between power leads and heat cable cold leads, use splicing kits recommended by the heat trace cable manufacturer and designed specifically for that purpose.

   g. Terminations. Use compression set or bolted type.

5. Device, Junction, and Pull Boxes.

   Boxes Installed Above Grade. Use boxes that are hot dipped galvanized cast iron or corrosion resistant alloy complete with conduit hubs. Use boxes designed for wet locations. Boxes must include either approved drainage openings not smaller than 1/8 inch and not larger than 1/4 inch in diameter, or listed drain fittings, whichever is necessary to maintain the boxes' environmental ratings.

   NEMA 4-rated wet location junction box 8"H x 8"W x 6"D.

   Pilot light at termination post shown in the plans shall be green light emitting diode (LED).

6. Plugs, Remote Power. Use remote power plugs that are 2-pole, 3-wire with ground, male, 30 amp, 240 VAC, NEMA L6-30P. Installed in wet location junction box with hinged weatherproof cover.

7. Grounding.

   a. Electrodes. Use electrodes that are copper-clad steel rods with a minimum diameter of 5/8 inch. Increase diameter as required to drive to the necessary depth without being damaged.

   b. Splices and Connections. Use an exothermic weld for all connections and joints in inaccessible locations. Use standard clamps and connectors in accessible locations.

8. Terminal Posts.

   a. Use terminal posts that are 6 X 8-inch pressure treated wood posts 8 feet long.

b. Use 6 foot, flexible, spring steel marking with Nordic Fiberglass Flexi-Flag CM-2 or approved equal.

CONSTRUCTION REQUIREMENTS

616-3.01 THAW WIRE. Meet all applicable requirements and recommendations of the NEC and the NESC.

Furnish the Engineer with circuit and wiring diagrams.

When required on the Plans, install a post and meter combination for each individual thaw wire or a single post and meter combination for any group of thaw wires as specified and paid for under Section 661.

1. Conduit and Fittings.

   a. Use galvanized rigid steel (GRS) conduit for direct burial at depths required by NEC Articles 300 and 426, unless noted otherwise. Repair damage to galvanized coatings per AASHTO M 36. Route power conductors to each heat trace circuit in minimum 1 inch conduit.

   a. Provide bituminous asphalt coating for all ferrous conduit installed directly in earth. Apply 2 coats after conduit is completely assembled. Use conduit with factory-applied protective coating in lieu of asphalt if suitable touch-up materials are used to seal couplings and repair injuries to the factory-applied coat.

   b. Cut and ream all conduit squarely at the ends. Make fittings tight.

   c. Route concealed conduit in a direct path with a minimum number of bends. Use bends of long radii where possible.

   d. Keep all bends free from dents or flattening.

   e. Install conduit mechanically and electrically continuous from termination to termination. Connect securely to cabinets, junction boxes, and device boxes using a locknut on the outside and a grounding bushing on the inside. Bushings and locknuts are not required where conduits are screwed into threaded connections.

   f. Before the installation of conductors, use caps or corks to keep foreign material out of open conduits.

2. Heat Cable. Install per manufacturer's instructions and as indicated on the electrical plans. Install in GRS conduit as indicated on the electrical plans. Use a minimum of 3/4 inch and a maximum of 1-1/2 inch, ensuring conduit fill does not exceed the fill allowed by the NEC. Do not splice heat cable. Do not exceed the manufacturer's published maximum heat trace cable length per circuit.

3. Controls. Install the controls as indicated on the electrical plans. Refer to the detail drawings.

   Maximum heat trace length of 320 feet results in leakage current <5.0 mA. The ground fault protection must be set to trip at 5.0 mA. Set Temperature at 50°F. See heat trace wiring diagram in the plans.

4. Conductors.

   a. Install all conductors in conduit.

   b. Clean all conduit before installing conductors.

   c. Install conductors continuously from box to box. Splice only at device or junction boxes.

   d. Circuit all feeder and branch circuits as shown in the drawings.

e. Install all conductors in a single raceway at one time so that conductors do not cross one another while being pulled into place. Leave sufficient conductor length at all fittings and boxes.

f. Stay within the pulling tensions specified by the manufacturer or as noted elsewhere in this division.

g. Maintain bending radii in excess of those allowed by the manufacturer.

h. Use lubricants according to UL, the conductor, and raceway manufacturers' requirements.

i. Neatly bundle and form conductors to fan into terminals at regular intervals inside panels.

j. Coordinate conductor insulation temperature rating and ampacity rating with the temperature and ampacity rating of the circuit protection devices.

k. The heat trace power conductors shall be sized to limit the voltage drop on the branch circuit conductors to no more than 3%, or to limit the total voltage drop on the feeder and branch circuit conductors to no more than 5%.

5. Color Coding.

a. Color all conductors #6 AWG and smaller continuously. Conductors larger than #6 may be either continuously colored or marked at each end and at every accessible point with appropriately colored paint, tape, or adhesive labels.

b. Mark or color grounding conductors according to the NEC.

c. Mark or color grounded conductors according to paragraph d. and according to the NEC.

d. Mark or color ungrounded conductors according to the following convention:

Nominal Voltage/Phase	Grounded	Ungrounded
120 volt, single phase, 2 wire	White	Black
120/240 volt, single phase, 3 wire	White	Black Red

6. Device, Junction, and Pull Boxes.

a. Anchor device boxes to structural members so there is no apparent movement when the device is operated.

b. Install junction and pull boxes in permanently accessible locations only. Size boxes according to NEC, Article 314.

c. Mount all boxes square and plumb.

7. Grounding.

a. General. Create an equipotential ground plane for the installation as shown on the drawing and as required at the service meter/disconnect cabinet. Connect the following items to the service entrance ground bar:

(1) The grounded neutral conductor for the utility service.
(2) Ground electrode(s).
(3) All non-current-carrying electrical equipment, conduit, and enclosures.
(4) Metal culvert and/or end sections.

(5) Heat cable metal sheath.

b. Resistance. Ensure that the resistance between the service entrance ground electrode and earth ground, as measured using a multiple ground rod method and a ground resistance tester, is as close to zero as possible with the design shown in the drawings. Give the resistance measurement to the Engineer in writing. Include the environmental conditions during testing. Ground resistance testing shall be performed per IEEE 81, Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.

c. Conductors. Size conductors according to the drawings or, if not shown on drawings, as required by NEC Article 250. Grounding electrode conductors shall be sized per Table 250.66 and equipment grounding conductors shall be sized per Table 250.122. Protect conductors from physical damage.

d. Electrodes. The grounding electrode system installation shall comply with NEC Article 250.50. Drive ground rods at least 8 feet deep.

8. Field Test. Electrical circuits must pass the following test before the Engineer will accept the work for payment. Perform this test 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. Insulation Resistance (megohm) Test. Complete this test to verify the integrity of each conductor's insulation after pulling the conductors and/or 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.

616-4.01 METHOD OF MEASUREMENT. See Section 109 and as follows:

Thaw Wire. By the measured length of heat trace complete in place with all connections made and all appurtenances provided.

616-5.01 BASIS OF PAYMENT. All fittings are subsidiary.

Payment will be made under:

PAY ITEM

Item Number	Item Description	Unit
616.0003.____	Thaw Wire Installation	LF

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SECTION 617
RAILROAD CROSSINGS

Special Provision

617-1.01 DESCRIPTION. Add the following:

This work shall consist of furnishing and placing railroad ballast in conformance with the lines, grades and thickness' shown on the Plans.

617-2.01. MATERIALS. Add the following:

Prepared ballast shall be crushed shot rock or crushed pit-run rock, size No. 4A, composed of hard, strong and durable particles, free from injurious amounts of deleterious substances and conforming to the following requirements:

TEST	TEST PROCEDURE	TEST STANDARD
Gradation Tests:		
Sampling Aggregates	ASTM D75 ASTM C702	
Sieves with Square Openings	ASTM E11	
Sieve Analysis	ASTM C136	See table below
Materials Finer than No.	200 ASTM C117	See table below
Material Quality Tests:		
Bulk Specific Gravity	ASTM C127	2.60 min.
Absorption	ASTM C127	1.0 max.
Magnesium Sulfate Soundness (Five Cycles)	ASTM C88 1.0% max.	
Clay Lumps & Friable Particles	ASTM C142	0.5% max.
Flat and/or Elongated Particles	USACE CRD-C119	5.0% max.
Degradation (LA Abrasion)	ASTM C535	30 max.
Mill Abrasion	see description below	9.0% max
Abrasion Number	see description below	45 max
Fractured Particles	see description below	75% min.

TYPE 4A BALLAST GRADATIONS

Sieve Size	**Percent Passing**
2-1/2 in.	100
2 in.	90-100
1-1/2 in.	60-95
1 in.	10-35
3/4 in.	0-10
3/8 in.	0-3
No. 200	0-0.3

Mill Abrasion Test Description:

A representative sample is obtained and sized using the current ASTM Methods of Test. From the coarse aggregate, split a representative portion into a sample consisting of 3.3 lb. passing the 1-1/2 inch sieve and retained on the 1 inch sieve plus 3.3 lb. passing the 1 inch sieve and retained on the 3/4 inch sieve. The sample shall be washed and oven dried in accordance with the Los Angeles Abrasion procedure. The sample will then be placed in a 1.5 gallon, 9 inch external diameter porcelain or steel ball mill pot, along with 6.6 lb. of distilled water. The mill shall be rotated at 33 rpm for a total of 10,000 revolutions (five hours). The sample shall then be wash-sieved through a No. 200 sieve and oven dried before weighing. Mill abrasion shall be calculated as a percentage loss in weight by the following formula:

Mill Abrasion = (Loss in Weight / Original Weight) x 100

Abrasion Number:

The Abrasion Number is a number calculated with the results of the Los Angeles Abrasion Test and the Mill Abrasion Test given in this specification. The Abrasion Number shall be calculated by the following formula:

Abrasion Number = LA Abrasion Number + (5 x Mill Abrasion Number)

Fractured Particles Test Description:

The Fractured Particles Test is as follows:

A representative sample is obtained and sized using current ASTM Standard Methods D75 and C702, respectively. All fractured and non-fractured aggregate particles obtained by sampling shall be included for evaluation. ASTM Standard Method D5821 shall be used to determine the percentage, by mass, of coarse aggregate fractured particles.

The following fracture criteria shall apply:

A fractured particle shall be a particle with three or more fractured faces. Each of the fractured faces on the fractured particle must have a freshly exposed rock surface with a maximum dimension of at least one third the maximum particle dimension and a minimum dimension of at least one quarter of the maximum particle dimension. The included angle formed by the intersection of the average planes of adjoining fractured faces must be less than 135 degrees for each of the faces to be considered as separate fractured faces.

For example, a particle just retained on the two inch screen (i.e., particle size =2 inch) must have at a minimum:

1. A freshly exposed maximum face of between two-thirds of an inch and 2 inches, and
2. A second freshly exposed face with a minimum dimension of one-half inch, and
3. A third freshly exposed face ranging in dimension between the other two.

The angle formed between any two of these faces must not exceed 135 degrees.

Particles which do not meet the above criterion will be classified as non-fractured faces.

Testing and Inspection:

Upon notification of Intent to Award a contract, and during the actual performance of the contract, the Supplier shall engage the service of a qualified Professional Engineer registered in the State of Alaska to oversee performance of the above referenced tests on the processed ballast. All sampling and testing shall be done either by the Professional Engineer himself or by a qualified and experienced technician working under the direction of the Professional Engineer. Samples of processed ballast shall be taken directly off belt to minimize segregation and contamination. Material quality tests shall be done by testing laboratory which is selected by the Contractor and approved by the owner and the ARRC.

The frequency of tests shall be as follows:

1. Pre-Manufacturing Tests: Prior to production of ballast, the Contractor shall submit whole and crushed samples of the proposed source rock along with test reports that verify that they conform to the Specifications.

2. Start-up Manufacturing Test: When ballast manufacturing begins another full battery of tests shall be run to verify that the ballast manufactured conforms to the specifications.

3. Periodic Full Testing: Whenever the nature of the source rock changes significantly, such that conformance to specifications is in doubt, above tests shall be redone as appropriate to verify conformance and the results submitted for approval.

4. Periodic Gradation Testing: Perform the gradation tests and visual monitoring of degree of fracture during manufacturing on every 1,000 cubic tons of ballast that is produced, but at least daily. A complete fractured particle test shall be run on every 5,000 cubic tons of ballast manufactured.

Submit all test reports to the State for approval. The Professional Engineer shall verify that all test reports are accurate and shall indicate whether or not they conform to these specifications. Any tests that fail to conform shall be brought to the immediate attention of the State's Project Manager and immediate steps shall be taken to bring manufacturing into conformance.

The Engineer may reject any material that does not conform to these specifications. In addition, in the event of the material's continuing failure to conform to the specifications, the Engineer may order that manufacturing cease until the product conforms and defective material is disposed of.

The State may periodically inspect the ballast at the manufacturing site and the final stockpile area(s). The State, at its own expense, reserves the option to perform additional sampling and testing for acceptance.

Manufacturing, Handling, Delivery, and Stockpiling of Material:

The ballast shall be manufactured, handled, delivered, stockpiled, and placed in such a manner that it is kept clean and free from segregation. Processed ballast shall be washed and/or rescreened as necessary to remove fine particle contamination as defined by the specification prior to stockpiling. Stockpiling of ballast will only be allowed over firm stable base areas. In order to minimize segregation ballast shall be stockpiled in more or less horizontal layers with no dumping over the sides of the stockpile allowed. Travel of construction machinery and other vehicles over the top of the stockpiles shall be kept at a minimum. Contractor will be responsible for the control of dust when hauling to and from stockpile.

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617-3.01 CONSTRUCTION REQUIREMENTS.

1. General.

   Replace 1b with the following:

   b. Remove the track from service only at the times authorized by the Chief Engineer. Restore the track to service within the time period specified. Should the embankment construction not be completed on time, liquidated damages will be charged at the rate specified in the written authorization allowing the excavation, or at the rate specified in the Standard Specifications for Work on Railroad Property, Section 7, Train Delays included in the Special Provisions Appendices, whichever is greater. The Department will collect the amount of liquidated damages from the Contractor and pay them to the Railroad.

C617.2-20.0801

Delete 1c. and replace with the following:

c. The Contractor shall provide equipment and labor to assist the ARRC crews in removing and replacing rail and ties to the limits determined by ARRC as needed to accomplish the culvert removal and installation work.

Add the following:

e. Ballast dumped on subgrade prior to track or crossing construction shall be kept free from material tracked in by construction equipment. Ballast dumped on skeleton track and turnouts shall be distributed uniformly during the dumping operation to minimize the carrying or regulating required to provide the designed ballast section.

Contractor shall submit his plan for handling and placing ballast for approval. This plan shall include material source, type of equipment to be used (e.g. HyRail dump truck), location of stockpiles, and method of distribution and compaction.

Add the following new subsection:

617-3.02 BALLAST PLACEMENT

1. Ballast shall be placed to the lines and grades indicated. The average thickness shall be within one-quarter inch of the thickness shown on the drawings. Ballast shall not be placed on soft, muddy, or frozen areas. Where the prepared subgrade (roadbed) is soft, muddy, rutted, exhibits severe depressions, or is otherwise damaged, the ballast shall not be placed until the damaged subgrade has been repaired and the Engineer has approved the area.

2. Forming of ruts that would impair proper drainage shall be prevented when distributing ballast from trucks and off track equipment. Any ruts formed greater than one (1) inch shall be leveled and graded to drain.

3. Ballast shall be unloaded as close as possible to the point of use so that unnecessary handling is prevented. Excess ballast shall be picked up and redistributed at the Contractor's expense. Ballast shall be handled in such a manner as to ensure it remains clean of deleterious materials and within specifications.

4. Minimum Ballast Depth: The minimum depth of ballast below the bottom of the tie shall be 12 inches.

617-4.01 METHOD OF MEASUREMENT. Add the following:

Ballast placed as shown on the Plans will be measured by the ton in accordance with Section 109. Ballast will be measured pursuant to the typical cross section and the limits shown on the plans. No payment will be paid for ballast that is in excess of the typical section. Any excess ballast shall be recovered by the Contractor at no additional cost.

617-5.01 BASIS OF PAYMENT. Add the following:

The accepted quantity of ballast will be paid for at the contract unit price per ton for the pay item shown in the bid schedule, complete in place.

Payment will be made under:

PAY ITEM

Item Number	Item Description	Unit
617.2006.____	Railroad Ballast, Type ___	TON

Z546590000

Special Provisions

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 618.0001.____ and .0002.____ 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.

2. Pay Item 618.0003.____ Water for Seeding. Payment is for water applied for growth of vegetative groundcover through the establishment period.

   If Pay Item 618.0003.____ Water for Seeding, is not included in the bid schedule, water applied for growth of vegetative groundcover through the establishment period is subsidiary.

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

PAY ITEM

Item Number	Item Description	Unit
618.0001.____	Seeding	Acre
618.0002.____	Seeding	LB
618.0003.____	Water for Seeding	MGAL

C618-23.0601

Special Provision

Replace Section 619 with the following:

SECTION 619
SOIL STABILIZATION

619-1.01 DESCRIPTION. Furnish, install, and maintain materials to stabilize the soil. Control erosion, sediment, and pollution.

619-1.02 RELATED SECTIONS, REFERENCE ORGANIZATIONS, AND STANDARD DOCUMENTS.

1. Alaska Department of Transportation and Public Facilities (ADOT&PF):

   Standard Specifications for Highway Construction
   - Seeding ..... Section 618
   - Topsoil ..... Section 620
   - Planting Trees and Shrubs ..... Section 621
   - Silt Fence ..... Section 633
   - Erosion, Sediment, and Pollution Control ..... Section 641
   - Soil Stabilization Material ..... Section 727

2. American Association of State Highway and Transportation Officials (AASHTO)

   Standard Practice for:
   - Compost for Erosion/Sediment Control (Filter Berms and Filter Socks) ..... R 51
   - Compost for Erosion/Sediment Control (Compost Blankets) ..... R 52

3. United States Composting Council (USCC)
   - Testing Methods for the Examination of Compost and Composting (TMECC)
   - Seal of Testing Assurance Program (STA) documents

4. Erosion Control Technology Council (ECTC)
   - Hydraulic Erosion Control Products (HECPs) Specification Chart
     Table 1, Performance Chart for Standard HECPs
   - Rolled Erosion Control Products (RECPs) Specification Chart
     Table 1, Rolled Erosion Control - Temporary
     Table 2, Rolled Erosion Control - Permanent

5. National Transportation Product Evaluation Program (NTPEP)
   - Testing and Evaluation of Products Materials and/or Devices

6. Texas DOT/Texas Transportation Institute (TTI) Hydraulics and Erosion Control Laboratory

619-1.03 SUBMITTALS. Submit stabilization and erosion, sediment and pollution control performance testing results with certifications for each material, Section 619-2.01 Materials. Submit a sample of each material to the Engineer 7 days before the scheduled installation.

1) Test compost, all applications, no more than 90 days before installation.
2) At a minimum, certificate will include the name of the manufacturer, product name, style number or similar, chemical composition of the material, the fibers, netting, yarn and similar and the weed free status of the material.
3) Organic materials shall be accompanied with all applicable health certificates and permits.
4) Furnish a Material Safety Data Sheet (MSDS) that demonstrates the product is not harmful to plants, animals, and aquatic life.

619-2.01 MATERIALS. Select stabilization materials, individually or a combination of, matched to the project applications/conditions (sheet flow, concentrated flow, slope, length of slope, access, etc.) providing performance and functional longevity meeting the most restrictive requirements of the Construction General Permit (CGP), the approved Storm Water Pollution Prevention Plan (SWPPP) and Section 641 Erosion, Sediment and Pollution Control.

1) Mulch ..... Subsection 727-2.01
   - Dry Erosion Control, Stabilization Products
   - Hydraulic Erosion Control Products (HECPs)
2) Matting ..... Subsection 727-2.02
   - Rolled Erosion Control Products (RECPs)
3) Sediment Retention Fiber Rolls (SRFRs) ..... Subsection 727-2.03
   - Filter Socks
   - Compost Socks
   - Coir Logs
4) Compost ..... Subsection 727-2.04
5) Tackifier ..... Subsection 727-2.05
6) Soil Binders (Polyacrylamide (PAM)) ..... Subsection 727-2.06
7) Geotextile-Encased Check Dams and Sediment Barriers ..... Subsection 727-2.07
8) Sandbag ..... Subsection 727-2.08
9) Manufactured Inlet Protection System ..... Subsection 727-2.09
10) Clear Plastic Covering ..... Subsection 727-2.10
11) Staples ..... Subsection 727-2.11
12) Other stabilization materials submitted to and approved by the Engineer.

Include on the packaging the manufacturer's name, the content, the air dry-weight and the guaranteed chemical analysis of the contents. Ship and deliver to the site in the original, unopened containers.

CONSTRUCTION REQUIREMENTS

619-3.01 GENERAL. Stabilization may include individual or a combination of materials, including but not limited to temporary seeding, mulch, tackifier, staples, matting, stabilizing emulsions, soil binders, dustless sweeping, dust palliatives, and others.

1. Material Storage and Protection. Store materials elevated off the ground and covered protecting them from construction and or damage from the environment including but not limited to:
   - Precipitation
   - Extended ultraviolet radiant including sunlight
   - Chemicals that are strong acids or other
   - Flames and welding sparks
   - Excess temperatures
   - Other environmental conditions that may damage the materials

2. Fabrication.
   a. Sandbags. Sand bags shall measure 15 inches by 30 inches. Place approximately 1.0 cubic foot of select Material, Type B, in each sandbag sack. Close the open end of the sandbag as recommended by the fabric manufacturer.

619-3.02 SURFACE PREPARATION. Clear all areas to be stabilized of stones 4 inches in diameter and larger and of weeds, plant growth, sticks, stumps, and other debris or irregularities that might interfere with the stabilization operation, growth of cover (where vegetative cover is part of the stabilization operation) or subsequent maintenance of the vegetative-covered area(s).

Smooth the surface of the area(s) to be stabilized; make the areas reasonably free of ruts, holes, and humps; trackwalk if required by the manufacturer; apply the stabilization material to each area.

If specified, apply topsoil to the area to be stabilized before application of the stabilizing material. Section 618 and 620.

619-3.03 APPLICATION. Apply stabilization material, including rate of application, according to the specifications. If not specified, apply according to the manufacturer's requirements. Where manufacturer requirements conflict with the specification, except where the Engineer directs otherwise, apply the material according to the requirements of the manufacturer.

If seeding is specified, except where seed is included in the stabilization material, complete the application of stabilization materials within 24 hours after seed is placed.

Do not use vehicles or equipment which cause rutting or displacement of the subgrade or topsoil.

1. Temporary Seeding. Annual Ryegrass per Subsection 724-2.02, Table 724-1. Apply at a rate of 1/2 lb/1000 sq. ft., minimum, on level ground to a maximum of 1 1/2 lb/1000 sq. ft., maximum, on sloping ground and highly erodible soils. Prepare surface and place seed as noted under Subsection 619-3.02 Surface Preparation and Section 618 Seeding. Confirm application of temporary seeding with the Engineer.

2. Tacking Agents - Tackifiers. Apply tacking agents according to the manufacturer's installation instructions matched to the application providing functional longevity, erosion control effectiveness, and vegetative establishment.

3. Soil Binders. Apply soil binders according to the manufacturer's installation instructions.

    a. Using Polyacrylamide (PAM) and PAM with Short-Term Mulch:
    Apply PAM on bare soils.

    Apply PAM and PAM with short-term mulch only where sediment control is in place and complete.

    Do not apply PAM and PAM with short-term mulch on saturated ground during rainfall.

    b. Using Moderate-Term Mulch:
    Apply moderate-term mulch according to manufacturer's installation instructions. If the curing period to achieve maximum performance is greater than the time period before precipitation is predicted, or the soil is saturated, do not apply the moderate-term mulch except as approved by the Engineer.

    c. Using Long-Term Mulch:
    Apply long-term mulch according to the manufactures installation instructions.

4. Erosion Control Blankets (ECBs). Select blankets, as specified by the manufacturer, to match the slope; and installed according to the manufacturer's instructions rolled out on well prepared soils to assure intimate contact and anchored with staples, stakes and or anchor trenches. Temporary erosion control blankets with 60 percent or greater open area may be installed prior to seeding. Place blankets with less than 60 percent open area immediately after the seeding operation.

    Staple matting/ECBs as recommended by the manufacturer for the application.

5. Compost Blankets. Construct compost blankets according to latest AASHTO R 52 and as specified. Use coarse compost and place over bare soil a blanket of 2 inch minimum thickness, except as otherwise specified. Apply material either by hand spreading and or pneumatically. Compost will have no free water visible or produce dust when handled. Place compost before seeding or mix seed with compost.

6. Check Dams. Place check dams as soon as possible and practicable or when and where if directed by the Engineer. Place the check dams perpendicular to channels and construct of a height sufficient to maximize detention while keeping the water in the channel. Place and install check dams according to the Plans and anchor to maintain in effective position.

    a. Sandbag. Place the initial row in tight contact with the ditchline for the length of the dam. Place each following row centered across the joint between the bags of the lift/row below.

7. Stabilized Construction Entrance.
   Temporary stabilized construction entrance shall be constructed according to the Plans, prior to beginning any clearing, grubbing, earthwork, or excavation.

   When the stabilized entrance no longer prevents track out of sediment or debris, the Contractor shall either rehabilitate the existing entrance to original condition, or construct a new entrance.

   When the Plans require a tire wash in conjunction with the stabilized entrance, the Contractor shall include details for the tire wash and the method for containing and treating the sediment-laden runoff as part of the SWPPP. All vehicles leaving the site shall stop and wash sediment from their tires.

8. Sediment Control Barriers. Sediment control barriers shall be installed according to the Plans or manufacturer's recommendations in the areas of clearing, grubbing, earthwork, or drainage prior to starting those activities.

   a. Sandbag. Place the initial row in tight contact with the surface perpendicular to the slope. Place each following row centered across the joint between the bags of the lift/row below.

   b. Sediment Retention Fiber Rolls.

   c. Silt Fence.

   d. Compost Berm. Construct compost berms according to latest AASHTO R 51. Use coarse compost.

9. Turf Reinforcement Mats and High Performance Turf Reinforcement Mats. According to manufacturer's installation instructions. Install topsoil and seed prior to placing HPTRM.

C619/Z546590000

619-3.04 MAINTENANCE. Maintain stabilized areas in a satisfactory condition for the term of the Contract. Inspect as required by the CGP, approved SWPPP, and Section 641 Erosion, Sediment and Pollution Control and correct any deficiencies immediately. Remove and dispose of temporary measures, including trapped sediment and contaminants, off project at approved locations. Materials manufactured as degradable may be left in place when approved by the Engineer.

Maintenance includes but is not limited to:

1. Protecting stabilized areas against traffic by approved warning signs or barricades.

2. Repairing surfaces gullied or otherwise damaged following application of stabilization material(s).

Where seeding is included as a part of the soil stabilization:

1. Reseeding, as required by Section 618 Seeding. Reapply the stabilization materials correcting the problems of the initial application.

2. Watering, where vegetative growth is part of the soil stabilization, according to Section 618 Seeding.

The Engineer will perform inspection of the stabilization as required in the CGP, Section 641, and the SWPPP. Make repairs as required by same and as directed.

619-4.01 METHOD OF MEASUREMENT. Section 109, measured on the slope of the ground surface.

619-5.01 BASIS OF PAYMENT. Water, maintenance, repair, removal, and disposal of temporary stabilization materials are subsidiary.

High Performance Turf Reinforcement Mat. The contract unit price includes furnishing all materials, equipment, and labor necessary for the installation of HPTRM.

C619/Z546590000

Seeding is paid under Section 618 Pay Items, topsoil under Section 620 Pay Items, silt fence under Section 633 Pay Items and temporary erosion, sediment, and pollution control under 641 Pay Items.

PAY ITEM

Item Number	Item Description	Unit
619.0001.____	Mulching	SY
619.0002.____	Matting	SY
619.2001.____	Compost	SY
619.2002.____	Turf Reinforcement Mat	SY
619.2003.____	Sediment Retention Fiber Rolls	LF
619.2004.____	Check Dam and Sediment Barrier (-Geotextile)	LF
619.2005.____	Check Dam	LF
619.2006.____	Sediment Barrier	LF
619.2007.____	Compost Berm	LF
619.2008.____	Sandbags	Each
619.2009.____	Manufactured Inlet Protection System	Each
619.2010.____	Sandbag Inlet Protection System	Each
619.2016.____	Mulch	SY
619.2017.____	High Performance Turf Reinforcement Mat	SY

C619-18.0501-2/Z546590000

Special Provision

Replace Section 621 with the following:

SECTION 621
PLANTING TREES AND SHRUBS

621-1.01 DESCRIPTION. Furnish and plant trees, seedlings, and shrubs. Maintain the plants for the term of the Contract.

MATERIALS

621-2.01 PLANT STOCK. Furnish plants that are true to type and name according to the current edition of *Standardized Plant Names*, American Joint Committee on Horticultural Nomenclature. Furnish plants and plant bundles labeled with durable and legible labels according to size, botanical genus, and common plant name.

Furnish the variety and species specified in the Special Provisions. Furnish plants that are typical of the species or variety and that conform to American Standard for Nursery Stock (ANSI Z60.1) for type and grade.

Furnish nursery grown plants, except specified collected plants. Furnish plants grown or conditioned to an environment similar to the project site, including elevation, annual precipitation, soil conditions, and climate. Furnish plants free from disease, injurious insects, mechanical wounds, broken branches, decay, or other defects.

Furnish tree and shrub seedlings 18 to 24 inches in height above the ground at the time of planting.

1. **Nursery Stock**.

    a. Furnish trees and shrubs root pruned during their growing period in the nursery, according to standard nursery practice, to produce a fibrous compact root system suitable for the species and sizes called for on the Plans.

    b. Furnish container grown plants that have been growing for at least one year and no more than two years in the same container. Only ground cover plants may exhibit a "pot-bound" condition.

    c. Provide trees with straight trunks, well-branched with symmetrical tops and unhealed scars less than 3/4-inch in diameter.

2. **Collected Stock**. Collect healthy plants growing under natural conditions in locations and soils that permit proper collecting practices. Provide collected stock with a root system or ball at least 25 percent larger than nursery-grown material.

3. **Balled and Burlapped Plants**.

    a. Meet the ball diameters and depths specified in the *American Standard for Nursery Stock*.

    b. Furnish plants with a firm ball of earth from the undisturbed soil in which the plant was growing. Wrap the ball with burlap or similar approved material and lace it tightly to hold the ball firm and intact. Plant material at the planting site with broken or loose earth balls or with manufactured earth, will not be accepted. Handle balled and burlapped plants by the earth ball only and protect against drying and freezing.

4. **Substitutions**. Substitutions require written approval.

    Notify the Engineer, in writing, six weeks before the target planting date if a plant is not available. The Engineer will evaluate availability and consider allowing the nearest available size of similar variety with a corresponding adjustment to the contract unit price.

5. **Storage and Packing**. Handle and pack all plant material according to standard nursery practice and as required by the planting soil and climatic conditions. Improperly stored or handled plants will not be accepted.

6. **Inspection**.

   a. Make all planting stock available for inspection in the nursery or collecting field before digging. At least 14 days before digging operations, furnish complete and detailed information about the supply source for each item of plant material.

   b. Final inspection and acceptance for size of ball or roots, color, absence of defects, and for other requirements will be made at the planting site before placing the plants in their permanent positions.

The Engineer will reject plants:

1. Listed on the Alaska Department of Natural Resources Division of Agriculture webpage with an Alaska Natural Heritage Program Invasiveness Ranking greater than 70;

2. Without attached labels;

3. Lacking proper proportions, injuries to bark or roots, broken branches, insect pests, disease;

4. Showing signs of improper storage, handling, damaged or loose earth balls;

5. Containing prohibited noxious weeds (as listed in 11 AAC 34.020(a)) in the earth ball or containers.

621-2.02 FERTILIZER. Use a regular release, 8-32-16 (N-P-K) fertilizer in granular form with trees, seedlings, and shrubs. Mix the fertilizer with the soil at the manufacturer's recommended application rate.

621-2.03 LIMESTONE. Use limestone that meets Subsection 712-2.03.

621-2.04 MULCH. Use mulch that meets Section 727-2.01 MULCH, Dry Erosion Control, Stabilization Products, 2 Shredded Bark Mulch. Commercially available shredded wood fiber landscape mulch is acceptable, provided added color is natural dark brown.

621-2.05 BACKFILL MIX. Use free draining topsoil for backfill in planting beds of a natural friable surface soil that is without admixtures of undesirable refuse, foreign materials, roots, hard clay, noxious weeds, tall grasses, brush, sticks, stubble, litter, and toxins. Local red loam or imported peat mix with nutritional and gradation data may be used to supplement topsoil. Use topsoil backfill with 10-15 percent organic matter as determined by loss-on-ignition of oven-dried samples according to ATM 203, and meeting the following:

Sieve Designation	Percent Passing by Weight
3/4 Inch	100
No. 4	95-100
No. 16	30-55
No. 200	25-55

621-2.06 STAKES. Use stakes that are strong and fit for the purpose intended.

621-2.07 TREE WOUND DRESSING. Use tree wound dressing that is antiseptic, waterproof, and contains no materials harmful to the living tissue of trees.

CONSTRUCTION REQUIREMENTS

621-3.01 TEMPORARY STORAGE. Where temporary storage or heeling-in of plants is required, provide, and prepare a suitable heeling-in ground or a well-ventilated and cool storage shed, located near the planting site, before shipping planting stock.

Heel-in or properly store all acceptable planting stock if not planted within 24 hours, as follows:

1. **Balled and Burlapped Plants**. Temporarily store in a protected area with balls 6 inches apart. Fill voids with moist mulch up to and including the top of the ball.

2. **Bare-Rooted Plants**. Puddle immediately, then heel-in by placing the plants, properly spread, in a trench and covering the roots with moist topsoil.

Protect bare root plants adequately at all times. Plants left out of the ground unprotected overnight, left with roots exposed to the sun, or improperly protected during transit, unloading, heeling-in, or during the planting operation, are unacceptable.

Protect the roots of plants stored in a shed at all times using moist straw or other approved material. Water as required.

621-3.02 ADVANCE PREPARATION AND CLEANUP. After clearing and grubbing of the area is complete, remove any stones, sticks, stumps, clods, and other debris which might interfere with growth or maintenance. Repair any subsequent damage from erosion or other causes.

621-3.03 PLANTING. Perform all planting work using good horticultural practices.

1. **Plant Season**.

    a. **Locally Grown**. Plant between June 1 and September 15.

    b. **Imported**. Handle plants according to the nursery recommendations. Plant between June 1 and August 15.

2. **Excavation**.

    a. Keep topsoil separate from underlying layers and render it loose and friable. Remove any material detrimental to plant growth and dispose of it at approved locations.

    b. Make pits for trees at least 2-5 times the diameter of the root ball or the spread root system of bare-root trees. Make the depths of pits for trees at least 2 feet and as much deeper, as may be necessary to provide a minimum depth of 9 inches below the bottom of the ball or spread root system of the tree when placed at the proper elevation.

    c. Construct planting pits for seedlings and shrubs.

    d. Ensure that the dimensions of pits, pockets, or trenches for vines, ground covers, and similar types of plants will provide space for the spread root system. Keep the depth and width at least 6 inches below and around the root system.

3. **Pruning**.

    a. **Roots**. Prune all damaged or broken main roots with a clean, oblique cut immediately above the point of damage.

    b. **Branches**. Use pruning techniques that conform to the best horticultural practices with due regard to natural or desired form and growth characteristics of the individual species. Preserve a single terminal leader when pruning. On all deciduous plants, remove 1/3 to 1/2 of the potential leaf-bearing surface. Treat all cut surfaces that are 3/4 inch or more in diameter with tree wound dressing.

4. **Transplanting**. Relocate plant material, within the limits of the project, designated for transplanting to areas shown on the drawings or as specified. Dig this material with root systems or balls as specified for collected stock and replant it the same way as new stock.

5. **Placing Plants**.

   a. Set plants plumb on lightly tamped backfill mix and at a level so that the root collar will bear the same relation to the planting site as it bore to the ground from which it was dug.

   b. Handle balled and burlapped plants by the earth ball and not by the plant itself. Place the plants in holes without removing the burlap.

   c. Fill the hole with water before placing the plant. Place the backfill gradually, allowing the soil to soak up the water.

6. **Backfilling**. Backfill seedlings, trees, and shrubs with topsoil and fertilizer mix.

   Work backfill mix around the roots and firmly tamp it as it is placed into the holes to eliminate air pockets. Avoid bruising or breaking the roots while tamping or firming the backfill mix about them. Hold upright plants plumb during the backfilling operation. When the backfilling is 2/3 completed, loosen the exposed burlap and lay it back from the ball or cut off excess. After thorough watering, complete the backfilling. During backfilling, remove stocks, sod, clods, or other material that tend to form air pockets. Except in areas for shrub beds, construct a shallow basin of backfill mix approximately 3 inches deep and as wide as the diameter of the hole around each plant. On steep slopes, pull enough soil to the lower side of the plants to form shallow basins to catch and hold water. After the backfilling is completed, water the plant basins thoroughly.

7. **Wrapping**. When specified, wrap the trunks of all deciduous shade and flowering trees with 4-inch-wide waterproof paper, overlapping 1-1/2 inches, between the lowest main branches to the ground line. Tie the wrapping in at least 5 places, including top, middle, and bottom. Complete these protective measures within 4 days after planting.

8. **Staking and Guying**.

   a. Immediately after planting, brace all evergreen trees 4 to 6 feet high and all deciduous trees 6 feet and over in height and less than 1-1/2 inch in diameter. Use a single stake measuring at least 2 inches by 2 inches by 6 feet and place it 2 feet deep into the ground on the windward side to avoid injury to the root system. Connect the stake to the tree using approved binding straps.

   b. Immediately guy all deciduous trees 1-1/2 inches and over in diameter, and all evergreen trees 6 feet and over in height using 3 cables spaced approximately 120 degrees apart around the tree. Use cables each made of 2 No. 12 galvanized steel wires, free from bends and kinks, twisted into a strand. Fasten cables around the trunk immediately above a substantial limb wherever possible. Fasten cables around the trunk at a distance from the ground equal to 1/2 to 2/3 of the total height of the tree. Anchor cables to the ground at an equal distance away from the trunk. Protect the tree from damage caused by the cable using an approved method.

   c. Use other anchor stakes that are at least 2 inches x 2 inches x 2 feet. Drive the stakes at right angles to the guy wire. Ensure that the stakes do not extend more than 3 inches above the ground. Notch or drill the stakes to prevent cables from slipping.

621-3.04 PERIOD OF ESTABLISHMENT. The 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, Subsection 621-3.07.

Employ all possible means to preserve/maintain the plants in a healthy and vigorous condition to ensure successful establishment. Maintain the plants according to Subsection 621-3.07, to not less than the requirements for acceptance, Subsection 621-3.06. In addition, apply fertilizer to seedlings, trees, and shrubs by driving a 1 1/2 ounce fertilizer spike, of the same material and proportions initially applied to the soil, into the ground at the drip line of each plant between May 15 and May 31; and again for the shrubs between June 15 and June 30.

621-3.05 CLEANUP. Remove from planting sites any quantities of subsoil, rock, and other spoils resulting from excavation after planting. Dispose of them as directed. On slopes 3:1 and steeper, you may scatter or dispose of material other than rock and coarse debris. Leave all planting sites in an acceptable condition.

621-3.06 PLANT ACCEPTANCE AND REPLACEMENTS. Engineer and Contractor, in the growing season after the planting year and before June 30, inventory seedlings and shrubs planted to determine the number of dead and unhealthy plants.

1. **Acceptance**. Acceptance of each species of tree, seedling, and shrub requires a minimum of 75% of the number originally planted to be in healthy and vigorous condition in the growing season after the planting year.

2. **Replacement**. For each species of tree, seedling and shrub, replace the dead and unhealthy plants to maintain at least 75% of the number originally planted, in a healthy and vigorous condition. The Engineer will select the dead and unhealthy plants to replace. Remove the dead and unhealthy plants selected.

   Provide healthy replacement plants of the same species and size as the original plantings. Complete replacement planting between July 1 and July 15.

621-3.07 MAINTENANCE. Maintenance includes but is not limited to the following:

1. Protecting planted areas against traffic by approved warning signs, barricades, or other approved means and against erosion.

2. Replacing plants vandalized, stolen, or damaged during the maintenance period. Replace plants as soon as weather conditions permit.

3. Performing the necessary weeding, spraying (with approved insecticides or fungicides), cultivating, replacing mulch, and tightening or replacing guy wires and stakes as may be required, and maintaining the plants in an upright position and at the proper grade.

4. Apply fertilizer to trees, seedlings, and shrubs by driving a 1 1/2 ounce fertilizer spike, of the same material and proportions initially applied to the soil, into the ground at the drip line of each plant between May 15 and May 31, and again for the shrubs between June 15 and June 30.

5. Deep water the trees, seedlings, and shrubs immediately after planting. Deep watering shall provide water penetration throughout the entire root zone to the total depth of the plantings, planting pits and trenches with a minimum of runoff. Keep the immediate root areas moist at all times. Rain is not a substitute for deep watering unless permitted by the Engineer.

   Deep water trees, seedlings and shrubs according to the following maintenance schedule:

   a. Deep water plants at least twice a week during the first 45 days after planting.

      (1) The 45 Days Extend Past September 30. Stop the twice weekly deep watering after September 30 and resume the twice weekly watering on May 1 of the following calendar year for the balance of the 45 days. Continue to water the plants as noted in Subsection 621-3.07.3.a.(2).

      (2) The 45 Days Does Not Extend Past September 30. After the 45 days of deep watering in the planting year, water the plants for the balance of the growing season.

         (a) Once a week in June and July,
         (b) Once between August 10 and August 20,
         (c) Once during the last week in September.

b. Deep water the plants during the Period of Establishment.
   (1) Once a week during May, June, and July,
   (2) Once between August 10 and August 20,
   (3) Once during the last week of September.

c. When directed, deep water trees, seedlings, and shrubs past September 30, or provide supplemental watering any time during the life of the project if weather conditions are excessively warm or dry.

d. When directed, deep water trees, seedlings and shrubs before freeze-up.

Equip watering equipment with, or following equipment with a Type B advance warning arrow panel using caution mode according to Part VI of the Alaska Traffic Manual.

621-4.01 METHOD OF MEASUREMENT. Section 109, by the number of plants or length of hedge alive, healthy and in a vigorous condition accepted at final inspection.

621-5.01 BASIS OF PAYMENT. Excavation, topsoil, backfill, fertilization, and disposal of all unsuitable and surplus material and water for planting are subsidiary.

Pay Item 621.2006.____ Water for Maintenance. Payment is for water for maintenance, growth, and establishment through the term of the Contract. Type B Advance Warning Arrow Panel for watering is subsidiary. Water for planting is subsidiary to planting.

Pay Items, except Pay Item 621.2006.____, paid at rate of 90% of the bid unit price for the initial plantings. The balance withheld is after the establishment period and all dead and unhealthy plants, Subsection 621-3.06, are replaced, and established.

PAY ITEM

Item Number	Item Description	Unit
621.0001.____	Tree	Each
621.0002.____	Shrub	Each
621.0003.____	Hedge	LF
621.0004.____	Vine	Each
621.0004.____	Perennial, ____	Each
621.0005.____	Furnishing and Planting, ____	Each
621.0006.____	Water for Maintenance	MGAL

C621-23.0601-1

SECTION 632
PAVING FABRIC

Special Provisions

632-3.01 CONSTRUCTION.

2. Application of Sealant.

   Replace the 2nd Sentence with:

   Apply the asphalt sealant uniformly at 0.20 to 0.30 gallons per square yard and at a temperature of between 295 °F min. and 320 °F max. in the distributor tank, or as directed by the Engineer and/or Paving Fabric manufacturer.

4. Fabric Placement.

   Add the following:

   Do not allow the Geotextile to become wet.

C632.1-20.0101

SECTION 633
SILT FENCE

Standard Modification

633-2.01 MATERIALS.

Replace "Silt Fence Subsection 729-2.04" with the following:

Silt Fence Subsection 729-2.02

633-3.01 CONSTRUCTION REQUIREMENTS.

Replace the first sentence with the following:

Install silt fence according to the SWPPP, Appendix B.

HSM20.13-20.1130-1

Replace Section 634 with the following:

SECTION 634
GEOGRID FOR EMBANKMENT AND ROADWAY STABILIZATION AND REINFORCEMENT

634-1.01 DESCRIPTION. Furnish and install geogrid material at locations shown on the Plans.

634-2.01 MATERIALS. Use materials that conform to the following:

Geogrid	Subsection 729-2.04

CONSTRUCTION REQUIREMENTS

634-3.01 WEATHER LIMITATIONS. Do not expose geogrid to sunlight for longer than 14 days after removal of protective covering.

634-3.02 SURFACE PREPARATION.

1. Very Soft Ground (CBR < 1). Care should be taken to avoid disturbing any surface crust overlying softer soil. In these cases the geogrid should be placed directly on the unprepared subgrade.

   If directed by the Engineer, minimize disturbance of the subgrade by leaving root mats in place, cutting stumps and other projecting vegetation as close and even to the ground surface as practical.

   Swampland, peat, muskeg or marshes may be difficult to smooth grade and/or compact. Create a surface that is as uniformly smooth as possible. Grade or crown the surface for positive drainage away from the construction zone.

2. Firm Ground (CBR 1 – 3). Prepare surface by removal of stumps, brush, boulders, and sharp objects. Fill holes and large ruts, as directed by the Engineer, with material shown on the Plans or as approved by the Engineer.

3. Firm Ground (CBR > 3). Compact and finish subgrade or subbase prior to placement of the geogrid.

634-3.03 GEOGRID PLACEMENT. Unroll geogrid directly onto the prepared ground surface in the direction of advancing construction, parallel to the centerline of the roadway or according to the Plans. Do not drag the geogrid across the subgrade. Install the geogrid in the longest continuous practical length, free from folds, creases or wrinkles. Hold the geogrid in place with pins, staples, sandbags or piles of granular material.

1. Very Soft Ground. Overlap geogrid panels a minimum of 36-inches at all joints with the upper geogrid in the direction that fill will be placed. Tie panels together securely with cable ties or hog rings at 5-feet intervals or as recommended by the manufacturer and approved by the Engineer.

   To limit lateral spreading and separation of overlaps, if approved by the Engineer, the Contractor may unroll the geogrid transversely/perpendicular to the roadway embankment alignment. Overlap the adjacent rolls and tie together with cable ties or hog rings at 5-feet intervals.

2. Soft Ground. Overlap geogrid panels a minimum of 24-inches at all joints with the upper geogrid in the direction that fill will be placed. Tie panels together securely with cable ties or hog rings at 20-feet intervals or as recommended by the manufacturer and approved by the Engineer.

3. Firm Ground. Overlap geogrid panels a minimum of 12-inches at all joints in the direction that fill will be placed. Tie panels together securely with cable ties or hog rings at 20-feet intervals. Hand-tension geogrid and stake to the ground at the edges, overlaps, and in the center of each roll, at 30-feet intervals or as specified on the Plans.

634-3.04 PLACING AND SPREADING COVER MATERIAL. Do not operate equipment directly on the unprotected geogrid. Spread fill material in the direction of the fabric overlap. Compact using a smooth drum roller. Do not allow construction equipment to make sudden stops, starts, or turns on the cover material.

1. Very Soft Ground. End-dump material onto previously placed material and spread over the geogrid with a low ground pressure (LGP equates to tire pressure of 4 psf) dozer to the depth permitted. Maintain a minimum depth of 12-inches of cover material at all times between the geogrid and the wheels or tracks of the construction equipment, unless otherwise shown on the Plans or directed by the Engineer. Do not dump material directly on the geogrid. To prevent a mud wave, end-dump fill along the edges of the geogrid to form toe berms or access roads that extend one to two panel widths ahead of the remainder of the embankment fill placement. After constructing the two berms, spread fill in the area between the toe berms by placing material parallel to the alignment and symmetrical from the toe berms inward toward the center to maintain a U-shaped leading edge (i.e., concave outward) to contain the mud wave. Limit height of dumped piles above the geogrid to avoid local bearing failure. Traffic on the first lift should be parallel to the embankment alignment. Do not allow construction equipment to turn on the first lift. Compact the first lift by tracking in place with dozers or end-loaders. Compact with specified compaction equipment once the embankment is at least 2-feet above the geogrid.

2. Soft Ground. End dump material onto previously placed material and spread over the geogrid with a LGP dozer to the depth permitted. Maintain a minimum depth of 6-inches of cover material at all times between the geogrid and the wheels or tracks of the construction equipment unless otherwise shown on the Plans or directed by the Engineer. Place the end-dumped material along the roadway centerline and spread it outward to the roadway edges to prevent the development of wrinkles or movement of the geogrid during construction. Fill in any ruts that form during construction with material shown on the Plans. Do not cut down the fill adjacent to the ruts.

3. Firm Ground. Maintain a minimum depth of 6 inches of cover material at all times between the geogrid and the wheels or tracks of the construction equipment.

634-3.05 GEOGRID REPAIR. If the geogrid is torn, punctured, or the overlaps disturbed – as evidenced by visible geogrid damage – remove the backfill around the damaged area and repair or replace the damaged area. Make repairs to the damaged area with a patch of the same class of geogrid originally placed. Overlay torn area with geogrid with a minimum 3-feet overlap around the edges of the torn area and secure as recommended by the geogrid manufacturer, unless otherwise directed by the Engineer.

634-4.01 METHOD OF MEASUREMENT. Measure geogrid by the square yard of ground surface covered. No allowance will be made for overlap, whether at joints or patches.

634-5.01 BASIS OF PAYMENT. Payment will be made at the Contract unit price. Repair and replacement costs for damaged geogrid are subsidiary to the Section 634 Pay Items.

Material used to fill ruts and holes paid at the unit price for the class of material used.

PAY ITEM

Item Number	Item Description	Unit
634.0001.____	Geogrid, Stabilization, Class ___	SY
634.0002.____	Geogrid, Reinforcement, Class ___	SY

C634-15.0903-2

Replace Section 639 with the following:

SECTION 639
DRIVEWAYS

639-1.01 DESCRIPTION. Construct driveways and approaches.

639-2.01 MATERIALS. Reserved.

639-3.01 CONSTRUCTION. Reserved.

639-4.01 METHOD OF MEASUREMENT. By the number of driveways and approaches constructed.

639-5.01 BASIS OF PAYMENT. The Contract unit price for driveways and approaches is for furnishing equipment and labor.

Materials required to construct driveways and approaches will be paid for separately under the respective items listed in the bid schedule.

Driveways and approaches being reconstructed/constructed with new finished profile grades and full structural section rebuild will be paid for under Pay Item 639.2000____ Approach. Driveways and approaches only being repaved and blended in to match existing, aka “Non-Reconstruction”, will be paid for under Pay Item 639.0001____ Driveway.

PAY ITEM

Item Number	Item Description	Unit
639.0001.____	Driveway	Each
639.0002.____	Driveway, Residential	Each
639.0003.____	Driveway, Commercial	Each
639.2000.____	Approach	Each

C639/Z546590000

Special Provision

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.

SWPPPTRACK. Software Subscription service version SWPPPTrack DOT AK developed and provided by SWPPPTrack AK LTD, for use on construction projects that require coverage under the APDES CGP.

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) 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 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 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 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.
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. Where documents are completed in SWPPPTrack, utilize SWPPPTrack to sign and initial documents. When documents are not completed in SWPPPTrack (e.g. Form 25D-111 SWPPP Certification for Contractor), upload scanned copies after signing and initialing the documents into SWPPPTrack.

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.

641-1.08 USE of SWPPPTRACK. The Contractor is responsible for purchasing and contracting with SWPPPTrack AK LTD for the use of the SWPPPTrack software application and services until final stabilization is achieved and the eNOT has been completed. Contact SWPPPTrack Alaska Support at (888) 401-1993 or AKSupport@SWPPPTrack.com for project fees, setup coordination, device requirements, and training.

Perform and document all inspections required by the CGP and the SWPPP with SWPPPTrack and populate all inspection fields accurately to represent current project conditions. Complete the following forms using SWPPPTrack:

1. SWPPP Construction Site Inspection Report (25D-100)

2. SWPPP Grading & Stabilization Activities Log (25D-110)

3. SWPPP Corrective Action Log (25D-112)

4. SWPPP Amendment Log (25D-114)

5. SWPPP Daily Record of Rainfall (25D-115)

6. SWPPP Training Log (25D-125)

7. SWPPP Project Staff Tracking (25D-127)

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 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.

J. Complete all setup and training required to implement SWPPPTrack.

k. Complete the upload of the BMP inventory into SWPPPTrack.

2. During Construction.

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.

Collate all documents into a single electronic file before transmittal. 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.

    For projects on a 14-day inspection frequency or reduced inspection frequency, SWPPPTrack will generate a precipitation alert for storm events that produce more than 0.5 inch of rainfall in 24 hours. If a storm event does not produce a discharge from the project zone, submit an explanation in response to the SWPPPTrack precipitation alert.

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.____ 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.____ 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.____ 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.____ SWPPP Manager. At the Contract lump sum price for a SWPPP Manager that conforms to this specification. When Item 641.0007.____ 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.____ does not appear in the Bid Schedule, the SWPPP Manager is subsidiary to Item 641.0001.____.

Item 641.0008.____ SWPPPTrack. Payment for purchasing and contracting with SWPPPTrack AK LTD for the use of the SWPPPTrack software application and services will be based on paid receipts plus a 5 percent markup.

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.____ 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.____	Erosion, Sediment and Pollution Control Administration	LS
641.0005.____	Temporary Erosion, Sediment and Pollution Control by Directive	CS
641.0006.____	Withholding	CS
641.0007.____	SWPPP Manager	LS
641.0008.____	SWPPPTrack	CS

C641-24.0401

SECTION 642
CONSTRUCTION SURVEYING AND MONUMENTS

Special Provisions

642-2.01 MATERIALS.

Add No. 4:

4. Digital Measuring Instrument: Nu-metrics, Nitestar DMI (www.ae-traffic.com), or approved equal.

642-3.01 GENERAL.

Add No. 11:

11. Before work on the project starts, stake and reference the existing centerline on both sides of the roadway alignment. Stake the existing centerline on tangents at 100 ft, and 50 ft intervals on curves from the beginning and ending of super-elevation changes when the roadway is no longer at normal crown. Stake sign locations at proper offset. Stakes shall be a minimum of 1" x 2" x 2'-0" and be offset 4 to 8 ft from the shoulder on both sides of the roadway. Extend lath stakes a minimum of 2 ft above ground. Show the offset distance to centerline and the station from the beginning of the project. Maintain staking until the final roadway striping is completed. Staking accuracy work requires an electronic distance measuring instrument (DMI) be installed in the Contractor's vehicle. Calibrate the DMI to roadway alignments as stationed in the Plans before beginning work. Record the calibration and staking information in the field book.
    Install a reference sign every 500 ft. These reference signs shall meet the following requirements:

    a. mounted with the base a minimum of 5 ft above the shoulder,
    b. located a minimum of 10 ft from the edge of shoulder,
    c. marked with the station from the beginning of the project, in 6 inch high permanent black lettering with a letter proportion height to width ration of 1:0.6 and a stroke width to height ratio of 1:6, on an orange background.

C642.1-15.0220-1

Add No. 12:

12. Passing Sight Distance. Record the existing centerline striping and final passing sight distance. A copy of the 8 1/2" x 11" Existing Striping, Passing Sight Distance and Final Striping form is included herein. Document the existing passing and sight distance similar to the example included.
    Using the "Existing Striping, Passing Sight Distance and Final Striping" form:

    a. Document the existing striping. Do not disturb the existing striping until the striping record is accepted by the Engineer.

        1) Project Information: Road Name, Stationing, Surveyor & license, Date surveyed.
        2) Col. 1.: Project Stationing in 100-foot intervals from beginning to end of project.
        3) Col. 2.: Posted operating speed per minimum passing sight distance (Table 642-1).
        4) Col. 3a & 4a: Each direction of travel (NB; SB, EB, WB) record the existing striping: passing (dashes) and no passing zones (continuous line) similar to the example. Maintain the orientation of travel to the form, each road, from the beginning of the project to the end of the project.
        5) Col. 6.: Add comments to help clarify the documentation and significant sight obstructions, as needed. Initial your comments.

        Submit the form to the Engineer and make changes when directed by the Engineer.

b. Document the passing sight distance. Use the form approved in a. for b. Measure and record, after the base course layer is complete, passing sight distance along the roadway in both directions of traveled way at 100-foot maximum intervals and referenced to the project station. Use a 3.5-foot object height or instrument height looking ahead to a 3.5-foot target height which is at the centerline or opposing edge of traveled way.

1) Col. 3 & 4.: Each direction of travel (NB, SB, EB, WB) record the sight distance each station. Record the measurement to the nearest 100-foot up to 1200-foot where the passing sight distance exceeds the minimum passing sight distance. Where the passing sight distance exceeds 1200-foot, record the measurement as "1200+ Feet." Record the measurement to the nearest 10-foot at all stations that fall below the minimum passing sight distance.

2) Col. 6.: Add comments to help clarify the documentation as needed. Initial your comments.

Submit the form to the Engineer and make changes when directed by the Engineer.

c. Final Striping. Using the information approved in a. and b., the existing striping and passing sight distance, the Engineer will evaluate the existing striping and provide the final striping plan 14 days after the Contractor's passing sight distance submittal, 12b above.

1) Col. 3 & 4: Engineer, indicate if the existing striping passes (P) or fails (F).
2) Col. 5a & 5b: Engineer, indicate the final striping.
3) Col. 6.: Engineer, add comments if needed to clarify the final striping. Initial your comments.

Do not begin striping until the Engineer returns the form, signed and dated with the final striping plan.

Engineer, provide the Regional Traffic and Safety Engineer an informational copy of the final striping plan.

TABLE 642-1
PASSING SIGHT DISTANCE REQUIREMENTS [a]

Posted Speed (mph)	Minimum Passing Sight Distance and Minimum Length of Passing Zone (ft)	Minimum No-Passing Zone on Stopped Approaches to Intersections (ft)
30	500	220
35	550	255
40	600	295
45	700	330
50	800	365
55	900	405
60	1000	440
65	1100	480
70	1200	515

a. One- and two-direction no-passing zones for one direction of traffic shall be no shorter than 500 feet

C642.2-15.0722-1

Add the following Subsection:

642-3.06 CONTRACTOR FURNISHED COMPUTATIONS. Provide computations for volumetric Pay Items using DTM's developed per Section 642-3.07. Cross sections developed from the appropriate DTM's will be used as a supplementary quality control check on DTM parameters and quantities, and not for pay. The Contractor may use the Average End Area Method in accordance with Section 109, only if approved in writing by the Engineer.

1. Deliverables: Provide copies of the following to the Engineer:
   a. Plotted cross sections from the DTM surfaces. Develop separate cross sections for each volumetric Pay Item. More than one Pay Item per plotted cross section is not allowed.
      (1) Plot every 50 ft on Station, including intermediate stations as required to define angle points, curves, or other significant changes in the roadway geometry.
      (2) Show the elevation and offset information for all vertex points. Weeding vertex point labels is not allowed. Elevation and offset information may be shown on a separate report if the amount of information exceeds what can be legibly shown on the plot.
      (3) Show the area for each cross section.
      (4) Label each plot with the project name, project number, Pay Item number, and Pay Item name.
      (5) Label each plot with the Surveyor's Company name and address.

   b. Plotted profiles from the DTM surfaces. Develop separate plots for each volumetric Pay Item. Each plot shall only identify the profiles appropriate to the volumetric Pay Item.
      (1) Plot the profile along the alignment centerline as shown in the plans.
      (2) Label each profile as original ground, bottom of excavation, and the top or bottom of embankment, as appropriate.
      (3) Label topographic profiles with elevation and station information, using a weeding frequency of every 100 ft, or as necessary to match the frequency shown on the plans.
      (4) Label the neat-line profiles with elevation and station information every 100 ft, and for the beginning, end, and VPI of all vertical curves and grade breaks. Label the percent slope between all grade breaks, to the fourth significant decimal.
      (5) Label each plot with the project name, project number, Pay Item number, and Pay Item name.
      (6) Label each plot with the Surveyor's Company name and address.

   c. Electronic Data
      (1) Provide copies of all Topographic, Neat-line, and Combination surfaces to the Engineer. Include all electronic features (alignments, profiles, sections, etc.) used to generate the surfaces.
      (2) All data shall be delivered on a clearly labeled CD-ROM or DVD, unless specified otherwise by the Engineer. The label shall include the project name, project number, Surveyor's company name, and date. All data becomes the property of the State of Alaska.
      (3) DTM files shall be saved in Autodesk, TIN, XML, or other approved formats compatible with Department software.

   d. Volume Reports
      (1) Provide interim volume reports showing quantities between every 50 ft station. The volume reports shall be summarized to allow the Department to reference the quantities per individual plan sheet, or as defined in any earthwork summary shown on the plan sheets.
      (2) Provide a final volume report reflecting the final total quantity. Attach all data, calculations and plots to the report. The report shall be signed

Add the following Subsection:

642-3.07 CONTRACTOR FURNISHED ENGINEERING TOOLS. Furnish and maintain Engineering Tools as directed by the Engineer, for the exclusive use of the Engineer throughout the duration of the project. The Contractor shall furnish all equipment specifications to the Engineer for approval, prior to furnishing equipment. The equipment shall be in good working condition not more than 1 model year old. The Contractor shall insure and indemnify the Department against normal wear and tear, damage, theft, and all other events that may cause a loss of function of the furnished tools. The equipment shall be returned to the Contractor upon completion of the project, or when services are terminated by the Engineer. Furnish training for the Engineer's staff, as directed by the Engineer.

1. GPS Rover Unit – All components shall be fully compatible to provide a stand-alone GPS Rover Unit and be the same or compatible to the contractor's unit. The Rover Unit shall be an "all on the pole" system equipped with the following:

   a. Receiver
      (1) Bluetooth compatible.
      (2) Meet waterproof specification IPX7.
      (3) Shockproof for a drop onto a hard surface from a height of 4 feet.
      (4) Dual frequency receiver capable of tracking at least twelve (12) satellites simultaneously on parallel channels.
      (5) Capable of RTK, Static, and Fast Static occupations.
      (6) Capable of receiving L1, L2, and GNSS frequencies.
      (7) Antenna model shall have undergone antenna calibration by the NGS.
      (8) Ensure the receiver contains the manufacturer's latest firmware upgrades.
      (9) Provide the manufacturer's user guide.

   b. Controller
      (1) Bluetooth compatible.
      (2) Equipped with onboard software allowing for the configuration of RTK, PPK, or Static rover modes.
      (3) Meet waterproof specification IPX7.
      (4) Shockproof for a drop onto a hard surface from a height of 4 feet.
      (5) Full QWERTY keyboard with numeric keypad, and/or equivalent touch screen interface.
      (6) Capable of collecting data in WGS84 and displaying local project coordinates.
      (7) Equipped with onboard software that allows automatic point logging.
      (8) Capable of creating and storing line-work in DFX or DWG format.
      (9) Equipped with onboard software to allow the user to stake-out points, 3D lines, and DTM surfaces. Software shall allow the user to read cut/fill elevations relative to a DTM surface.
      (10) Capable of importing, exporting, and storing point, line, and DTM data.
      (11) Capable of showing satellite, radio, and battery status.
      (12) Equipped with onboard software that allow the user to create and manage survey jobs, point data, coordinate systems, and alignments.
      (13) Equipped with a removable memory storage device with a minimum capacity of 512MB.
      (14) Capable of storing custom configuration settings for the GPS Rover Unit.
      (15) Ensure the controller contains the manufacturer's latest firmware upgrades.
      (16) Provide the manufacturer's user guide.

   c. Radio System
      (1) Meet waterproof specification IPX7.
      (2) Support a frequency compatible with the Reference Station.
      (3) Capable of storing multiple radio frequencies.
      (4) Compatible with the Reference Station's broadcasting format and protocol.
      (5) Power and programming cables.
      (6) Provide the manufacturer's user guide.

d. Batteries
   (1) Provide all batteries required to fully power and operate the GPS Rover Unit.
   (2) Batteries shall be capable of powering their respective equipment continuously, for not less than 6 hours under normal operating conditions.
   (3) Each battery shall be rechargeable and commercially available.
   (4) Provide an identical replacement backup battery for each primary battery required.
   (5) Provide all power connectors necessary to connect the batteries to the equipment.
   (6) Provide battery chargers to allow all onboard batteries to be charged simultaneously, and that safeguard against overcharging.

e. Rod
   (1) Fixed height (non-adjustable).
   (2) Mounting hardware for GPS controller and radio.
   (3) Pole grip with bubble level.
   (4) Detachable bipod.
   (5) Interchangeable flat and pointed footings.
   (6) Quick release adapter for the GPS receiver.

f. Carrying Case
   (1) Hard Shell.
   (2) Shockproof.
   (3) Waterproof.
   (4) Capacity to hold all components of the GPS rover, minus the rod.

2. Continually Operating Reference Station – The location of the CORS shall not change for the duration of the project. The CORS shall be permanently mounted per NGS CORS standards. All structures, mounting hardware, power supply, computers, software, networking, and personnel required to support and operate the CORS is considered subsidiary to this item. Store CORS data for the duration of the project, and post online for use by the Engineer. The CORS shall include and conform to the following requirements:

   a. GPS Receiver
      (1) Choke-ring antenna, model shall have undergone antenna calibration by the NGS.
      (2) Meet waterproof specification IPX7.
      (3) Shockproof for a drop onto a hard surface from a height of 4 feet.
      (4) Able to operate in temperatures between -20º F to +140º F.
      (5) Capable of logging L1/L2 data continuously for 180 days, and storing at 1 second intervals. If onboard memory storage capacity is insufficient, backup all data on an external memory storage device.
      (6) Support multiple, simultaneous data logging sessions at different collection rates.
      (7) Equipped with a dual frequency receiver capable of tracking L1, L2, and GNSS frequencies on at least 12 satellites. Receiver shall have a minimum of 24 channels.
      (8) Support CMR/CMR+ and RTCM output simultaneously via separate ports.
      (9) Use multi-path mitigation techniques.
      (10) Satellite acquisition technology shall provide improved tracking in areas of high radio interference such as under power lines, around airports, near radio-intensive construction sites.
      (11) Capable of 1PPS output with an accuracy of 1*u*sec.
      (12) Equipped with 1 primary and 1 secondary power input port.
      (13) The system shall automatically switch between power sources.
      (14) Equipped with over-voltage protection on all power inputs.
      (15) Capable of reporting Signal-to-Noise Ratio (SNR) values for L1 and L2.
      (16) Capable of logging data at operator selected intervals of 0.5, 1, 5, and 30 seconds.
      (17) Provide the manufacturer's user guide.

b. Radio
   (1) Transmission power, 25 watt minimum.
   (2) Meet waterproof specification IPX7.
   (3) Ensure the radio has a current license to broadcast in accordance with FCC requirements.
   (4) Ensure the radio broadcast frequency doesn't conflict with other nearby broadcasting sources.
   (5) Provide the manufacturer's user guide.

c. CORS Facility – Provide a facility to mount and house CORS station equipment.
   (1) Facility shall meet NGS CORS mounting requirements, and shall be approved by the Engineer.
   (2) Shall be physically located in a clear view of the sky, away from objects that may cause multi-path interference.
   (3) Location shall provide for maximum strength of geometry relative to the primary control network and the project limits.
   (4) Shall be connected to a primary power source, and a backup power source capable of providing uninterrupted backup power for a minimum of 48 hours.

3. GPS Base/Repeater Station – All components shall be fully compatible to provide a stand-alone GPS Base/Repeater Station setup. The setup shall include the following:

a. Receiver
   (1) Meet waterproof specification IPX7.
   (2) Shockproof for a drop onto a hard surface from a height of 4 feet.
   (3) Dual frequency receiver capable of tracking at least 12 satellites simultaneously on parallel channels.
   (4) Antenna model shall have undergone antenna calibration by the NGS.
   (5) Ensure the receiver contains the manufacturer's latest firmware upgrades.
   (6) Carrying case.
   (7) Tribrach with optical plummet and height rod.
   (8) Provide the manufacturer's user guide.

b. Controller
   (1) Equipped with onboard software allowing for configuration as a GPS reference station in RTK, PPK, Static, and Fast Static modes.
   (2) Capable of logging raw observations for post processing.
   (3) Capable of showing satellite, radio, and battery status.
   (4) Meet waterproof specification IPX7.
   (5) Shockproof for a drop onto a hard surface from a height of 4 feet.
   (6) Full QWERTY keyboard with numeric keypad, and/or equivalent touch screen interface.
   (7) Equipped with a removable memory storage device with a minimum capacity of 512MB.
   (8) Equipped with 1 primary and 1 secondary power input port.
   (9) Ensure the controller contains the manufacturer's latest firmware upgrades.
   (10) Provide the manufacturer's user guide.

c. Radio
   (1) Transmission power, 1 watt minimum.
   (2) Meet waterproof specification IPX7.
   (3) Shockproof for a drop onto a hard surface from a height of 4 feet.
   (4) Support a frequency compatible with the Reference Station.
   (5) Capable of storing multiple radio frequencies.
   (6) Compatible with the CORS broadcasting format and protocol.
   (7) Ensure the radio has a current license to broadcast in accordance with FCC requirements.
   (8) Ensure the radio broadcast frequency doesn't conflict with other nearby broadcasting sources.
   (9) Equipped with onboard software/firmware allowing for configuration as either a Reference Station or a Repeater Station.
   (10) Carrying case.
   (11) Antenna.
   (12) Antenna/pole mounting adapter.
   (13) Provide the manufacturer's user guide.

d. Tripods – Provide one of each:
   (1) Conventional tripod with extendible range pole. Include carrying case.
   (2) Conventional wood tripod.

e. Batteries
   (1) Provide all batteries required to fully power and operate the GPS Base/Repeater Station.
   (2) Batteries shall be capable powering their respective equipment continuously, for not less than 6 hours under normal operating conditions.
   (3) Each battery shall be rechargeable and commercially available.
   (4) Provide an identical replacement backup battery for each primary battery required.
   (5) Provide all power connectors necessary to connect the batteries to the equipment.
   (6) Provide battery chargers to allow all batteries to be properly charged, and that safeguard against overcharging.

4. Computer Hardware – Hardware shall meet the following minimum requirements:

a. Laptop Computer
   (1) 2.8 GHz multi-core CPU.
   (2) 120GB Internal Hard Drive.
   (3) 4 GB System RAM.
   (4) Display 13” with 1,600 x 1,200 resolution.
   (5) 512MB video memory.
   (6) DVD Burner Drive.
   (7) Internal Bluetooth and Wi-fi.
   (8) Internal Battery.
   (9) 120v AC Adapter.
   (10) 12v DC Adapter.
   (11) Built-in CF, SD, and PCMCIA card ports.
   (12) 4 USB 2.0 ports.
   (13) 1394 (firewire) port.
   (14) Mouse (wireless).
   (15) Travel Case (hard) for laptop and accessories.

b. Laptop Computer Mount
   (1) Permanently installed in a vehicle, as directed by the Engineer.
   (2) Fastened to the passenger side of the vehicle.
   (3) Shock and vibration resistant.
   (4) Fully adjustable positioning with mechanically locking hinge points.

c. Desktop Computer
   (1) 3 GHz multi-core CPU
   (2) 120GB Internal Hard Drive
   (3) 4 GB System RAM
   (4) Compatible DVI 19” monitor with 1,600 x 1,200 resolution
   (5) Internal video card/chip, 512MB, 2 DVI ports
   (6) Internal DVD Burner Drive
   (7) CF and SD media card reader
   (8) 6 USB ports
   (9) 1394 (firewire) port
   (10) Internal wireless (IEEE 802.11 b/g) network card
   (11) Internal Ethernet card (10/100 Mbps).
   (12) Uninterruptible Power Source (UPS), 8 outlets, 390 Watt
   (13) 250 GB Backup Hard Drive (external)
   (14) Mouse and Keyboard

d. Laser Printer
   (1) 45 pages per minute print speed.
   (2) 1200 x 1200 dpi print quality.
   (3) Main tray capacity shall hold no less than 500, 8.5 x 11 inch sheets.
   (4) Multipurpose tray capable of custom sizes up to 11 x 17 inch sheets.
   (5) 128 MB of onboard memory, minimum.

5. Computer Software – All software shall be licensed and fully operational. Provide software that is similar or approved equal in accordance with the following:

   a. Operating System Software – Provide an operating system that supports the drivers of all onboard and auxiliary computer hardware systems. The operating system shall be of the latest release, with the most current updates installed. The operating system shall support all of the applications listed below.

   b. CAD Software – Provide CAD software that is capable of dynamically associating and updating alignment, profile, section, grading, point, and surface data. The software shall be capable of saving all data to formats that are compatible with the latest release of CAD software currently used by the Department. Formatting shall preserve the dynamic relationship of all DTM features. Software that doesn't dynamically associate all DTM features is not acceptable.

   c. Word Processing Software – Provide software that is compatible with the latest release of word processing software currently used by the Department.

   d. Spreadsheet Processing Software – Provide software that is compatible with the latest release of spreadsheet processing software currently used by the Department.

   e. Anti-Virus Software – Provide software to protect against viruses and other security threats. Software shall be equipped with a firewall containing industry standards of system protection. The software shall be capable of backing up all hard drive data.

   f. GPS Processing Software – Provide GPS processing software of the latest release and from the same vendor as the GPS equipment furnished. Include all necessary hardware/software keys to enable L1 & L2 Static, PPK, and RTK processing, GNSS processing, network adjustments, datum and map transformations, and RINEX data importing and exporting.

Z546590000

642-4.01 METHOD OF MEASUREMENT. Add the following:

The work will be measured according to Section 109, and as follows:

Pay Item 642.2008.____ Passing Sight Distance Measurement. By the number of stations of the project measured separately along centerline, once for each direction, only after the certified and recorded results (642-3.01 12a & 12b) have been accepted by the Engineer.

C642.2-15.0722-1

Contractor Furnished Engineering Tools. Contingent sum work will be measured in accordance with the directive authorizing the work.

Z546590000

642-5.01 BASIS OF PAYMENT. Add the following Pay Items:

PAY ITEM

Item Number	Item Description	Unit
642.2005.____	Contractor-Furnished Computations	LS
642.2006.____	Contractor-Furnished Engineering Tools	CS
642.2008.____	Passing Sight Distance Measurement	STA

C642.2-15.0722-1/Z546590000

Existing Striping, Passing Sight Distance and Final Striping

Project Name and Number: *Example Project Striping, X-(XX)/XXXXX*
Road Name: *Traveled Way*
Stationing: From *101+00* To *129+00*
Surveyor & License Number: *Name, License #* Date of Survey: *mmddyy*

1. Station (ft.)	2. Speed/ Req'd Dist. (mph/ft)	SB Travel 3. Sight Dist. (ft)	Existing Striping 3a. CL	NB Travel Existing Striping 4a.	4. Sight Dist. (ft)	SB Travel 5. Final Striping 5a. CL	NB Travel Final Striping 5b.	6. Comments
101+00	45/700	>500 F			>500 F			
102+00	45/700	>550 F			>400 F			
103+00	45/700	>600 F			>400 F			
104+00	45/700	>600 F			>400 F			
105+00		>600 F			>400 F			
106+00		>500 F			>500 F			
107+00		>400 F			>500 F			
108+00		>400 F			>600 F			
109+00		>400 F			>550 F			
110+00		>500 F			>500 F			
111+00	45/ 700	>500 F			=700 P			
112+00		=700 P			=700 P			
113+00		=700 P			<800 P			
114+00		<800 P			<800 P			
115+00		<800 P			<800 P			
116+00		<800 P			<900 P			
117+00		<900 P			<900 P			
118+00		<1200 P			<1000 P			
119+00		<1200+ P			<1000 P			
120+00	45/700	"			<1000 P			
121+00	30/500	"			<1000 P			
122+00	30/500	"			<1200 P			
123+00	30/500	"			<1200+ P			
124+00	30/500	"			"			
125+00	30/500	"			"			
126+00	30/500	"			"			
127+00	30/500	"			"			
128+00	60/900	"			"			
129+00	60/900	<1200+ P			<1200+ P			

Existing Striping, Passing Sight Distance and Final Striping

Project Name and Number: _____

Road Name: _____

Stationing: From _____ To _____

Surveyor & License Number: _____ Date of Survey: _____

1. Station (ft.)	2. Speed/ Req'd Dist. (mph/ft)	__ Travel 3. Sight Dist.	__ Travel Existing Striping 3a. ↓ CL 4a. ↑	__ Travel 4. Sight Dist.	__ Travel 5. Final Striping 5a. ↓ CL 5b. ↑	6. Comments

Existing Striping 12a. – Date Received: _____

_____ Date Returned: _____
DOT/PF Engineer

Sight Distance 12b. – Date Received: _____

_____ Date Returned: _____
DOT/PF Engineer

Final Striping 12c. – Date Received: _____

_____ Date Returned: _____
DOT/PF Engineer

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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.

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Closures and Major Traffic Sequencing (events). No later than three (3) weeks prior to each proposed event or subsequent proposed change to an approved event, Contractor shall submit a written request to the Engineer for review and approval of each proposed event and event date for highway closures. For railroad closures, the minimum time shall be four (4) weeks notice, or longer as necessary to ensure compliance with conditions included in the ARRC temporary construction permit (ARRCTCP). The approved proposed event date shall be no less than two (2) weeks from the date of written approval for all closures.

1. Railroad Closures: The Alaska Railroad Corporation (ARRC) will allow closures for installation of culverts and other associated work beneath or in close proximity of the ARRC tracks outside of ARRC passenger train windows. Refer to ARRC temporary construction permit (ARRCTCP) and Section 686 Alaska Railroad Coordination for requirements.

2. Blasting and Road Closures: The Department may permit road closures nightly from 20:00 to 05:00 (Alaska Time adjusted as customary for Daylight Saving Time), two (2) times per week, from May 15th to September 15th of each calendar year. Outside of the May 15th to September 15th window, the Department may permit nightly road closures from 20:00 to 05:00 (Alaska Time adjusted as customary for Daylight Saving Time), seven (7) days per week. Contractor shall publish a schedule of road closures approved by the Engineer per Subsection 643-3.03 Public Notice. Alaska Railroad track closures may also be required for blasting activities. The Contractor shall comply with all scheduling requirements of the ARRCTCP and Section 686 Alaska Railroad Coordination for track closure requirements.

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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.

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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.

Limits of unpaved surfaces on the Seward Highway are as follows:

1. Through traffic shall not traverse more than two gravel sections of roadway in any given period. These sections shall be no more than one mile in length.

2. Pavement Break(s) for Culvert or Utility Work: Patch pavement breaks(s), with hot mix asphalt, not more than 48 hours after removing the existing pavement.

3. When approved by the Engineer.

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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.

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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 Thursday**: 0530 hrs to 0800 hrs and 1630 hrs to 1900 hrs.

2. **Weekends**. Friday 0530 hrs to Sunday 2200 hrs

3. **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.

Road Closures: Except as restricted above, the Department will permit closures per section 643-1.03 Traffic Control Plan Closures and Major Traffic Sequencing (events). Work items include but are not limited to rock blasting, excavations, and culvert removal/installation. Start and end times for the full road closures may be shifted one hour at the Engineer's discretion.

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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.

Do not delay the school buses 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.

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. Traffic Traversing Unpaved Surfaces 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 ADOT & 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
Temporary ADA Facilities		
ADA Pedestrian Rail	Lineal Foot	$6.00
ADA Pedestrian Barrier	Lineal Foot	$8.00
ADA Ramps and Hole Covers in Path	Square Foot	$10.00
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
643.0001.____	Traffic Maintenance	CDAY
643.0002.____	Traffic Maintenance	LS
643.0003.____	Permanent Construction Signs	LS
643.0004.____	Construction Sign	Day
643.0005.____	Type II Barricade	Day
643.0006.____	Type III Barricade	Day
643.0007.____	Traffic Cone/Tubular Marker	Day
643.0008.____	Plastic Safety Fence	LF
643.0009.____	Drum	Day
643.0010.____	Sequential Arrow Panel, Type C	Day
643.0011.____	Special Construction Signs	SF
643.0012.____	Portable Concrete Barrier	Each
643.0013.____	Temporary Crash Cushion	Each
643.0014.____	Interim Pavement Marking	STA
643.0015.____	Flagging	HR
643.0016.____	Pilot Car	HR
643.0017.____	Street Sweeping	HR
643.0018.____	Watering	MGAL
643.0019.____	Lane Closure	HR
643.0020.____	Detour	Day
643.0021.____	Road Closure	Day
643.0022.____	One Lane Road	HR
643.0023.____	Traffic Price Adjustment	CS
643.0024.____	Portable Changeable Message Board Sign	Day
643.0025.____	Traffic Control	CS
643.0026.____	Temporary Sidewalk Surfacing	SY
643.0027.____	Temporary Guardrail	LF
643.0030.____	Portable Steel Barrier	LF
643.0031.____	Interim Pavement Marking	LS
643.0032.____	Flagging	CS
643.0033.____	Detour	LS

C643-25.1001

SECTION 644
SERVICES TO BE FURNISHED BY THE CONTRACTOR

Special Provisions

Replace Subsection 644-2.01 with the following:

644-2.01 FIELD OFFICE. Furnish and maintain a suitable office for the Engineer, available for occupancy from 2 weeks before beginning work, through 30 days after issuance of the notice of project completion as defined in Subsection 105-1.15. The following office requirements shall be met:

1. A minimum of 1000 square feet of floor area. The office area shall be divided so that it contains an office room separated by a closable door. The office room shall have a minimum of 160 square feet of floor area.
2. A thermostatically controlled interior heating system with necessary fuel.
3. Adequate electrical lighting and 120 volt, 60 hertz power, with a minimum of 6 electrical outlets.
4. A minimum of 100 square feet of window area and adequate ventilation.
5. Adequate parking for a minimum of 16 vehicles, with one handicap parking space meeting the requirements of Americans with Disabilities Act Accessibility Guidelines (ADAAG).
6. Attached indoor plumbing with sanitary lavatory facilities and potable drinking water provided.
7. Provide engineering communication services to the field office, Subsection 644-2.08.
8. If a part of the Contractor's building, it shall be completely partitioned off from the balance of the structure and provided with a separate outside door equipped with a lock.
9. Located within 3 miles of the project.
10. Weekly janitorial service consisting of emptying trash receptacles, vacuuming office area, and cleaning restrooms and counter areas.
11. Provide one mobilization and one demobilization of the Engineer's office equipment and furniture.
12. Provide a security system controlled by the Department for the office including camera coverage for the vehicle parking.

C644.1-20.0801_FOCOM

644-2.02 FIELD LABORATORY.

Replace 2.g. with the following:

g. 500 gallon capacity tank with a pressure pump or a commercial pressurized system.

Replace Subsection 2.h.(2) and (3) with the following:

(2) Wiring system to support a 100-amp user load demand with one 50-amp and two 20-amp circuits, all GFI protected.
(3) Outlets, ten conveniently spaced around the lab, 20-amp capacity, with no more than five outlets per circuit, and consistent with local codes.

Add 2.h.(6):

(6) Outside outlet, 220-volt.

Replace Subsection 4.c.(3) with the following:

(3) Wiring system with each circuit GFI protected to satisfy a 60-amp user load demand. Provide three 20-amp circuits each with a 20-amp outlet. Space the outlets around the shed for the users convenience.

Replace 6.a. with the following:

a. Supply 240 volt, 60 hertz power, a 100 pound propane bottle, and a 500 gallon capacity water tank with a pressure pump or a commercial pressurized system for a State provided portable asphalt lab at a location designated by the Engineer.

Add the following:

7. Provide one mobilization and one demobilization of the Engineer's laboratory equipment from Anchorage.

8. Provide engineering communication services to the field laboratory, Subsection 644-2.08.

9. Provide a security system controlled by the Department for the lab including camera coverage for the vehicle parking.

C644.2-20.0801-1_LAB

644-2.05 VEHICLES.

Replace the second and third paragraphs with the following:

Pickup(LT)/Sport Utility Vehicle (SUV): Furnish full-size, four-wheel drive vehicles, either pickup/light truck(s) with crew cabs or sport utility vehicle(s). Provide vehicles less than three model years old, in good condition, and with less than 36,000 miles on the odometer. Furnish all fuels, maintenance and parts, and insurance during the Department's operation and use.

Equip each vehicle with lightbars wired into the vehicle's electrical system with a dash mounted switch easily accessible to the vehicle operator. Provide Code 3; Reflex C5590AA 15.3-inch mini lightbar, or approved equal. Approved equal equipment shall have the following characteristics:

- (4) 55 watt rotators with amber filters
- 1200 flashes per minute
- (2) diamond mirrors
- 55 inches in length

Equip each vehicle with hands-free communication connectivity.

If you are working after October 1, provide four studded snow tires mounted on each vehicle.

You are responsible for normal wear and tear, and any other incidental damage including broken windshields, occurring during the Department's operation and use. The State of Alaska is responsible for damage to any vehicle caused by its own negligent operation.

C644.3-20.1130_LTSUV

Add the following Subsection 644-2.08 Engineering Communication and Office Equipment:

644-2.08 ENGINEERING COMMUNICATION AND OFFICE EQUIPMENT. Engineering Communications and Office Equipment, minimum service includes:

1. Three phone/facsimile lines and commercial phones (different phone numbers for each line)

   a. One phone with built-in digital answering machine.
   b. Ancillary equipment for operational service and as required by the Engineer.

2. High speed internet service with modem (DSL or Cable)

    a. Send and receive capability supporting 10.0 Mbps download and upload speed or higher at all times.
    b. Data usage, 10 GB minimum monthly.
    c. Wireless router.
    d. Battery backup.
    e. Ancillary equipment for operational service and as required by the Engineer.

3. Equipment rental services

    a. All-in-one printer/copier/scanner
        (1) Black-white and color
        (2) Pages per minute (ppm): 50
        (3) Paper trays: 8.5" x 11" and 11" x 17"
        (4) Capacity: 1100 sheets minimum

C644.1-20.0801_FOCOM

644-4.01 METHOD OF MEASUREMENT.

Replace the third paragraph with following:

Vehicle (LT/SUV). For each vehicle provided. If a replacement vehicle is necessary, no additional measurement will be made.

C644.3-20.1130_LTSUV

644-5.01 BASIS OF PAYMENT.

Add the following:

Electricity, propane, and water supplied for the State provided portable asphalt lab will not be paid for separately, but will be subsidiary to Pay Item 644.0002.____ Field Laboratory.

C644.2-20.0801-1_LAB

Add the following:

Pay Item 644.2007.____ Vehicle (LT/SUV):

1. A percentage of the Contract unit price, to be determined by the Engineer, will be paid as full compensation for furnishing the vehicle at the site.

2. The balance of the Contract unit price will be prorated over the anticipated active construction period with a portion included as part of each interim payment, for maintenance, repairs, and fuel and, at the end of the project, for removing it from the site. If anticipated construction period changes, the final increment will be held until final payment.

PAY ITEM

Item Number	Item Description	Unit
644.2007.____	Vehicle (LT/SUV)	Each

C644.3-20.1130_LTSUV

Add the following:

Pay Item 644.2004.____ Engineering Communications:

Usage services including long distance calls made by State personnel and the Internet service provider will be reimbursed by the State. Payment for communication usage services and equipment rental agreements shall be based on paid receipts to the service provider plus 15%.

Connection fees (initial connection) local calls, providing equipment and disconnection are subsidiary to Pay Item 644.0001.____ Field Office and as such are paid by the Contractor.

PAY ITEM

Item Number	Item Description	Unit
644.2004.____	Engineering Communications	CS

C644.1-20.0801_FOCOM

Special Provision

Replace Section 645 with the following:

SECTION 645
TRAINING PROGRAM

645-1.01 DESCRIPTION. This Statewide Special Provision for on-the-job training (OJT) implements 23 CFR 230, Subpart A, Appendix B.

As part of the Equal Employment Opportunity Affirmative Action Program, the Contractor shall provide on-the-job training aimed at developing full journey status in the type of trade or job classification involved. The number of individuals to be trained and the number of hours of training to be provided under this contract will be as shown on the bid schedule.

645-2.01 OBJECTIVE. Training and upgrading of minorities and women toward journey status is the primary objective of this program. The Contractor shall enroll minorities and/or women, where possible, and document good faith efforts prior to the hire of non-minority males in order to demonstrate compliance with this Training Special Provision. Specific good faith efforts required under this Section for the recruitment and employment of minorities and women are found in the Federal EEO Bid Conditions, Form 25A-301.

645-3.01 GENERAL. The Contractor shall determine the distribution of the required number of apprentices/trainees and the required number of hours of training among the various work classifications based upon the type of work to be performed, the size of the workforce in each trade or job classification, and the shortage of minority and female journey workers within a reasonable area of recruitment.

Training will be provided in the skilled construction crafts unless the Contractor can establish prior to contract award that training in the skilled classifications is not possible on a project; if so, the Department may then approve training either in lower level management positions such as office engineers, estimators, and timekeepers, where the training is oriented toward construction applications, or in the unskilled classifications, provided that significant and meaningful training can be provided. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Credit for offsite training hours indicated above may only be made to the Contractor where the apprentices/trainees are concurrently employed on the project and the Contractor does one or more of the following: contributes to the cost of the training, provides the instruction to the apprentice/trainee, or pays the apprentice's/trainee's wages during the offsite training period.

Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

Prior to award of the contract, the Contractor shall submit Form 25A-311, Training Utilization Report, indicating the training program to be used, the number of apprentices/trainees to be trained in each selected classification, the number of hours of training to be provided, and the anticipated starting time for training in each of the classifications.

Training must begin within 2 weeks of the anticipated start date(s); unless otherwise authorized by a Directive. Such authorization will be made only after submission of documentation by the Contractor, and approval by the Engineer, of efforts made in good faith which substantiate the necessity for a change.

Contractors may use a training program approved by the U.S. Department of Labor, Office of Apprenticeship (USDOL/OA); or one developed by the Contractor using Form 25A-310 and approved prior to contract award by the OJT Coordinator in the DOT&PF Civil Rights Office.

The minimum length and type of training for each classification will be established in the training program selected by the Contractor. Training program approval by the Department for use under this section is on a project by project basis.

It is expected that each apprentice/trainee will begin training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist or until training has been completed. It is not required that apprentices/trainees be continuously employed for the duration of the contract.

If, in the judgment of the Contractor, an apprentice/trainee becomes proficient enough to qualify as a journey worker before the end of the prescribed training period and the Contractor employs that individual as a journey worker in that classification for as long as work in that area remains, the individual's training program will be considered completed and the balance of training hours required for that apprentice/trainee shall be waived.

The Contractor shall furnish each ADOT&PF training program trainee a copy of the program (Form 25A-310) to be followed during training on the project, and with a written certification showing the type and length of training completed on the project. Existing USDOL/OA apprentices should already have a copy of their program. No employee shall be employed for credit as an apprentice/trainee in a classification in which that employee has previously worked at journey status or has previously completed a training course leading to journey status.

The Contractor shall periodically review the training and promotion potential of minority and women employees and shall encourage eligible employees to apply for such training and promotion.

The Contractor shall provide for the maintenance of records and the furnishing of periodic reports documenting the progress of each apprentice/trainee. The Contractor must submit Form 25A-313 by the 15th of each month and provide each ADOT&PF trainee written evaluation reports for each unit of training provided as established on Form 25A-310.

645-3.02 WAGES. Trainees in ADOT&PF approved training programs will be paid prevailing Davis-Bacon fringe benefits plus at least 60 (but less than 100) percent of the appropriate minimum journey rate specified in the contract for the first half of the training period, at least 75 (but less than 100) percent for the third quarter of the training period, and at least 90 (but less than 100) percent for the last quarter of the training period. Trainee wages shall be identified on Form 25A-310. Apprentices in USDOL/OA training programs shall be paid in accordance with their approved program. Beginning wages of each trainee/apprentice enrolled in a Section 645 Training Program on the project shall be identified on Form 25A-312.

645-3.03 SUBCONTRACTS. In the event the Contractor subcontracts a portion of the work, he shall determine how many, if any, of the apprentices/trainees are to be trained by the subcontractor. Any such subcontracts shall include this Section 645, Form 25A-311 and Form 25A-310, where appropriate. However, the responsibility for meeting these training requirements remains with the Contractor; compliance or non-compliance with these provisions rests with the Contractor and sanctions and/or damages, if any, shall be applied to the Contractor in accordance with subsection 645-5.01, Basis of Payment.

645-4.01 METHOD OF MEASUREMENT. The Contractor will be credited for each approved apprentice/trainee employed on the project and reimbursed on the basis of hours worked, as listed in the certified payrolls. There shall be no credit for training provided under this section prior to the Contractor's submittal and approval by the Engineer of Form 25A-312 for each apprentice/trainee trained under this Section. Upon completion of each individual training program, no further measurement for payment shall be made.

645-5.01 BASIS OF PAYMENT. Payment will be made at the contract unit price for each hour of training credited. Where a trainee or apprentice, at the discretion of the Contractor, graduates early and is employed as a journey worker in accordance with the provisions of Subsection 645-3.01, the Contractor will receive payment only for those hours of training actually provided.

This payment will be made regardless of any other training program funds the Contractor may receive, unless such other funding sources specifically prohibit the Contractor from receiving other reimbursement.

Payment for training in excess of the number of hours specified on the approved Form 25A-311 may be made only when approved by the Engineer through Change Order.

Non-compliance with these specifications shall result in the withholding of progress payments until good faith efforts documentation has been submitted and acceptable remedial action has been taken.

Payment will be at the end of the project following the completion of all training programs approved for the project. No payment or partial payment will be made to the Contractor if he fails to do any of the following and where such failure indicates a lack of good faith in meeting these requirements:

1. provide the required hours of training (as shown in the Bid Schedule and approved Form 25A-311),

2. train the required number of trainees/apprentices in each training program (as shown in the Bid Schedule and approved Form 25A-311), or

3. hire the apprentice/trainee as a journey worker in that classification upon completion of the training program for as long as work in that area remains.

Failure to provide the required training damages the effectiveness and integrity of this affirmative action program and thwarts the Department's federal mandate to bring women and minorities into the construction industry. Although precise damages to the program are impractical to calculate, they are at a minimum, equivalent to the loss to the individuals who were the intended beneficiaries of the program. Therefore, where the Contractor has failed, by the end of the project, to provide the required number of hours of training and has failed to submit acceptable good faith efforts documentation which establishes why he was unable to do so, the Contractor will be assessed an amount equal to the following damages to be deducted from the final progress payment:

Number of hours of training not provided, times the journey worker hourly scale plus benefits. The journey worker scale is that for the classification identified in the approved programs.

PAY ITEM

Item Number	Item Description	Unit
645.0001.____	Training Program, __ Trainees/Apprentices	LH

HSP20.2-20.1130_FED

SECTION 646
CPM SCHEDULING

Special Provisions

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.

C646.1-23.0501

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 payed 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 647.2000.____ Wide Pad Dozer, 65-HP Minimum: payed at the rate of $250/hour.

Pay Item 647.2002.____ Backhoe, 4WD, 1 CY Bucket, 75-HP Minimum, 15 ft Depth: payed at the rate of $225/hour.

PAY ITEM

Item Number	Item Description	Unit
647.2000.____	Wide Pad Dozer, 65-HP Minimum	CS
647.2002.____	Backhoe, 4WD, 1 CY Bucket, 75-HP Minimum, 15 ft Depth	CS

C647-16.1103-2

Special Provisions

Add the following Section:

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)
- AT & T Alascom (AT&T)
- Chugach Electric Association (CEA)
- ENSTAR Natural Gas (ENS)
- GCI Communication Corp.
- Homer Electric Association (HEA)
- Telalaska Inc. (Interior Phone, Eyecom TV & Mukluk Telecom)

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.

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.

CR651-23.0601

The contractor shall coordinate and provide all required support for utilities relocation during construction. This support work can include: SWPPP, traffic control, clearing, grubbing, and excavation.

The Contractor shall hold a utility coordination meeting with the utilities below prior to construction to coordinate the utility relocation work sequencing.

Z546590000

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.

CR651-23.0601

Work done by utility owner(s) is as follows:

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651-1.04 COOPERATION BETWEEN CONTRACTORS. The following state owned projects may be under construction concurrently with this project.

Project Name:	Project No.:

Coordinate traffic control, construction, and material hauling operations with the prime contractor of the above projects to minimize impact on the traveling public, and to minimize conflicts with the work being performed under the other contracts.

CR651-23.0601

Special Provisions

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."

C652-24.0610

Special Provisions

Add the following Section:

SECTION 654
MONITOR

654-1.01 DESCRIPTION. When authorized by directive, engage a Professional Service Contractor to monitor eagle(s) at their nests.

654-1.02 SUBMITTAL.

1. Eagle Monitoring Plan and documentation as required by the monitoring plan.

2. Professional Service Contractor resume(s).

654-1.03 QUALIFICATIONS. Each position is required to be an employee of the Professional Service Contractor.

Professional Service Contract Manager

1. Bachelor of Science degree in biology, environmental science, or ecology and working in the field of the degree, or

2. Two years of experience monitoring or studying the habitat of birds of prey.

Monitor

1. Professional Service Contract Manager or a person trained and supervised by the Professional Service Contract Manager or other similarly qualified representative.

654-2.01 MATERIALS.

Video Camera	Optical zoom lens, minimum 10 power

654-3.01 CONSTRUCTION REQUIREMENTS.

Before beginning construction activity in the restricted area(s) specified in the directive, submit and receive approval for the following:

1. The qualifications of the Professional Service Contract Manager and Monitor.

2. An Eagle Monitoring Plan prepared by the Professional Service Contract Manager coordinated with the Contractors' Work Plan for work in the restricted area or any timing restricted period.

During Construction, submit and receive approval for the following:

1. Eagle monitoring documentation, reports, forms, video as required by the approved Eagle Monitoring Plan and included in the authorizing directive.

Refer to Section 107-1.11 Eagles for further information.

654-4.01 METHOD OF MEASUREMENT. Eagle monitoring measured as specified in the authorizing directive.

654-5.01 BASIS OF PAYMENT. Eagle monitoring work specified in the authorizing directive.

PAY ITEM

Item Number	Item Description	Unit
654.2002.____	Eagle Monitoring	CS

C654-17.1001-1

Special Provision

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.

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.

   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.

660-3.14 ARC FLASH HAZARD WARNING. Label traffic controller cabinets, and other electrical equipment that is likely to require examination, adjustment, servicing, or maintenance while energized, to warn qualified persons of potential electrical arc flash hazards per NEC 110.16. The labels must meet the requirements in NEC 110.21(B) and must contain the information required in NFPA 70E 130.5(H).

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 660.0001.____Traffic Signal System Complete, ( ).

1. Signal structures
2. Traffic controller assemblies including assembly testing and preparation, vehicle and pedestrian indications, detection systems, emergency vehicle preemption systems, PTZ cameras, auxiliary and test equipment, on-site manufacturer assisted start up, and training when called for in the Plans.
3. Work associated with installing loop detectors and conduit crossings, and any other items except when included in a separate Pay Items such as saw cutting, asphalt removal, aggregate base course, tack coating, and installing new hot mix asphalt.
4. Includes salvage of existing signal system components not specified in plans to be reused, when not included as a separate item.

Pay Item 660.0003.____Highway Lighting System Complete, ( ).

1. Lighting structures.
2. Includes salvage of existing lighting components not specified in plans to be reused, when not included as a separate item.

Pay Item 660.2000.____ Temporary Electrolier.

1. Work to have plans and materials approved.
2. Temporary electrolier including the structures, foundations, and load centers (as needed) and their removal. Moving the electroliers, assembly and operational installation, removing and replacing, and installing conductors (in conduit or direct bury only). Furnishing and installing temporary electrical load centers when existing load centers are not available for use.
3. Temporary electrolier will be paid on a contingent sum basis at the unit price of $3300/each. The Engineer does not require a change order/directive for this Pay Item.

Pay Item 660.2008.____ Traffic Loop Replacement.

1. Replace loops within the specified depth of planning that are damaged during the planning operation at a rate of $1250 each. Loops outside the specified depth of planning that are damaged during the planning operation are replaced at no expense to the Department per 202-5.01.

Payment will be made under:

PAY ITEM

Item Number	Item Description	Unit
660.0001.____	Traffic Signal System Complete, _____	LS
660.0002.____	Flashing Beacon System Complete, _____	LS
660.0003.____	Highway Lighting System Complete, _____	LS
660.0004.____	Sign Illumination System Complete, _____	LS
660.0005.____	Structure Illumination System Complete, _____	LS
660.0007.____	Temporary Signal System Complete, _____	LS
660.0008.____	Temporary Illumination System Complete	LS
660.0009.____	Bored Casing, ___-Inch Minimum Diameter	LF
660.0011.____	Traffic Loop	Each
660.0012.____	Underpass Lighting System Complete	LS
660.0013.____	Relocate Electrolier	Each
660.2000.____	Temporary Electrolier, _____	CS
660.2001.____	Signal and Lighting Salvage, _____	LS
660.2002.____	Pedestrian Lighting, _____	LS
660.2003.____	Traffic Signal System Modifications _____	LS
660.2004.____	Adjust Junction Box	Each

PAY ITEM

Item Number	Item Description	Unit
660.2005.____	Junction Box, Type __	Each
660.2008.____	Traffic Loop Replacement	CS
660.2031.____	Signal System Timing and Adjustments _____	CS

Z546590000

SECTION 661
ELECTRICAL LOAD CENTERS

Special Provisions

661-2.01 MATERIALS.

Add the following:

Precast Concrete Products	Subsection 550-2.03

C661.3-21.0601

Add the following:

Anchor Bolts	Subsection 740-2.02

Load Center.

Replace the 1st and 2nd paragraphs with the following two paragraphs:

NEMA 3R enclosure constructed of .125" thick aluminum, with no external screws, bolts, or nuts.

Shop coat cabinet components with a 2-part urethane paint undercoat and 2-part urethane finish coat. Finish coats must be standard white for removable panels and non-gloss silver-gray, closely matching AMS-STD-595 Color No. 36622, for the enclosure.

C661.1-21.1231-2

Equipment List(s) and Drawings.

Replace No. 1. with the following:

1. Materials on the *Qualified Products List:* The Qualified Products List does not apply to the 661 Pay Items. Provide catalog cuts of materials to the Engineer for review and approval.

3. Materials Not Requiring Certification: Replace the 2nd sentence with the following:

   Submit these materials for review and approval if included on the Materials Certification List (MCL) or requested by the Engineer.

Add the following materials:

Ground Rods. Furnish one piece 3/4" diameter by 10 feet long copper clad steel rods.

Ground Rod Clamps. Furnish one piece bronze clamps with a hex head setscrew that are suitable for direct burial and for use with copper clad ground rods.

Meters. Furnish meter sockets and landing pads rated for 200 Ampere Service.

Photoelectric Controls.

Delete the first sentence and substitute the following:

Use three wire photoelectric controls that directly switch a circuit from one conductor to another. Furnish two piece photoelectric controls that consist of a plug-in control unit and a locking type receptacle set in a cast aluminum adapter.

1. Plug-in Control Unit.

Furnish photoelectric control units that consist of a light sensitive element connected directly to a normally closed, single-pole, single-throw, and control relay free of intermediate amplifications. For highway lighting, use horizontal or zenith type sensing units that:

a. Operate at voltages between 120 and 277 VAC, 60 Hz,

b. Handle loads up to 1,800 volt-amperes,

c. Operate at temperatures from -40 °F to +150 °F,

d. Consumes less than 10 watts of power,

e. Feature a 3-prong, EEI-NEMA standard, twist-lock plug,

f. Turn-on between 1.0 and 5.0 foot-candles and turn-off at light levels between 1.5 and 5.0 times those at turn-on.

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.

Screen the photoelectric control units to prevent artificial light from interfering with normal photoelectric control operation. Extend screens to the top of the control units. Use 3 inch wide x 0.063 inch thick (min) aluminum meeting ASTM B209, Alloy 3003-H14.

2. Locking Receptacles.

Furnish twist lock type, phenolic resin receptacles set in one of the following cast-aluminum adapters.

a. For photoelectric controls installed on signal poles and load centers, furnish a mounting adapter with a threaded connection that fits conduit outlet bodies threaded for 1/2 inch rigid metal conduit, General Electric model MB-PECTL or approved equal.

b. For photoelectric controls installed atop lighting poles (with mast arms,) furnish a pole top adapter: equipped with a terminal block, made to slip over the ends of poles 3 1/2 to 4 1/2 inches in outside diameter, and secured by set-screws, General Electric model PTA-PECTL or approved equal.

661-3.01 CONSTRUCTION REQUIREMENTS.

Replace the 11th paragraph with the following:

Install two ground rods at least 8 feet apart at each load center. Connect the neutral bus to the ground rods with a soft drawn bare copper grounding electrode conductor sized per the NEC, 6 AWG minimum. Bond non-current carrying metal parts in each load center to the ground bus. At Type 1 load centers, install one ground rod inside the base, readily accessible though the removable cover, and the second ground rod outside the base. Route the grounding electrode conductor to the second ground rod through one of the knockouts.

Replace the 12th paragraph with the following:

Install photoelectric controls at the locations indicated. Orient photoelectric control units to face the north sky. Install a screen to prevent artificial light from interfering with normal photoelectric control operation.

For photoelectric controls installed on load centers, install a Myers hub in a cabinet wall shielded from traffic. To the hub, attach an assembly that consists of a Type LB conduit body, a length of conduit, and a Type C conduit body. Fabricate the conduit at least 3 ft long and locate the photoelectric control 1 ft above the top of the load center. Mount the photoelectric control adapter on the Type C conduit body. Install a conduit hanger to brace the top of the conduit.

For photoelectric controls installed on signal poles, install a Myers hub in the center of the rain cap. Attach a Type C conduit body to the hub with a close nipple. Mount the photoelectric control adapter on the conduit body. Use five conductor 14 AWG wire to connect the photoelectric control to the load center.

For photoelectric controls installed on electroliers, install a pole top adapter. When the photoelectric control is on a lighting standard with a slip base or frangible coupling style base, use an approved breakaway disconnect in the base of the light standard. Restrain the cable in a similar manner as the illumination cable in the pole base. Use five conductor 14 AWG wire to connect the photoelectric control to the load center.

Add the following:

Coordinate new load centers with existing and or new service utilities.

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.

661-5.01 BASIS OF PAYMENT.

Add the following:

The following work is subsidiary to 661 Pay Items:

- All necessary hardware for mounting (shelf angles, rack, shelving, harness, etc.).
- Removing existing load centers being replaced with new load centers, their foundations, and ground rods.
- Payment of fees required by the local authority for electrical inspection(s) and the costs of correcting the deficiencies noted during the inspection(s).
- All work including, but not limited to, contacting and coordinating with the utilities for service; maintenance and usage payments until the Engineer provides the notice of final acceptance.
- Replaced failed equipment, equipment components and repaired failed workmanship.

C661.1-21.1231-2

Special Provisions

Add the following Section:

SECTION 669
AUTOMATED TRAFFIC RECORDERS

669-1.01 DESCRIPTION. This work shall consist of reconstruction, refurbishing, and installation of Automated Traffic Recorder (ATR) stations.

ATR consists of inductive loop and piezoelectric sensors connected to a traffic counter. In each traffic lane, two inductive loops are separated by a specific travel distance and buried beneath the pavement. Two piezoelectric sensors are located adjacent each inductive loop, embedded in the pavement surface. Lead wires run in underground conduit from the sensors to a type CBA2 cabinet located at the side of the road. Inside the type CBA2 cabinet, the lead wires connect to the traffic counter. The traffic counter detects the presence and speed of passing vehicles from inductive loop signals. The traffic counter detects axle number and center-to-center axle spacing from piezoelectric signals. Presence, speed and axle passage information is processed by the traffic counter to classify the number and type of vehicles, which is stored for later retrieval. ATRs are operated and maintained by personnel of the Highway Data Section (HDS); main office located at 2200 E. 42nd Ave., Anchorage, phone (907) 269-0876.

ATR stations may be equipped with a Temperature Data Probe (TDP), which consists of temperature sensors connected to a data-logger. Sampled conditions may include air temperature, pavement profile temperatures and subgrade profile temperatures. Temperature sensors send voltage signals to the data-logger. Sensor voltage levels are processed by the data-logger to yield temperature information, which is stored for later retrieval.

The locations of traffic detection sensors and cabinets, shown on the Plans are approximate and the Engineer shall establish the exact locations in the field after consultation with the DOT/PF HDS.

669-1.02 REGULATIONS AND CODE. Use materials and workmanship that conforms to the standards of the Underwriter's Laboratories, Inc. and the National Electrical Safety Code and local safety code requirements, where applicable.

Use electrical equipment that conforms to the standards of the National Electrical Manufacturer's Association, where applicable.

669-2.01 MATERIALS. Unless otherwise stated, provide new materials that meet the following requirements:

1. Wiring. Subsection 660-3.05, Wiring. Use single wire conductors and cables that have clear, distinctive and permanent markings on the outer surface throughout the entire length giving the manufacturer's name or trademark, insulation type-letter designation, conductor size, voltage rating and the number of conductors if a cable. Home run label all wires and cables in each junction box and cabinet; for example, W1SLA (for wire) and GaSLA (for cable) as shown on the Plans.

2. Conduit. Subsection 660-3.03, Conduit. Use galvanized rigid metal for conduits, except for PVC conduit forming the inductive loops. Provide grounding bushings with plastic-sleeves to minimize the potential for insulation damage during wire pulls.

3. Junction Boxes. Subsection 660-3.04, Junction Boxes. Label the covers of all junction boxes used for loops or sensor wires 'TRAFFIC'. Label the covers of all junction boxes used to provide electrical service to ATR installations 'ELECTRIC'. Keep junction boxes for 120V/240V electrical service completely separate from junction boxes containing loop or sensor wiring

4. Terminal Blocks. Mount Terminal Blocks to match orientation of the roadway. Use terminal blocks with nickel, silver or cadmium plated brass binder-head screw terminals. Use barrier type

terminal blocks rated 600 VAC at 20 Amps, sized for 12-18 AWG wire with removable shorting bars in each position and with integral type marking strips.

5. Presence Loops. Use UL listed IMSA specification #51-5-1984 single conductor PVC nylon with tube jacket, type THHN, #14 AWG conductors for detector presence loops.

   Use twisted pairs of 18 AWG stranded tinned copper wire for multiple pair loop lead-in cable. Each twisted pair shall have its own 20AWG tinned copper drain wire. An aluminum foil shield shall surround each individual bundle of twisted pair and drain wire. Multiple pair loop lead-in cable shall have an overall PVC or PE outer jacket.

6. Electrical Load Centers. Use NEMA Type 3R Electrical Load Centers and provide a 120/240V 100 amp single-phase, three-wire-circuit electrical service.

7. Style CBA1 Cabinets. Cabinets shall meet or exceed a UL 50, NEMA Type 3R rating. Provide the cabinet type shown in the plans. Construct the cabinet and hinged door from 5052-H32 or better unpainted sheet aluminum alloy with a minimum thickness of 1/8 inch and a smooth grain finish on the exterior. Corbin #2 Key Lock. One (1) adjustable shelf. Drip Shield. Interior has four (4) instruct channels for installing adjustable shelves. Grounding points included on body and door. Door latching mechanism is a single point PowerGlide padlocking handly system which secures the door in the middle. A door stay is included at the botton of the door with three positions: 90, 120, and 180 degrees. Ensure that welds are neatly formed and free of cracks, blowholes and other irregularities. Ensure inside and outside edges of the cabinet are free of burrs. Design the cabinet with a sloped top to prevent the accumulation of water on its top surface.

8. Style CBA2 Cabinets. Cabinets shall meet or exceed a NEMA Type 3R rating. Cabinets shall be third party certified as an assembly. Style CBA2 cabinets shall meet the following requirements:

   a. Cabinet Dimensions. The cabinet shall be as shown in Plans.

   b. Cabinet Construction. Construct the cabinet and door from 5052-H32 or better unpainted sheet aluminum alloy with a minimum thickness of 1/8 inch and a smooth grain finish on the exterior. Ensure that welds are neatly formed and free of cracks, blowholes and other irregularities. Ensure inside and outside edges of the cabinet are free of burrs. Design the cabinet with a sloped top to prevent the accumulation of water on its top surface.

   c. Door. Use double flanged door opening on four sides to prevent dirt and liquids from entering the enclosure when the door is opened. Provide a door restraint to prevent door movement in windy conditions. Provide a cabinet door that encompasses at least 80% of the cabinet frontal surface area and is hinged on the right side when facing the cabinet. Furnish the door with a gasket that satisfies the physical properties found in UL508 table21.1 and forms a weather tight seal between the cabinet and the door. Use a hinge that is continuous and made of stainless steel or at least 2.2 mm thick aluminum. Securely weld the hinge along a quarter, or more, of its length or bolt the cabinet using stainless steel bolts and non-slip nuts.

   d. Latch/Lock. Use a 3 point draw roller type latching mechanism. Use either stainless steel or cadmium plated, Type II Class 1 or better center catch and pushrods. Use rollers with a minimum diameter of ¾ inch and made of nylon. Furnish a stainless steel operating handle with a ¾ inch shank. Use a Corbin #2 lock keyed lock that matches existing HDS cabinets. Furnish two keys with each lock.

   e. Ventilation. Provide ventilation using louvered vents in the front door with a removable air filter. Ensure louvers satisfy the NEMA rod entry test for 3R ventilated cabinets. Provide filters that cover the vents and are held firmly in place with bottom and top brackets and a spring-loaded top clamp. Vent exhaust air out between the top of the cabinet and the door.

   f. Shelves. Mount adjustable equipment shelves on "C" factory mounting channels inside of cabinet and support them on both sides. Mount 2 vertical channels on both sides of the cabinet and on the back, for a total of 6 inside each CBA2 cabinet. Construct shelves from 5052-H32 or

better sheet aluminum alloy with a minimum thickness of 1/8 inch. Provide a shelf with a minimum depth of 10 inches. Ensure that shelves are adjustable to within 4 inches of the bottom and to within 8 inches of the top of the cabinet.

g. Keyboard Tray. Mount a retractable tray as shown in the Plans.

h. Circuit Breaker Panel. Ensure the circuit breaker panel conforms to the UL67 and NEMA PB1 standards. Use a MLO, single-phase, 3 wire configuration circuit breaker panel rated at 70 Amp (minimum) 120/240 Volts, in a NEMA Type 2 enclosure with separate neutral and ground buses. Unless shown otherwise in the Plans, or described herein, provide two 20 amp single pole type circuit breakers with a minimum short-circuit interrupting rating of 10,000 AIC. Circuit breaker #1 will serve the utility and equipment receptacles, and circuit breaker #2 will serve the thermostatically controlled outlet, cooling fan, and cabinet light.

i. Transient Voltage Surge Protection. Provide transient voltage surge protection, rated at a minimum 500 Volts at 3000 Amps integral to the circuit breaker panel, or integral to each individual circuit breaker.

j. Interior Light. Provide a fluorescent, 120-volt single-tube lamp interior light fixture rated at 13 watts minimum with ballast that will start the lamp at temperatures of 0°F. Provide a single pole, illuminated toggle switch, mounted inside of the cabinet door to control the light.

k. Cooling Fan. Provide a thermostatically controlled fan in the top of the cabinet that operates at a settable high temperature limit and exhausts air through a filtered and hooded vent at the top front of the cabinet. Set an integral thermostat at a temperature lower than the thermostat noted in Item “m” below so that the auxiliary thermostat controls the fan, and not any integral thermostat.

l. Thermostatically Controlled Outlet. Ensure that a thermostatically controlled single duplex outlet operates at a settable low temperature limit.

m. Thermostats. Provide remote bulb-type thermostats with SPDT contacts, rated for 16 amps @ 120 VAC for combined motor and resistive loads, for the thermostatically controlled outlet and cooling fan. Use Tradeline T6031A1029 (equal or better), White-Rogers, Johnson Controls, or Sunne brand thermostats. Ensure the thermostats for the “Thermostatically Controlled Outlet” have a contact that closes on lowering temperature and set at 50°F. Provide a thermostat for the “Cooling Fan” that has a contact that closes on rising temperature and set at 90°F. Mount sensing bulbs as shown on the Plans.

n. Conduit, Raceway and Layup. Provide EMT, liquid tight metal flex or metal clad conduit for wiring in 120V equipment including circuit breaker panel boards, lights, vent fans, and power receptacles. Terminate other low voltage wiring on terminal blocks and neatly train within the cabinet using wiring duct or ties.

o. Certification. The Cabinet Assembly consists of the cabinet itself and high voltage (greater than 24 volts) components that are permanently installed, including the circuit breaker panel, receptacles, light and fan as shown on the Plans or described herein. Obtain certification that the cabinet and associated permanently installed equipment, as a unit, complies with recognized applicable national standards through an authorized local or national testing agency or fabrication shop that complies with ANSI Z34.1-1987 “Third- Party Certification Programs for Products, Processes, and Services”, including but not limited to; Electrical Testing Laboratories (ETL), Underwriters Laboratories (UL), Canadian Standards Association (CSA), Electro Test Incorporated (ETI), or other certified testing agency recognized by the Labor Standards & Safety Division of the State of Alaska Department of Labor.

9. Temperature Data Probe

a. Ground Temperature Probe. Provide the following: Campbell Scientific temperature probe model 105E-L with 150 feet of cable length.

b. Ambient Air Temperature Sensor. Provide the following: Campbell Scientific temperature probe 107-L with 50 feet of cable length.

c. Temperature Data Probe. Provide the following:
Campbell Scientific model CS230-L50meters-S15-E0.
Cable length=50meters
# of External Probes=0
# of Internal Probes=15
Measurement Depth Starting Point=0

Cable length	50 meters
# External probes	0
# Internal probes	15
Measurement Depth Starting Point	0

Sensor details:

# External Probes	Depth (m)
0	none
1	none
2	none
3	none
4	none

# Internal Sensors	Depth (m)
1	0
2	0.0762
3	0.1524
4	0.2286
5	0.3048
6	0.4572
7	0.6096
8	0.762
9	0.9144
10	1.0668
11	1.2192
12	1.3716
13	1.524
14	1.6764
15	1.8288

d. Data-logger. Provide the following: Campbell Scientific CR1000X-XT-SW-NC Part 16130-24. XT -55C to +85C, SW Standard 3yr Warranty, NC No Calibration Cert.

e. Solar Radiation Shield. Provide the following: Campbell Scientific Model 41303-5A 6 Plate Radiation Shield UV-Stabilized white thermoplastic plates, aluminum mounting bracket, white powder coated stainless-steel U-bolt clamp.

f. Heater. Portable heater rated 1200-1500 watts @ 120 VAC, fan forced, cord connected electric heater. Broan Model 6201 or equal. Single stage thematically controlled heater connection power cord, rated 16 at 120 VAC. 30oF to 100oF range. Sure-stat Cat #T118P or equal.

10. Automated Volume and Classification Count Equipment.

a. Housing: Weather resistant cast aluminum (powder coat) with carrying handle.

b. Weight: Less than 15lbs.

c. Size: 7inx13.5inx6in

d. Display: 20-Character by 4-Line

e. Inputs: 16 Piezo/8 Loop inputs

f. Data Storage: 2GB-16 GB; User-set memory rollover

g. Study Periods: 1-60 minute intervals

f. Classification: FHWA 15-category classification or a user set classification table

g. Communications: RS232 serial comms from 300 to 115K baud with 9 Pin female port, USB capable

h. Power: Up to 31 days per charge; On/Off switch

11. Piezoelectric Sensor, Class II. Locate piezoelectric sensor lengths and lane locations as shown in the plans.

a. Center Core. 16 gauge, flat, braided, silver plated copper wire.

b. Piezoelectric Material. Highly compressed piezoelectric copolymer, P(VDF-TrFE).

c. Outer Sheath. 0.406 mm thick brass, CDA-260, ASTM B 587-88.

d. Final Dimensions. ¼ inch wide x 1/16 inch thick; ±0.13 mm.

e. Insulation. Insulation resistance between core and shield: > 500M ohms.

f. Piezoelectric Coefficient: ≥ 20 pC/N – nominal.

g. Passive Signal Cable. RG 58 type with an underground/direct burial rated outer jacket. The OD of the cable is 1/5 inch. The nominal capacitance of the cable is 89 pF/m.

669-3.01 CONSTRUCTION REQUIRMENTS.

1. Wiring.

a. Referenced Requirements. Subsection 660-3.05, Wiring.

b. Termination. Terminate unused pairs at junction boxes within splices. Terminate unused pairs in terminal blocks at cabinets. Terminate and solder conductors, including unused spares to “spade” type terminal lugs at terminal blocks.

c. Relief. Provide at least 2 feet of slack cable for wiring in each junction box and at least 6 feet of slack cable available in the equipment cabinet before the terminal block.

d. Labeling. Label wiring in junction boxes and at terminal blocks.

2. Conduit.

a. Referenced Requirements. Subsection 660-3.03, Conduit, or as indicated on the Plans.

b. Pull Cords. Leave nylon pull cords in all conduits larger than 1 inch and in spare conduits.

c. Bushings. Ensure that plastic or plastic-sleeved bushings are in place before wire pulls are performed.

3. Junction Boxes.

a. Referenced Requirements. Subsection 660-3.04, Junction Boxes, or as indicated on the Plans.

b. Voltage Limitation. Junction boxes used for ATR installations shall not contain wiring of systems at or greater than 24 V or conduits carrying wiring of systems at or greater than 24 V.

4. Terminal Blocks.

   a. Terminal Block Placement. Mount terminal blocks within cabinets so that terminals are easily accessible from the front of the cabinet.

   b. Labeling. Clearly label terminal blocks and wire pairs on the block.

   c. Termination. Terminate and solder conductors, including unused spares to "spade" type terminal lugs

5. Presence Loops.

   a. Placement Design Adherence. The Plans are not schematics; installation of the presence loops shall closely conform to the location and layout of conduit runs shown in the Plans. The contractor shall notify the Project Engineer 14 days prior to saw cutting the pavement for approval of the site layout.

   b. Presence Loop Dimensions. Unless otherwise noted on the plans, form presence loops using four turns of wire, making 6 feet square with a tolerance of ± 1 inch.

   c. Presence Loop Dimensions for On-Ramps and Off-Ramps. Form presence loops in On-Ramps and Off-Ramps using four turns of wire, making a rectangular 8 feet wide and 6 inch long with a tolerance of ± 1 inch.

   d. Lead-in Conduit. Place lead-in conduits straight and perpendicular to the centerline of the road from the edge of pavement to the presence loops.

   e. Presence Loop Alignment. Center presence detector loops in the traffic lane with a tolerance of ± 1 inch.

   f. Presence Loops in Asphalt.

      I. Loop Placement. Locate presence loops 16 feet from leading edge to leading edge unless otherwise noted on the Plans with a tolerance of ± 1 inch. Align presence loops in adjacent lanes within a tolerance of ± 1 inch.

      II. Compaction tests. Compaction test requirements are at the discretion of the Engineer.

6. Piezoelectric Sensors.

   a. Manufacturer's Recommendations: Install piezoelectric sensors according to AVC equipment and piezoelectric sensor manufacturer's recommendations. The piezoelectric sensor manufacturer’s representative or a piezoelectric sensor manufacturer-certified installation technician must observe and approve piezoelectric sensor installations.

   b. Placement Design Adherence. The Plans are not schematics; install the piezoelectric sensors as close as possible to the locations and layouts of conduit runs shown in the Plans.

   c. Saw cut Requirement. Install piezoelectric sensors in saw cut slots in final pavement. "Block outs" are not allowed.

   d. Coaxial Cable. Run coaxial cables to the equipment cabinet without splices. Terminate on the specified terminal block, with at least 6 feet of slack cable available in the equipment cabinet before the terminal block.

e. Lead-in Conduit. Install lead-in conduits from edge of pavement to the piezoelectric sensors straight and perpendicular to the centerline of the road. Install and cap lead-in conduits for piezoelectric sensors at the sensor end with tape or sealant before paving. Extend lead-in conduits beyond the edge of the pavement. Completing lead-in conduit runs to junction boxes and cabinets may be done before or after paving.

f. Piezoelectric Sensor Placement. Center each piezoelectric sensor in the travel lanes between sensors adjoining inductive loops unless otherwise noted on the Plans or directed by the Engineer. Install piezoelectric sensors with a tolerance of ± 1 inch.

g. Piezoelectric Sensors in New Asphalt. Install piezoelectric sensors in new asphalt pavement only after three days of normal traffic has passed over the final paving.

7. Cabinets.

a. Cabinet Placement and Orientation. Install cabinets out of the Clear Zone with the doors facing away from the road. Unless the orientation is otherwise noted on the plans.

b. Conduit Entry. Install conduit entries for above-ground enclosure through the bottom of the enclosure. No conduit runs shall be cut through the sides or top of above-ground enclosure.

c. Style CBA2 Cabinets Mounting. Mount style CBA2 cabinets on 4 inch GRMC or DN100 galvanized pipe and support with reinforced concrete foundations as shown on the Plans

8. Utilities.

a. Electrical. Provide and install the Load Center as required per the Plans, specifications and the requirements of the appropriate Electrical Utility. Provide and install wiring from the load center to the equipment in the cabinet. Request inspection of the Load Center by the Department of Labor, Division of Mechanical Inspection (DOL/DMI). After approval of the load center by the DOL/DMI, inform the Engineer as to when electrical service is needed at the load center, with sufficient time to enable the HDS to schedule the installation with the Electrical Utility before commissioning of the equipment. The HDS will make arrangements in writing with the Electrical Utility to establish billing accounts. The Electrical Utility will provide service to the Load Center upon request of the Engineer

b. Asphalt Pavement Roughness. No transverse seams, joints or roughness within 50 feet of any inductive loops placed in asphalt pavement section is allowed. Test the finished surface of the asphalt with a straightedge 10 feet long. Ensure that the surface does not vary more than ¼ inch from the lower edge of the straightedge within 50 feet of sensors at the ATR installations. At the Engineer's discretion, run an inertial profiler or a profilograph equipped with a chart recorder down each wheelpath of each lane for a distance of 50 feet before and after each ATR installation. HDS will supply the profilograph for the Contractor's personnel to operate. Ensure that the asphalt surface as recorded by the chart recorder does not vary more than ¼ inch in 10 feet.

c. Field Inspection. Notify the Engineer in writing a minimum of 3 working days in advance (excluding Saturday, Sunday and State or Federal Holidays) before installing conduit/wiring, inductive loops, bending plate equipment, piezoelectric cable, axle sensors, and cabinets. The Engineer shall be present to approve the installation before backfill placement and paving. At the Contractor's expense, correct and allow the Engineer to re-inspect unacceptable installations for completeness prior to backfill placement and paving. The Contractor shall be required to excavate, remove, and replace all installations backfilled or paved without prior approval by the Engineer at the Contractor's expense.

d. Communications. Provide and install the phone line from the NID service box to the cabinet and connect to modem to ensure DSL connection. At ATR locations to be provisioned with cellular modems, provide Sierra Wireless RV50 configured for AT&T as the service provider.

9. 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 workmanship.

669-3.02 ACCEPTANCE TESTING. Perform acceptance testing on ATR installations.

1. General Tests. Perform tests for the ATR installations according to subsection 660-3.01, Installation Details.

2. AVC Acceptance Tests.

   a. Scope and Governance. In addition to the General Tests, perform Acceptance Tests on AVC installations. AVC acceptance tests govern acceptance or rejection of the AVC installation.

   b. Manufacturer Participation. Observe acceptance tests and assist the AVC counter manufacturer's representative, or an AVC counter manufacturer-certified installation technician.

   c. Highway Data Section Participation. Before beginning AVC Acceptance Tests, notify the HDS. Notify in writing, through the Engineer, a minimum of 3 working days before proposed testing (excluding Saturday, Sunday and State or Federal Holidays). Notification includes descriptions of the proposed test vehicles. A representative of the HDS approves descriptions of the proposed test vehicles in writing before testing and be on-site during final acceptance testing. Provide a tabulated listing of each vehicle's gross weight and measured axle spacing to the HDS representative before testing. The HDS representative must approve scheduling of data sampling and testing for each lane.

   d. Results Certification. The Highway Data Manager or designated representative shall certify in writing when the installation has met the accuracy requirements of the acceptance tests.

   e. Acceptance Test Procedure. Perform the Acceptance Tests as follows:

      Acquire a set of test data for the AVC sensor array. Obtain test data by passing test vehicles over the AVC sensors in each lane. Test data consists of 10 valid samples per lane, for each of 3 test vehicles. Test data samples will include FHWA class designation and computed axle spacing for each sensor pass.

      To be considered valid, obtain sample data under the following conditions:

      The test vehicle must maintain good lane discipline while traversing the entire sensor array.

      I. The test vehicle must maintain a constant speed, between 40 mph and the maximum speed limit, while traversing the entire sensor array.

      II. Acquire data for a particular lane using the same group of 3 test vehicles.

      III. Sample data from successive sensor passes of each test vehicle. Data may not be omitted or included out of order for any 10 samples.

      IV. Sensor passes for the 3 classes of vehicles may be intermixed.

      V. Sensor passes for multiple lanes may be acquired simultaneously.

   f. Accuracy Requirements. The Automated Vehicle Classifier must meet the following requirements separately in each lane:

      I. The AVC system correctly assigns FHWA class designation for 9 out of 10 successive sensor passes of each vehicle class.

II. The AVC system computes axle spacing to within 6 inches of the actual measurements, for 9 out of 10 successive sensor passes of each vehicle class.

g. Test Vehicles. Provide, and make arrangements for; test vehicles and drivers as needed for the acceptance testing.

The group of three test vehicles shall consist of one each of the following:

I. A two axle, six wheel, single unit vehicle (FHWA Class 5)

II. A three axle, ten wheel, single unit vehicle (FHWA Class 6)

III. A five axle, eighteen wheel, single trailer vehicle (FHWA Class 9), with high-cube-rated HCR) trailer

h. Class 5 Vehicles. Class 5 vehicles shall meet the following requirements:

I. Spacing between steering and drive axles of 14 feet to 23 feet

II. Weight on the steering axle between 2,200 lb. and 12,000 lb.

III. Weight on the driving axle between 7,000 lbs and 18,000 lb.

i. Class 6 Vehicles. Class 6 vehicles shall meet the following requirements:

I. Spacing between steering axle and the drive axle group of 13 feet to 23 feet

II. Spacing between the drive axles of 4 feet to 6 feet

III. Weight on the steering axle between 6,000 lb. and 12,000 lb.

IV. Weight on the drive axle group between 20,000 lb. and 37,500 lb.

j. Class 9 Vehicles. Class 9 vehicles shall meet the following requirements:

I. Spacing between the steering axle and the drive axle group of 13 feet to 23 feet

II. Spacing between the drive axles of 4 feet to 6 feet

III. Spacing between the drive axle group and the trailer axle group of 25 feet to 45 feet

IV. Spacing between the trailer axles of 4 feet to 6 feet

V. Weight on the steering axle between 6,000 lb. and 12,000 lb.

VI. Weight on the trailer axle group between.20,000 lb. and.37,500 lb

k. Vehicle Loading. Ensure that three-test vehicles are loaded with non-shifting material to a minimum of 50% of legal load during testing.

l. Tire Inflation. Ensure that tires on the three-test vehicles are inflated to recommended pressures during testing.

m. Weighing Method. The gross weight of each test vehicle and the weight of each test vehicle's axle groups shall be determined by weighing on a static scale at a scale house operated by the State of Alaska Department of Commerce, Division of Weights and Measures.

An axle group is defined as any two axles whose centers are within 8 feet of each other. The Class 5 and Class 6 test vehicles each have two axle groups. The Class 9 single trailer test vehicle has three axle groups.

669-3.05 DELIVERABLES. Submit deliverables to the HDS before final approval of the work or as otherwise called for herein.

1. Materials Submittal.

   a. Format and Contents. Provide a Materials Submittal of proposed equipment and materials for the ATR installations. The Materials Submittal shall consist of three collated copies of an equipment and materials portfolio. Each identical portfolio shall contain information of sufficient detail to determine the suitability of the equipment and materials proposed.

   b. Table of Contents. Each portfolio shall include a table of contents listing each item's intended uses, item description, product name, manufacturer, model or part number and reference to associated information within the portfolio.

   c. Reference Drawings. The Materials Submittal shall include a detailed shop drawing of each equipment cabinet showing the location of mounted components.

   d. Delivery Interval. Deliver Materials Submittal for review and approval of the Highway Data Supervisor within thirty days following award of the Contract.

   e. Liability. The State of Alaska will not be liable for any materials purchased, labor performed, equipment used or delay to the work before equipment and materials have been reviewed and approved.

2. As-Built Plans.

   a. Prepare four complete sets of as-built plans, which will be current with the construction. These as-built plans shall detail construction changes made to the ATR design and include the following information on the appropriate sheets:

      I. Location and depth of inductive loops, piezo sensors, conduit runs and scales.

      II. Locations of equipment cabinets and junction boxes.

      III. Station and offset of junction boxes

   b. Present three sets of as-built plans to the Engineer, and affix one set to the inside of the cabinet door at the appropriate Automated Traffic Recorder Installation in a waterproof, clear plastic holder.

   c. Redlines of full size construction plans will be acceptable as-builts.

3. Photographs.

   a. Provide digital photos documenting sensor installations on usb, cloud based sharing software, or via email.

   b. The photographs shall show the inductive loops and conduit in place before covering with gravel and pavement for asphalt pavement sites, or before covering with epoxy compound for concrete pavement sites. The photographs shall include:

      I. Two or more overall views of each ATR installation showing placement of the inductive loops.

II. One or more views of each loop showing the loop and the conduit to the nearest junction box.

III. One or more views of each piezo sensor conduit showing the coaxial cable, saw cut, and conduit to the nearest junction box

IV. One or more views of each temperature sensor showing the lead cables, saw cut, and conduit to the nearest junction box

4. Test Results. Written or printed copies of the final results of tests, signed by the Contractor, shall be provided to the Engineer before acceptance of the Automated Traffic Recorder Installation.

5. Manuals. Provide to the Highway Data Manager installation, repair, and operation manuals for Automated Traffic Recording equipment supplied by the Contractor.

6. Materials.

a. Provide to the Highway Data Manager any ATR equipment, sensors, and epoxy grout remaining after installation.

b. Palletize the Deliverable Materials.

c. Group the contents of each pallet by like items.

d. Attach to each pallet a sealed plastic pouch containing complete copies of Material Safety Data Sheets that apply to the contents of that pallet.

e. Provide an itemized list of Deliverable Materials. For each item, the list shall detail:

I. Item description: including nature of the item, brand name, manufacturer name, model number, type number and serial number.

II. Item condition

III. Item quantity

f. Provide complete copies of Material Safety Data Sheets that apply to the Deliverable Materials. Attach Material Safety Data Sheets after the last page of the Deliverable Materials list.

669-4.01 METHOD OF MEASUREMENT. Section 109.

Automated Traffic Recorder sites will be measured Lump Sum.

669-5.01 BASIS OF PAYMENT.

The Contract unit price for Automated Traffic Recorder installations shall be full compensation for furnishing all equipment, labor and subsidiary materials required for completion of a site for which there is no specific item in the Plans is subsidiary to the 669 item. This includes but is not limited to:

- backfill materials,
- seeding,
- topsoil,
- removal of structures and obstructions,
- structural excavation for conduits and minor structures,
- work in support of utilities as specified in Subsection 105-1.06,
- as-built plans,
- providing the manufacturer's representative,
- acceptance testing,
- j-boxes,

- CBA cabinets,
- portable heater and cooling fan,
- tilt poles,
- rigid conduit,
- load centers,
- demolition of CBA cabinet foundations and associated utility lines/conduits/appurtenances,
- loops,
- piezoelectric sensors,
- radar sensors,
- TDP's,
- surface temperature probes,
- ambient air sensors, and
- Other ATR equipment or work as shown on the plans.
- Wet cutting with a concrete saw for piezoelectric sensor installations.
- Replacing failed equipment, equipment components and repairing failed workmanship.

WITHHOLDING. To ensure full compliance under this Section, twenty percent (20%) of the billings for each 669 item shall be withheld until written acceptance of the site has been received from the Highway Data Manager.

Payment will be made under:

PAY ITEM

Item Number	Item Description	Unit
669.2003.____	Automated Traffic Recorder (Location Description)	Lump Sum

Z546590000

Special Provision

Replace Section 670 with the following:

SECTION 670
TRAFFIC MARKINGS

670-1.01 DESCRIPTION. Furnish and place traffic markings of the type, color, dimensions, and at the locations shown on the Plans. Meet these specifications and the applicable portions of the Alaska Traffic Manual.

Furnish, locate and install Pavement Markings as shown on the Plans and as directed.

Pavement Marking Type: Methyl Methacrylate (MMA)

670-2.01 MATERIALS. Use materials that conform to the following:

Traffic Paint	Subsection 708-2.03
Glass Beads	Subsection 712-2.08
Preformed Pavement Markings	Subsection 712-2.15
Methyl Methacrylate Pavement Markings	Subsection 712-2.17
Glass Beads for Methyl Methacrylate Markings	Subsection 712-2.18

Construct the iron casting for the raised pavement markers of modular iron meeting ASTM A536.

Methyl Methacrylate Pavement Markings are a combination of methyl methacrylate, glass beads, and anti-skid aggregate.

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. Install interim pavement markings meeting Section 643 if permanent markings are not installed prior to opening the roadway to traffic.

1. Paint.

   a. Apply paint only to pavements that are clean, dry, and warmer than 40 °F.

   b. Remove all dirt, oil, grease, and other foreign matter from the surfaces to be painted in a satisfactory manner.

   c. Apply the paint at the rate of 80 ft^2/gal (approximately 20 mils wet film thickness). This rate is effectively 22 gallons of paint per mile of solid 4-inch stripe. A tolerance not to exceed 10 percent is allowed for film thickness or yield.

   d. Apply glass beads over the wet painted stripes in a uniform pattern at the rate of 6 pounds (± 0.1 pound) of beads per gallon of paint. Pressure-apply the beads using a mechanical dispenser mounted not more than 12 inches behind the paint dispenser.

   e. Use approved equipment for highway lane striping that is specifically designed and manufactured for that purpose by a company experienced in the design and manufacture of such equipment. Minimum requirements include the capability of striping two 4-inch yellow centerlines and one 4-inch white edge line simultaneously. Apply markings with clear-cut edges, true and smooth alignment, and uniform film thickness.

2. Preformed Marking Tapes (PMT). Apply the PMT material as directed by the manufacturer by either the inlay or overlay method. Use the inlay method whenever new HMA is placed. Use the overlay method to apply markings to existing pavement.

   Store all PMT materials between 60 °F and 85 °F for at least 24 hours prior to installation. During installation, maintain field stockpiles at the required storage temperature.

   For the inlay method, embed the pavement markings in the HMA surface with a conventional steel wheeled roller. Apply when the surface temperature of the mat is the warmest possible without deforming the marking. The minimum allowable surface temperature, taken within 3/8 inch of the top of the mat, is 140 °F.

   If the application of the PMT materials falls behind the paving operation to the extent that the markings are not being applied at the minimum acceptable temperature, slow the paving operation to match the rate of the marking laydown. Resume full paving operations after demonstrating that you have sufficiently skilled personnel to install the markings within the required temperature limits.

   When applying pavement markings by the overlay method, ensure the surface is clean and dry and is at least 60 °F and rising. Broom the surface clean. Remove any dust using compressed air. Apply a coat of primer/adhesive activator according to the manufacturer's recommendations. Install and roll the markings with a minimum 200-pound pneumatic roller.

3. Raised and Recessed Pavement Markers. Install raised and recessed pavement markers per the manufacturer's instructions.

   Cut or dado the finished pavement surface with a concrete saw to produce a slot with dimensions as shown on the Plans or recommended by the manufacturer. Clean and dry the slots using compressed air. Install a reflective marker of the color indicated with an epoxy adhesive recommended by the marker manufacturer.

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.

Used Stencils and Delivery to Maintenance Facility.

i. Notify the Engineer 5 working days before beginning markings requiring a stencil. The Engineer will identify stencils for a condition review after their use is complete.

ii. After all the identified stencil's use is complete, notify the Engineer and schedule a condition review. The Engineer will review the stencils and indicate the stencils to be delivered to the maintenance agency.

30049 Seward Highway, Crown Point, Alaska 99664.

Stencils not selected for a condition review, or selected for maintenance facility delivery, are the property of the Contractor.

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.

SURFACE APPLIED

Marking thickness will be measured from the pavement surface.

(1) Longitudinal Markings. Apply markings for lane lines, edge lines, and centerlines to yield a thickness of 60 mils.

(2) Other Markings.

(a) Transverse and Symbol Markings:

Apply marking for symbols, arrows, stop bars, railroad symbols, and cross walks to yield a thickness of 60 mils.

(b) Gore Markings:
Apply diagonal gore markings to yield a thickness of 60 mils.

INLAID

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 within 24 hours for evaluation. Thickness of material and depth of slot are measured from the surface of the pavement.

SURFACE APPLIED

(1) For surface applied longitudinal applications, measure the thickness of the lines (above the pavement surface) at the time of application, every 500 feet.

(2) For surface applied other markings measure the thickness in three locations for each marking.

INLAID

(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.

Refer to the Survey Field Books identifying the no passing zones (see Subsection 642-3.01)

670-3.02 and 3.03 RESERVED

670-3.04 PAVEMENT MARKING REMOVAL. Remove all existing traffic markings that are in conflict with the striping details shown on the Plans, an approved TCP, or any temporary striping as directed. Do not paint over existing markings. Do not use open flame on the final paving lift.

Remove pavement markings to the fullest extent possible without materially damaging the pavement surface, color, or texture. As the work progresses, remove sand or other material deposited on the pavement as a result of removing markings. Remove accumulations of sand or other material that might interfere with drainage or constitute a hazard to traffic.

Before making any change in the traffic pattern, remove or obliterate pavement markings that may create confusion to motorists.

Where using blast cleaning to remove pavement markings or objectionable material within 10 feet of a lane occupied by public traffic, immediately remove the residue (including dust) after contact between the sand and the surface being treated. For such removal, use a vacuum attachment operating concurrently with the blast cleaning operation or by other approved methods.

Repair any damaged pavement or surfacing caused by the pavement marking removal operation.

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.

670-3.05 PRELIMINARY SPOTTING. Provide the necessary control points at intervals including all changes of direction and changes in the basic configuration of striping, such as at the beginning and ending of no-passing zones on a 2-way, 2-lane roadway. Use these points in preliminary spotting of lines before striping is commenced. Perform preliminary spotting of the lines to be painted and obtain approval for all spotting before striping begins. Preliminary spotting is required for all longitudinal striping, with spacing of spots not to exceed 50 feet.

Reference the lines and markings to be replaced at their existing locations prior to performing any work that may disturb them.

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. See Section 109 and the following:

1. Mile Basis. By the horizontal distance along centerline from beginning to end of each stripe pattern, excluding gaps for intersections or other openings. Skip stripes will be measured as 1/4 of this distance.

    a. Single Stripe: A longitudinal marking less than 6 inches wide, such as, but not limited to, a single center line or edge stripe.

    b. Double or Wide Stripe: A longitudinal marking greater than 6 inches wide, such as, but not limited to, double center lines, and auxiliary lane lines.

2. Reserved.

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.

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.

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.

670-5.01 BASIS OF PAYMENT. At the Contract price per unit of measurement for those items listed below that appear on the bid schedule.

Accept payment as full compensation for cleaning of pavement, painting traffic markings, application of preformed pavement markings, glass beads, installing raised or recessed pavement markers, furnishing paint, glass beads, preformed marking tape, MMA, and all other materials necessary to complete the work prescribed in this Section.

Additionally, 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
- Used stencils delivered to the maintenance agency.
- Removal of pavement markings, items 670.0009.____, .0014.____, .0015.____, .0016.____ when not shown on the bid schedule.

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

For traffic markings which do not conform to the requirements of this Section, but which are allowed to remain in place, payment will be adjusted as follows:

1. Lump Sum. When payment is on a lump sum basis the price reduction will be the product of the lump sum price times the length of non-conforming markings divided by the total length of markings. For the purpose of this calculation, stripe lengths will be considered as continuous with no deduction for skips or breaks, for each 4-inch width stripe being applied, except that a double centerline stripe (No Pass) will be considered as one stripe.

2. Unit Prices. When payment is on a unit price basis, no payment will be made for those units which are not in conformance.

PAY ITEM

Item Number	Item Description	Unit
670.0001.____	Painted Traffic Markings	LS
670.0002.____	Single Stripe	Mile
670.0003.____	Double or Wide Stripe	Mile
670.0006.____	Preformed Pavement Markings	LS
670.0007.____	Raised Pavement Marker	Each
670.0008.____	Recessed Pavement Marker	Each
670.0009.____	Removal of Pavement Markings	Mile
670.0013.____	Painted Traffic Markings	LF
670.0014.____	Removal of Pavement Markings	LS
670.0015.____	Removal of Pavement Markings	SF
670.0016.____	Removal of Pavement Marking Symbols	Each
670.2000.____	MMA Pavement Markings	LS
670.2003.____	MMA Pavement Markings, Longitudinal Surface Applied	LF
670.2004.____	MMA Pavement Markings, Symbols and Arrow(s) Surface Applied	Each
670.2005.____	MMA Pavement Markings, Transverse and Gore Surface Applied	LF
670.2006.____	MMA Pavement Markings, Longitudinal Inlaid	LF
670.2007.____	MMA Pavement Markings, Symbols and Arrow(s) Inlaid	Each
670.2008.____	MMA Pavement Markings, Transverse and Gore Inlaid	LF

C670-24.1001

Special Provision

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.____ 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.

As-built, utility pothole log, per subsection 682-3.02, will be paid under Section 642.

Potholes for the Contractor's information and potholes not accepted by the Engineer will not be paid for by the Department.

Payment will be made under:

PAY ITEM

Item Number	Item Description	Unit
682.2000.____	Vac-Truck Pothole	CS

C682-14.0101-1

Special Provision

Add the following Section:

SECTION 686
ALASKA RAILROAD COORDINATION

686-1.01 DESCRIPTION. Obtain Alaska Railroad Corporation (ARRC) temporary construction permit(s) for any work within ARRC Right-of-Way, or for any work that may impact ARRC's operations. Coordinate construction phasing, scheduling, and track flagging, in compliance with the ARRC temporary construction permit.

686-2.01 DEFINITIONS.

ALASKA RAILROAD CORPORATION TEMPORARY CONSTRUCTION PERMIT (ARRCTCP). ARRCTCP is a permit required by the ARRC for any work that the ARRC determines will impact its facilities, operations, and/or right-of-way.

686-3.01 CONSTRUCTION PHASING. The Contractor shall coordinate with the Engineer to phase construction to ensure continuous compliance with the conditions and requirements of the ARRCTCP, referenced in Appendix F.

686-3.02 FLAGGING REQUIREMENTS. Flagging requirements shall comply with the ARRCTCP.

686-3.03 SCHEDULING. Construction schedules shall comply with Section 643 and the ARRCTCP.

686-5.01 BASIS OF PAYMENT. Contractor coordination with the ARRC, obtaining the ARRCTCP, and compliance with the ARRCTCP will be subsidiary to pay item 643.0002.____ Traffic Maintenance. The Department will pay ARRC directly for railroad flagging per the ARRC Utility Agreement.

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Special Provision

Add the following Section:

SECTION 688
UTILITIES SUPPORT

688-1.01 DESCRIPTION. Coordinate the project work with all utility work by others in accordance with subsection 105-1.06 and these Specifications. Utility work by others includes all installation, service connections and disconnections. The Contractor shall perform utility support work including scheduling work by others; erosion, sediment, and pollution control; excavation, backfill, surveying, and traffic maintenance.

688-1.02 UTILITY NOTIFICATION AND CONTACT INFORMATION. Make initial contact with each Utility Company through the Engineer.

Contact information for the Utilities:

AT&T Alascom Inc.
Name of Contact Raphael Otero
Address 505 E. Bluff Drive
Anchorage, Alaska 99501-1100
Phone Work: (907) 264-7797
Cell: (907) 268-7634
Email ro900r@att.com

Name of Contact Jana Lee
Address 505 E. Bluff Drive
Anchorage, Alaska 99501-1100
Phone (907) 264-7666
Email jl4132@att.com

TelAlaska
Name of Contact Jason Louvier
Address 401 E International Airport Rd,
Anchorage, AK 99518
Phone (907) 563-2003
Email jlouvier@telalaska.com

688-1.03 SCHEDULING AND COORDINATING THE UTILITY WORK BY OTHERS. Prior to commencing Utility related ground-breaking activities, the Contractor shall develop a detailed schedule for the complete installation of all utility work. The Contractor shall develop and maintain the schedule based on information provided by the Utilities. Develop and furnish a project schedule identifying utility support work in accordance with subsections 105-1.06 and 108-1.03. The schedule shall be incorporated into the CPM schedule and updated as required.

The Contractor shall work with the Engineer and Utilities to develop two-week look-ahead schedules. The Contractor's Superintendent, or Engineer approved designee, shall be the singular point of contact for coordinating scheduling with the Engineer. Two-week look-ahead schedules shall be submitted to the Engineer on a weekly basis and in sufficient detail to plan any supplemental needs for traffic maintenance, Storm water management, surveying support, and/or other activities authorized by the Engineer through directive.

The Contractor shall ensure that support work and coordination with the Utilities is performed in a manner that limits utility outages and outage durations. The Contractor shall expect longer utility outages will be scheduled during non-peak hours and anticipate performing support activities during these times which may include night and weekend work.

Each Utility has determined the timeframes that their utility relocation work is anticipated to take place, see section 651 Control of Work – Supplemental Requirements for these timeframes. These general work timeframes are subject to change.

688-2.01 RESERVED.

CONSTRUCTION REQUIREMENTS

688-3.01 WORK BY UTILITIES. The Utilities will perform installation of permanent utilities and removal or abandonment of utilities that are decommissioned in accordance with the Utility Agreements and dispositions completed between the Department and each Utility.

688-3.02 WORK BY THE CONTRACTOR SUPPORTING UTILITIES. Provide support to facilitate work by the Utility Company, including an Engineer-approved representative, on site during utility work by others.

688-4.01 METHOD OF MEASUREMENT. Measure Utility support work according with the Engineer's directive authorizing the work.

688-5.01 BASIS OF PAYMENT. Provide work necessary to support installation of permanent utilities by others. Payment is for work, authorized by directive, for time and materials to support utility work by others, per Section 109-1.05.

Erosion, Sediment, and Pollution Control work in support of Utilities will be paid for under Section 641.

Excavation and backfill in support of Utilities will be paid for under Section 203.

Surveying in support of Utilities will be paid for under item 642.0003.____ Three Person Survey Party.

Traffic Maintenance in support of Utilities will be paid for under Section 643.

Utility Support Price Adjustment. The total value of this contract will be adjusted by ($1,500) per calendar day for failure to provide the utility support or scheduling of utility work.

Payment will be made under:

PAY ITEM

Item Number	Item Description	Unit
688.2001.____	Utility Support	CS
688.2002.____	Utility Support Price Adjustment	CS

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Special Provision

Add the following Section:

SECTION 690
WATERWAY

690-1.01 DESCRIPTION. Construct a waterway bed (culvert lining, stream bed, river bed, creek 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).

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Establish a healthy living perennial vegetative mat by harvesting. Maintain the living cover for the term of the Contract.

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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
Top Soil	Section 620 & 726
Erosion, Sediment, and Pollution Control	Section 641
Selected Material	Section 703

Fertilizer. Regular release, 8-32-16 (N-P-K) fertilizer in granular form with seedlings, live stakes and cuttings mixed with the top soil at the manufacturer's recommended rate of application.

Plant Stock. Furnish plants that are true to type and name according to the current edition of *Standardized Plant Names*, American Joint Committee on Horticultural Nomenclature.

Furnish plants that are grown or conditioned to an environment similar to the project site, including elevation, annual precipitation, soil conditions, and climate. Furnish plants free from disease, injurious insects, mechanical wounds, broken branches, decay, or other defects.

Furnish plants and plant bundles, and cuttings labeled with durable and legible labels according to size, botanical genus, and common plant name. Additionally label the collected stock, cuttings, with the date collected.

1. 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.

2. Live Dormant Willow Cuttings (Cuttings).

   Cuttings without damage, damage to bark, trunk wood splitting, broken branches, dried out, sprouting or mildew.

   Cuttings 1/2-inch to 2-inches in diameter, 3-foot to 4-foot long, basal end cut at a blunt angle, grouped and bound with growing tips in the same direction placed in ventilated plastic bags or plastic cover and stored in a refrigerated area with controlled temperature and humidity.

Waterway Fill.

1. Bed Fill. A blend of 60% riprap, Class 1, and 40% selected material, Type B.
2. Bank Fill. A blend of 50% riprap, Class 1, and 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.

Provide a plant material consultant to supervise on site the harvest and placement of plant materials.

Fourteen days before digging, cutting and placing operations, furnish complete detailed information about the supply source for each item of plant material and the plant material consultant's qualifications. Receive approval of the plant materials and plant material consultant before beginning work.

Collected Stock.

1. 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.

2. Live Dormant Willow Cuttings (Cuttings).

Locate, harvest, and provide a controlled cold storage facility for the cuttings.

Do not damage the cuttings.

a. Collect Cuttings.

Collect live dormant cuttings under the supervision of a plant material consultant provided by the Contractor and approved by the Engineer.

Submit, at least one week before harvest, the harvest site locations for inspection and approval.

Collect cuttings from living woody plants when the plants are not actively growing.

Collect cuttings for spring and early summer plantings during winter/early spring before leaves appear but not later than March 31. Collect cuttings for fall plantings in the late summer/early fall, after plants have gone dormant, after leaves change color, and have dropped.

Flower buds are not acceptable. These buds typically occur at the tips of branches produced during the last growing season.

Do not mix invasive plant materials with the cuttings. Leave the invasive plant materials at the harvest site.

Collect cuttings 1/2-inch to 2-inches in diameter, 3-foot to 4-foot long. Handle cuttings with care to avoid bark stripping and trunk wood splitting. Make cuts 8 inches to 12 inches from the ground. Make cuts flat or at a blunt angle. Cut the basal ends, not the growing tips to obtain the required length.

1) Group and Bind. Group cuttings and bind together securely with twine at the harvesting site for ease of handling and protection during transport and storage. Keep side branches intact. Place growing tips in the same direction.

2) Transport to Cold Storage. Place cuttings in the transport vehicle using hoisting belts, in an orderly manner to prevent bruising. Cover to prevent drying out, or other damage.

Schedule cutting and delivery to storage facility to process the day they arrive.

b. Store Cuttings.

Store cuttings in a secure refrigerated area.

If collection of cuttings occurs while daytime temperatures remain below freezing, freeze cuttings not colder than 0°F until planting. If daytime temperatures are above freezing during collection, refrigerate cuttings at temperatures between 31°F and 40°F, with 60% to 70% humidity, until planting.

Place cuttings in ventilated plastic bags or cover. Monitor temperature and humidity to prevent cuttings from drying out, sprouting, or getting mildew. Discard cuttings that have mold, dried out, or have sprouted. Shade and protect outside storage locations from wind. Protect cuttings from drying.

Before transporting to the work site, soak cuttings in cool water for at least 24 hours, but for no more than 48 hours. Transport cuttings directly from the cold storage site to the planting site. Deliver only plant material to be installed that day to the work site. Do not return unplanted cuttings to cold storage. Shade and protect cuttings from damage, bruising, wind, and drying during transport and while on site.

3. Inspection.

   a. Initial Inspection. Make all planting stock available for inspection at the collecting site and receive written approval before digging or cutting, and at the storage facility for absence of defects, labels, proper cutting length, cutting diameter, binding, and the presence of unapproved plants.

   b. Final Stock Inspection and Acceptance. Receive final inspection and written approval for the health of the plant material, the absence of defects, the labels, proper cutting length, cutting diameter, binding, and other requirements at the planting site before placing the plants in their permanent positions.

   The Engineer will reject plants:

   That show signs of improper storage, handling, are dried out, molded, or have insect pests, diseases;

   a. 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)).

   b. Cuttings

      1) Without labels, or plants from which labels are removed;

      2) Lacking proper proportions, have injuries to the bark, trunk wood splitting, broken branches, sprouting;

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 (rock ribs), and bank reconstruction 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.

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690-3.05 WATERWAY BANK. Tie in, to the existing waterway bank, the ends of the constructed banks similar to those found in the field and as shown on the Plans to create a smooth transition from the constructed bank to the existing bank.

Place the bank reconstruction materials as shown on the Plans, and noted in the Specifications. Place topsoil and vegetative mat such that the top of the bank, the vegetative mat, is reasonably flat and at the same elevation as the existing bank.

1. Install Erosion Control measures before beginning work.

2. Salvage/harvest and stockpile vegetative mat.

3. Salvage/harvest and store Willow cuttings.

4. Determine constructed stream bank and existing stream bank tie-in points.

5. Excavate the waterway bank to width shown on the Plans.

6. Place topsoil, mixed with fertilizer at the manufacturer's recommended application rate, on top of the exposed waterway bank to a depth of 4-inches.

7. 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.

8. Place live Willow stakes: Plant live stakes before July 1st.
   a. Prepare several live stakes from one dormant cutting. Cut stakes 10-inches to 24-inches long and roughly 1/2-inch to 2-inches in diameter. Discard flower buds. Each stake requires at least one or two leaf buds near the top of the live stake.
   b. Create a hole, in the vegetative mat, for the live stake with rebar or similar.
   c. Plant stakes as vertical as possible, 1-foot to 3-feet apart with 3/4 of the stake below ground and no more than one or two leaf buds exposed above ground.
   d. Tightly pack the soil around the stake so the stakes stand vertical and no air pockets remain.

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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.

Replace dead and unhealthy cuttings/live stakes/plants with cuttings of similar size and quality as the original planting.

Engineer and Contractor, in the growing season (May 1 to September 30) after the planting year and before June 30, inventory the cuttings, live stakes, and vegetative mat planted on the project to determine the number/area of dead and unhealthy plants/organic materials.

1. Willow Cuttings.

    a. Acceptance. Acceptance requires at least 4 cuttings per foot, on average over a 4-foot section, for each individual layer to be in healthy and vigorous condition in the growing season after the planting year.

    b. Replacement. Replace the dead and unhealthy plants to maintain at least 75% of the number originally planted. Plant the replacement cuttings using live staking techniques; space the live stakes at 6-inches along the layer or as directed by the Engineer. Do not remove the dead cuttings.

2. Live Willow Staking.

    a. Acceptance. Acceptance requires a minimum of 75% of the number originally planted to be in healthy and vigorous condition in the growing season after the planting year.

    b. Replacement. Replace the dead and unhealthy plants to maintain at least 75% of the number originally planted.

    Reset cutting stakes to an upright position.

3. 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.

Coordinate the replacement of the vegetative mat with the live staking to minimize damage to healthy organic materials. The Engineer will select which of the dead or unhealthy cuttings, stakes, and 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.

If after the maintenance period the survival rate specified, of the planted organic material has not been attained, replant the materials to attain the specified survival rate for each live organic material planted.

Contractor is responsible for replacing plants vandalized, stolen, or damaged during the maintenance period. Replace plants as soon as weather conditions permit. Provide replacement cutting/live stake/plant size and quality equal to, or better than, initially specified.

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 cuttings, live stakes, and vegetative mat.

Deep water vegetative mat, cuttings, and live staking 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, cuttings and live stakes 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, Willow cuttings, and live Willow staking, 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.

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690-4.01 METHOD OF MEASUREMENT. Section 109.

690.2004.____ Waterway Restoration – Stream Realignment by linear foot of each bank measured between reference points shown on the Plans.

690.2007.____ Waterway – Live Willow Staking by the square yard of area being staked, measured on the slope of the ground surface.

690.2009.____ Waterway Bed Fill by neat line volume.

690-5.01 BASIS OF PAYMENT.

Pay Item 690.2004.____ Waterway Restoration – Stream Realignment. All materials and work to construct waterway restoration, including the plant material consultant.

Pay Item 690.2007.____ Waterway – Live Willow Staking. All materials and work to construct waterway live staking, including the plant material consultant.

Partial payments of up to 80% of full amount may be authorized for Pay Item 690.2004.____ & 690.2007.____ 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.

Pay Item 690.2009.____ Waterway Bed Fill. Riprap class and selected material mix placed as show on the plans. Difference in riprap class specified, ratio of selected material in the bed fill, excavation and backfill required for placement of waterway bed fill is subsidiary.

Subsidiary to Section 690 Pay Items:

1. Hauling, stockpiling, disposal of unsuitable and surplus material.
2. Water for maintenance, the use of a Type B Advance Warning Arrow for watering, and plastic safety fence.
3. Topsoil and fertilizer used for vegetative mats and willow staking.
4. Replanting necessary to reach the specified plant survival rate.
5. Water diversion and dewatering.

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Payment will be made under:

PAY ITEM

Item Number	Item Description	Unit
690.2004.____	Waterway Restoration – Stream Realignment	LF
690.2007.____	Waterway – Live Willow Staking	SY
690.2009.____	Waterway Bed Fill	CY

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DIVISION 700 — MATERIALS

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SECTION 702
ASPHALT MATERIALS

Standard Modification

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

Standard Modification

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

Special Provisions

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%

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/Z546890000

703-2.05 AGGREGATE FOR COVER COAT AND SURFACE TREATMENT.

In Table 703-5 replace the line for Degradation Value with the following:

TABLE 703-5
QUALITY PROPERTIES FOR COVER COAT AND SURFACE TREATMENT

Micro-Deval	AASHTO T 327	15%, max.

HSM20.40-22.0501

Special Provision

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
6-Inch	**100%**
3-Inch	**98%**
No. 4	20-55%
No. 200	0-6%, determined on the minus 3-inch portion of the sample

CR703.1/Z546890000

Add the following:

4. Type E: Hard, durable particles or fragments of stone or gravel from rock excavation. Meet the following gradation as tested by WAQTC FOP for AASHTO T27/T11:

Sieve	Percent Passing by Weight
No. 200	0-6% determined on the minus 3-inch portion of the sample

Type E shall have at least 98% by weight of the particles passing the 3-inch sieve within the top 6 inches of Type E material used within the structural section.

Z546890000

703-2.09 SUBBASE.

In Table 703-8 replace the line for Degradation Value with the following:

TABLE 703-8
QUALITY PROPERTIES FOR SUBBASE

Micro-Deval	AASHTO T 327	25%, max.

HSM20.40-22.0501

703-2.10 POROUS BACKFILL MATERIAL.

Add the following to the end of the paragraph:

Use Gradation A unless otherwise specified.

HSM20.33-123121

Special Provision

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 705
JOINT MATERIAL

Special Provisions

705-2.05 FLEXIBLE WATERTIGHT GASKETS. In 2. Joining flexible metal pipe (steel and aluminum)" delete Item "a. ASTM C433". Re-letter the remaining items.

HSM20.48-24.0129

SECTION 706
CONCRETE AND PLASTIC PIPE

Special Provisions

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 707
METAL PIPE

Add the following Subsection 707-2.08:

707-2.08 POLYMER COATED CORRUGATED STEEL PIPES. Meet AASHTO M245 and M246 for conduits and coupling bands. Meet the specified sectional dimensions, gages, and type of polymer coating. Fully coat coupling bands with polymer coating.

Z546590000

SECTION 709
REINFORCING STEEL AND WIRE ROPE

Special Provisions

Add the following subsections:

709-2.04 ROCK STABILIZATION MATERIALS.

1. Rock Dowels and Associated Hardware.

    a. Provide bars for the rock bolts/dowels, including anchorage, bearing plates, couplers, corrosion protection, and other appurtenances from a manufacturer regularly engaged in the manufacturing of materials for the construction of rock bolts/dowels.

    b. Provide bars with a minimum length of 15 feet, that are continuously threaded steel reinforcement bars conforming to AASHTO M 31 Grade 75 deformed bar, and that are capable of being post-tensioned to the test loads shown on the plans.

    c. Provide anchor bar steel with hot dip galvanizing for corrosion protection. Comply with ASTM A153 for the hot dip galvanizing with a minimum thickness of 3.9 mils.

    d. Provide a minimum #8 Grade 75 bar for use as a 10-kip rock dowel.

    e. Provide rock bolts with a minimum ultimate tensile strength not less than 90 ksi, with a minimum nominal diameter of 1” and meeting the requirements of ASTM A615 or A722.

    f. Provide a bond breaker for the stressing (unbonded) length of rock bolts. The bond breaker may consist of either a smooth or corrugated plastic or metal sheathing and be sealed to prevent grout intrusion.

2. Cement Grout. Fully grout the rock bolt/dowel installations using non-shrink water/cement grout with a minimum unconfined compressive strength of 4,000 psi at 28 days (grout shall meet acceptance/design strength within 7 days of placement).

3. Wire Mesh and Associated Hardware. Wire mesh and associated hardware used for blasted rock face stabilization shall conform to requirements in 709-2.05.

709-2.05 OVERBURDEN AND FRACTURED ROCK STABILIZATION MATERIALS.

1. Wire Mesh and Associated Hardware.

    a. High Strength Wire Mesh:

        (1) The mesh shall be woven construction and be a homogenous mesh consisting of a single size wire that allows anchors to engage the full strength of the mesh regardless of anchor location.

        (2) The mesh shall be made with minimum 0.118 inch diameter wire.

        (3) The loops of the wire mesh shall be fastened together to prevent unraveling of the mesh.

        (4) The wire shall be alloyed high strength carbon steel wire with a minimum tensile strength of 2,800 lbs in accordance with ASTM A1007 (Level 3 drawn Zn5Al wire).

(5) The wire shall be hot dip galvanized with a Zinc/Aluminum coating with a minimum weight of 0.40 oz/ft^2 in accordance with ASTM A1007 (Level 3 drawn Zn5Al wire).

(6) The size of the mesh opening shall be a maximum of 3 inches by 5 inches with an interior circular clearance diameter of 2.5 inches.

b. Connection Clips:

(1) The connection clips shall be fabricated from minimum 0.15 inch diameter high strength steel wire with a minimum ultimate tensile strength of 4,900 lbs in accordance with ASTM A1007 (Level 3 drawn Zn5Al wire).

(2) The clip shall measure 2.36 inches x 0.83 inches and have two reversed end hooks on one side of the clamp.

(3) The wire shall be galvanized with a 95% Zinc and 5% Aluminum coating with a minimum weight of 0.49 oz/ft^2. The connection clips shall be used to lace together adjacent mesh sheets.

c. Compression Claws: The Type 2 compression claws shall be minimum 0.30 inch diameter carbon steel bar and shall be hot dipped galvanized in accordance with ASTM A153/ A153M, Class B-3 with a minimum layer thickness of 1 oz/ft^2.

d. Bearing Plates:

(1) The Bearing Plates shall be made from minimum 0.39 inch thick steel and be hot dip galvanized in accordance with ASTM A123/ A123M with a minimum layer thickness of 85 uM (3.3 mils).

(2) The plate shall be diamond shaped with minimum dimensions of 7.48 inches by 13 inches with a formed 1-inch claw at each tip to engage the wire mesh fabric.

2. Boundary Ropes:

a. The ropes shall have a diameter of 0.5 inches.

b. The rope will be 6x19 construction (or equivalent), IWRC and galvanized with a minimum breaking strength of 23,940 pounds.

c. The rope shall in accordance with Federal Specification RR-W-410, ASTM A1023/ A1023M including galvanizing.

3. Main Soil and/or Rock Anchors:

a. The anchor nails shall be 1.25-inch diameter self-drilling hollow-core, high strength steel anchor nails that meet ASTM A615; supplied with a 3-inch diameter sacrificial bit, . Provide nails that are groutable and capable of being post tensioned to a minimum of 50,000 lbs.

b. The anchor nails shall have a minimum yield stress of 55 ksi, meeting the requirements of ASTM A615.

c. The anchor nails shall be galvanized according to ASTM A153. The minimum length of the anchors is in accordance with the plans.

4. Splice Couplers: When required, splice couplers may be used to splice the anchors and shall be capable of developing 100% of the guaranteed ultimate tensile strength of the bars.

5. Centralizers:

   a. Centralizers shall be installed as noted on the drawings, along the length of the anchor to insure that the anchor will be centered in the drill hole and that minimum grout cover encapsulates the rebar.

   b. Centralizers shall be manufactured from polyvinyl chloride (PVC). Centralizers are not required for self-drilling hollow core bar.

6. Grout: Use non-shrink Portland cement grout conforming to ASTM C1107, made with clean potable water and having a minimum unconfined compressive strength of 4,000 psi at 28 days. Grout shall meet acceptance/design strength within 7 days of placement.

7. Miscellaneous Materials:

   a. All miscellaneous material associated with the anchored mesh system shall be hot dip galvanized and be supplied by the vendor.

   b. Wire rope clips shall be in accordance with Fed Spec FF-C-450, Type 1, Class 1 and hot-dip zinc galvanized according to ASTM A153/ A153M.

   c. Thimbles shall be in accordance with Fed Spec FF-T-276b and hot-dip zinc galvanized according to ASTM A153/ A153M.

Z546590000

SECTION 710
FENCE AND GUARDRAIL

Special Provision

Replace Subsection 710-2.04 with the following:

710-2.04 METAL BEAM RAIL.

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

2. Box-Beam Guardrail. Meet ASTM A500 Grade B, or ASTM A501.

3. Symmetric and Asymmetric W-Thrie Beam Transition Section. Meet AASHTO M 180, Class B, Type II.

Galvanize the rail per AASHTO M 111 after fabrication.

710-2.06 GUARDRAIL POSTS AND BLOCKOUTS.

Add the following:

4. Transition Posts. Meet the section and length specified on the Plans. Meet ASTM A992 or ASTM A709, Grade 50.

5. Transition Blockouts. Meet the shape and dimensions shown on the Plans. Meet ASTM A500. Grade B or Grade C.

C710.4-25.1105

Replace Subsection 710-2.11 with the following:

710-2.11 GUARDRAIL TERMINALS.

W-beam shall meet requirements of AASHTO M 180, Class A, Type II. Box beam shall meet requirements of ASTM A500 Grade B, or ASTM A501. Galvanize after fabrication.

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

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

Guardrail Terminals shall be AASHTO MASH Test Level 3.

1. W-Beam. Provide one of the following terminal types, as shown on the plans, for single-rail W-beam guardrail. Design requirements: 31-inch top of rail height, 8-inch blockouts, W6x8.5 steel posts, 12 ft 6-inch w-beam panels, and mid-span splice connection to run of rail.

    a. Parallel Terminals. Provide the RoadSystems, Inc. MASH MSKT W-Beam terminal with the following characteristics:

        (1) Length: 50 ft nominal effective length.

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

    b. Buried in Backslope Terminal. Provide terminals as shown on the Plans.

2. Box Beam. Provide terminals, as shown on the plans for box beam guardrail. Design requirements: 28-inch top of rail height, designed for use with 6-inch x 6-inch x 3/16-inch box beam.

    a. Parallel Terminals. Provide terminals meeting the following:

        (1) Length: 33 ft nominal effective length, or a minimum 18 ft of box beam rail and standard 3-inch weak posts beyond the 1/8-inch tube rail, or as recommended by the manufacturer's installation manual.

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

HSP20.12-25.1105

Add the following Subsection 710-2.12 Transition Connection:

710-2.12 TRANSITION CONNECTION.

1. Thrie Beam Terminal Connector. Meet AASHTO M 180, Class B, Type II.

2. Guardrail Connection Plate. Meet ASTM A709, Grade 50.

C710.4-25.1105

SECTION 712
MISCELLANEOUS

Standard Modification

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

Special Provision

712-2.17 METHYL METHACRYLATE PAVEMENT MARKINGS. Replace No. 1. Quality Requirements: with the following:

1. Quality Requirements: Use a marking material formulated for the application type specified. Use a marking material manufactured from new materials and free from dirt and other foreign material. Use a methyl methacrylate based resin system for part "A". Use benzoyl peroxide system for part "B".

   Extruded or stenciled application: Material formulated for extruded or direct stenciled application with factory intermix beads, and anti-skid aggregate and the application of additional surface applied beads.

   Submit a manufacturer certification for both the methyl methacrylate material, glass beads and anti-skid aggregate to ensure that the materials furnished conform to these Specifications.

4. Performance Properties: Add the following:

   k. Color: Yellow, PR-1 Chart, 33538 Federal Yellow. White, minimum daylight reflectance of 84.

Replace Subsection 712-2.18 with the following:

712-2.18 GLASS BEADS FOR METHYL METHACRYLATE PAVEMENT MARKINGS. Use the type and quantity of beads specified in writing by the marking material manufacturer required to satisfy the specified performance requirements. The written certification will note the bead coating is compatible with the marking material binder.

1. Bead Manufacturer and Type.

   a. Swarco, Megalux-Beads or
   b. Approved equal beads

   Approved Equal Beads. Equal beads will demonstrate:
   (1) Bead coatings compatible with marking materials. Marking Material Manufacturer will certify compatibility.
   (2) Lasting retro reflectivity.

C712.1-09.0101-1

Special Provision

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

Special Provision

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.

      2) High Performance Turf Reinforcement Mats (HPTRMs). A long-term, non-degradable RECP composed of UV-stabilized, non-degradable, synthetic fibers, nettings and/or filaments processed into three-dimensional reinforcement matrices designed to provide sufficient thickness, strength and void space to permit soil filling and/or retention and the development of vegetation within the matrix. The HPTRM MARV tensile strength per ASTM D-6818 is 1000 lbs/ft in the weakest principle direction with a minimum limiting permissible shear stress of 4.0 lb/ft^2 and minimum weight of 8 oz/yd^2 HPTRMs (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.

C727/Z546590000

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/Z546590000

SECTION 730
SIGN MATERIALS

Special Provisions

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:

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).

1. Design Loads:

   a. Impact load from snow thrown by snowplows
   b. Weight of snow covering the pole (snow thrown from snowplows)
   c. Wind loads (100 mph, 3 sec gust)

2. Service Temperature Range: -40˚ F to +140˚ F.

3. Pole:

   a. Material:

      (1). Steel, or
      (2) Stainless Steel, or
      (3) 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

   b. Dimensions

      (1) Top of Pole: 60 inches to 84 inches above top of guardrail
      (2) Width/Diameter: minimum = 1 1/4 inches, maximum = 2 inches (steel/stainless steel not be greater than 5/8 inch diameter)
      (3) Thickness: as required by design

   c. Visibility:

      (1) 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.
      (2) 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.
            (i) Flag: Single retroreflective sheet each face
            (ii) Banding: Two bands completely around marker, 4 inches between bands

4. Hardware and Fasteners:

   a. Steel, and/or
   b. Stainless Steel, or
   c. 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

Special Provision

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) **Signal Poles**	**MEASUREMENTS**	**TAG MARKINGS**
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.

TABLE 740-3
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			

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.

Furnish each luminaire with a high pressure sodium lamp or LED of the wattage specified and matching ballast with an input voltage equal to circuit voltage.

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. Roadway luminaire

   a.

2. Intersection luminaire

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.

740-2.24 TRAFFIC SIGNAL COMMUNICATIONS SYSTEM. Furnish only fully functioning new equipment of the brand and type listed or approved equal. To be considered an approved equal equipment must meet or exceed the listed specifications. The products listed in this subsection are subject to review and approval if they are included on the Materials Certification List (MCL).

1. Broadband Ethernet Radio Interconnect System. The contractor shall provide a 5GHz Broadband Wireless Ethernet Radio Interconnect System. The system shall be the Intuicom Nitro58™ Wireless Solutions or an approved equal meeting the following minimum specifications:

    a. Comply with FCC part 15 and IC RSS-210 rules/regulations.

    b. Support and provide the following wireless protocols:

        (1) IEEE 802.11a (OFDM)

        (2) IEEE 802.11n (MIMO 2x2:2, OFDM)

        (3) Proprietary Wireless Protocol

c. Shall be available in the following wireless hardware configurations:

(1) 108Mbps – Integrated Panel Antenna or Stand Alone Radio

(2) 216Mbps – Stand Alone (Dual) Radio

(3) 432Mbps - Access Point Cluster (Quad) Radio

(4) 300Mbps – 802.11n Integrated Panel Antenna

d. All Radios shall contain embedded GPS for automatic Geo-location of fixed or mobile wireless locations.

e. Integrated Panel Antennas must contain an external status panel which combines Received Signal Strength Indicators (RSSI), Power Indicator, and a Reset Button.

f. Radios include Adaptive Modulation, Dynamic Frequency Selection, Automatic Transmit Power Control – RF link is monitored to automatically adjust the data rate to optimize the maximum link performance.

g. Any Radio shall be configurable as an Access Point, Remote, Repeater and Mesh Node.

h. The manufacturer and/or supplier of the Radio will be located in North America with performance testing over the Radio's operating temperatures of -40° to +85 C. Shall be IP67 and NEMA exceeding environmental specifications.

i. Detailed Requirements:

(1) Operating Frequency: 5.150 – 5.825 GHz

(2) Ethernet: Auto-sensing 10/100/1000BASE-T Ethernet

(3) Electrical: Gigabit PoE Compliant (IEEE 802.3af/at)

(4) Receiver Sensitivity: -74 to -94dBm

(5) Peek Transmit Power: 802.11a (Up to 28dBm), 802.11n (Up to 27dBm, +/- 2dBm)

(6) Channel Width: 5, 10, 20, 40 MHz

(7) Range: 20+ miles-LOS

(8) Supported Network Topologies: Point to Point, Point to Multipoint, Mesh

(9) Wireless Security Options:

(a) 802.11i WPA/WPA2 (PSK, EAP), AES-CCM, TKIP, 802. 1X, RSN.

(b) Radius Authentication

(c) MAC Access Control List

(d) User Login Controls

(10) Support the minimum IEEE Networking Features:

(a) 802.11e (WMM & QoS)

(b) 802.11h (DFS & TPC)

(c) 802.1d (Ethernet Bridging)

(d) 802.1p (Traffic Prioritization)

(e) 802.1q (VLAN)

(f) 802.1w (Rapid Spanning Tree)

(g) 802.3ac (802.1q & 802p support)

(h) 802.3ad (Link Aggregation)

(i) 802.3x (Full Duplex and Flow Control)

(11) Minimum Wireless Software Features:

(a) Automatic Geolocation of embedded GPS radios

(b) Icon roll over feature displays latitude and longitude coordinates of radios

(c) Customizable Menu Interface

(d) Automatically discover, organize, configure radios in network tree

(e) Provide a “Drag and Drop” radio configuration tool

(f) A color coded display of network-wide wireless diagnostics illustrated on map

i. Data Rate, RSSI, Client Connection Quality

(g) Provide Wireless Alert Reporting

i. A unique slider control allowing users to adjust upper and lower alert limits

(h) Network Management Capabilities

i. Firewall, ARP/Bridge Tables, Spanning Tree, Data Throughput

ii. IP Discovery, IP/Subnet Configuration, IP Conflict Tool

iii. Ping Watchdog

(i) Real-time wireless diagnostic tools

i. Bandwidth Test Tool, RSSI and CCQ

ii. Spectrum Analysis with AP Scan Tool

iii. Audio Antenna Aiming Tool

(j) Advanced User Control

(1) Terminal Window, Telnet, SSH2

(2) Dynamic Routing (BGP+, OSPFv3 and RIP protocols)

(3) Sniffer and Fetch tools

(4) IPV6 support

(5) DNS

2. Copper and Fiber Ethernet Switch Furnish the below model of Siemens RuggedCom Ethernet Switch in the quantity indicated in the plans

a. RSG920P: 6GK6092-OPS23-0BA0-ZA04+B04+C04+D04 (LC Fiber SFPS)
b. RS900G: 6G6090-0GS23-0BA0-ZA05 (SC Connectors)
c. RSL910: 6GK6491-OLB00-1CA0 (LC Fiber SFPs)
d. RX1511:
(1) 6GK6015-1BM26-0EC0-ZA01+B01+C36 (blank slot 2 SFPs)
(2) 2x 6GK6000-8FG52-0AA0 (2x1000LX SM, 1310, LC, 10km for slot 2)

APPENDIX A

CONSTRUCTION SURVEY REQUIREMENTS

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APPENDIX B

ENVIRONMENTAL PERMITS

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APPENDIX C

MATERIAL CERTIFICATION LIST

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HIGHWAY MATERIALS CERTIFICATION LIST

(updated 7/15/2025)

Project Name Seward Highway: MP 25.5 to MP 36.6 Trail River to Sterling Wye Rehabilitation

Project Number 0311(031) / Z546590000

Project Engineer Signature

Unshaded boxes indicate who approves the manufacturer's certificate of compliance or materials submittals. If two boxes aren't shaded, either approving authority may be used.

Materials Item	Specification	Construction		Design			Statewide Materials		Manufacturer/ Remarks	Certificate Location e.g. Binder #
	2020 or Std. Mod./Special Provisions, if noted	Project Engineer	Regional Materials or QA Engineer	Design Engineer of Record	State Bridge Engineer	Regional Traffic Engineer	*Qualified Products List (QPL)	State Materials or QA Engineer		
202 EXCAVATION AND EMBANKMENT									ASP = Alaska Standard Plan CRSP = CR Special Provision	
Timber, Pressure Treated	202-2.01								CRSP	
Steel Pipe, Galvanized	202-2.01								CRSP	
Steel Fasteners, Galvanized	202-2.01								CRSP	
Reflectors	202-2.01								CRSP	
Mail Boxes	202-3.02/ASP									
203 EXCAVATION AND EMBANKMENT										
Rock Stabilization Material	709-2.04								CRSP	
Slope Stabilization Materials	709-2.05								CRSP	
205 EXCAVATION AND FILL FOR MAJOR STRUCTURES										
Controlled Low-Strength Material	712-2.22								CRSP	
318 FOAMED ASPHALT STABILIZED BASE COURSE										
Mix Design	318-2.01								CRSP	
Asphalt Binder	318-2.02								CRSP	
Portland Cement	318-2.03								CRSP	
401 HOT MIX ASPHALT PAVEMENT										
Mix Design	401-2.09								CRSP	
Liquid Anti-Strip Additive	Mix-Design									
Asphalt Binder	401-2.01								CRSP	
Joint Adhesive	401-2.03/702-2.05								CRSP	
Joint Sealant	401-2.04, 702-2.06								CRSP	

aded boxes under QPL do not indicate that the materials are currently on that list. They indicate materials with potential for being on the QPL once qualified.
ection 106-1.05 for submittal requirements.

Unshaded boxes indicate who approves the manufacturer's certificate of compliance or materials submittals. If two boxes aren't shaded, either approving authority may be used.

Materials Item	Specification	Construction		Design			Statewide Materials		Manufacturer/ Remarks	Certificate Location e.g.
	2020 or Std. Mod./Special Provisions, if noted	Project Engineer	Regional Materials or QA Engineer	Design Engineer of Record	State Bridge Engineer	Regional Traffic Engineer	*Qualified Products List (QPL)	State Materials or QA Engineer		Binder #
Warm Mix Asphalt	401-2.05/702-2.07								CRSP	
Asphalt Release Agent	401-2.06/702-2.08								CRSP	
501 CONCRETE FOR STRUCTURES										
Concrete Mix Design	501-2.02									
Grout	501-2.01.5, 701-2.03									
Epoxy Adhesive for Crack Sealing	501-2.01.5									
Epoxy Adhesive for Crack Injection	501-2.01.5									
Low-Viscosity Resin	501-2.01.5, 712-2.19									
Epoxy Bonding Agents	501-2.01.5									
Concrete Anchor Bolts and Inserts	712-2.20									
Asphalt Felt	501-2.01.4									
Curing Materials	711-2.01									
Utiliduct, HDPE	706-2.08									
Utiliduct, Steel	716									
Structural Steel	716									
602 STRUCTURAL PLATE PIPE										
Flexible Watertight Gaskets										
Ring Gaskets for Rigid Pipe & Precast Manhole Sections	705-2.05									
Ring Gaskets for Flexible Metal Pipe	705-2.05									
Elastomeric Seals for Plastic Pipe	705-2.05									
Corrugated Steel Pipe, Pipe Arches, and Underdrains	707-2.01									
Corrugated Aluminum Alloy Culvert Pipe and Underdrains	707-2.03									
Structural Plate Culverts	707-2.04									
603 CULVERTS AND STORM DRAINS										
Flexible Watertight Gaskets										

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Materials Item	Specification	Construction		Design			Statewide Materials		Manufacturer/ Remarks	Certificate Location e.g.
	2020 or Std. Mod./Special Provisions, if noted	Project Engineer	Regional Materials or QA Engineer	Design Engineer of Record	State Bridge Engineer	Regional Traffic Engineer	*Qualified Products List (QPL)	State Materials or QA Engineer		Binder #
Ring Gaskets for Rigid Pipe & Precast Manhole Sections	705-2.05.1									
Ring Gaskets for Flexible Metal Pipe	705-2.05.2									
Elastomeric Seals for Plastic Pipe	705-2.05.3									
Box Culvert, Precast Reinforced Concrete										
Concrete Mix Design	501-2.02									
Reinforcing Steel	503									
Curing Materials	711-2.01									
Joint Materials	705									
Grout	701									
Steel Pipe										
Steel Pipe, 30 Inch	603-2.01								Project Special Provision	
Steel Pipe, 36 Inch	603-2.01								Project Special Provision	
Steel Pipe, 42 Inch	603-2.01								Project Special Provision	
Corrugated High Density Polyethylene (HDPE) Pipe										
Culverts, 12 Inch	706-2.07								CR Special Provision	
Culverts, 18 Inch	706-2.07								CR Special Provision	
Culverts, 24 Inch	706-2.07								CR Special Provision	
Culverts, 36 Inch	706-2.07								CR Special Provision	
End Sections for HDPE pipe, 12 Inch	706-2.07								CR Special Provision	
End Sections for HDPE pipe, 18 Inch	706-2.07								CR Special Provision	
End Sections for HDPE pipe, 24 Inch	706-2.07								CR Special Provision	
End Sections for HDPE pipe, 36 Inch	706-2.07								CR Special Provision	
End Sections for CSP pipe, 24 Inch	707-2.01								CR Special Provision	
End Sections for CSP pipe, 24 Inch	707-2.01								CR Special Provision	
End Sections for CSP pipe, 36 Inch	707-2.01								CR Special Provision	

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End Sections for CSP pipe, 42 Inch	707-2.01								CR Special Provision	
Corrugated Steel Pipe & Pipe Arches										
Zinc-Coated CSP, 72 inch	707-2.01.1									
Zinc-Coated CSP, 108 inch	707-2.01.1									
Zinc-Coated CSP Arch, 83x57 inch	707-2.01.1									
Polymer-Coated CSP, 24 inch	707-2.08									
Polymer-Coated CSP, 36 inch	707-2.08									
Polymer-Coated CSP, 42 inch	707-2.08									
Polymer-Coated CSP, 48 inch	707-2.08									
Polymer-Coated CSP, 54 inch	707-2.08									
Galvanizing	716-2.07									
Culvert Marker Posts (Flexible Delineator Posts)	730-2.05								CRSP	
Culvert Marker Strap and Seals	603-2.01								CRSP	
604 MANHOLES & INLETS										
Concrete Mix Design	550-2.02									
Curing Materials	711-2.01									
Clay or Shale Brick										
Sewer Brick	704-2.01									
Building Brick	704-2.01									
Concrete Brick	704-2.02									
Concrete Masonry Block	704-2.03									
Flexible Watertight Gaskets										
Ring Gaskets for Rigid Pipe & Precast Manhole Sections	705-2.05.1									
Ring Gaskets for Flexible Metal Pipe	705-2.05.2									
Elastomeric Seals for Plastic Pipe	705-2.05.3									

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Reinforcing Steel										
Reinforcing Steel Bars	709-2.01.1									
Headed Reinforcing Steel Bars	709-2.01.2									
Epoxy-Coated Reinforcing Steel Bars	709-2.01.3									
Epoxy-Coating Patch Material	709-2.01.7									
Bar Supports	709-2.03									
Epoxy for Bonding Dowels	712.2.21									
Precast Concrete Manhole Sections	712-2.05									
Frames, Grates, Covers & Ladder Rungs										
Gray Iron Castings	712-2.06									
Carbon-Steel Castings	712-2.06									
Structural Steel	712-2.06									
Galvanizing	712-2.06									
Malleable Iron Castings	712-2.06									
Steps	See Plans									
Corrugated Metal Units	712-2.07									
606 GUARDRAIL										
Concrete Mix Design	550-2.02									
Wire Cable	709-2.02									
Metal Beam Rail	710-2.04								CRSP	
Guardrail Posts and Blocks										
Wood Posts and Blockouts	710-2.06.1									
Timber treatment	714									
Steel Posts and Blockouts	710-2.06.2									
Synthetic Blockouts	710-2.06.3									

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Guardrail Hardware	710-2.07									
Terminals										
Parallel Terminals	710-2.11.1									
Terminal Markers (Flexible)	730-2.05								CRSP	
Guardrail Reflector Assembly Brackets	606-2.01								CRSP	
Retroreflective Sheeting Type IX or XI	606-2.01								CRSP	
Bollards										
Shapes, Plates and Bars	606-2.01								CRSP	
Bollard Pipe	716-2.06									
Bollard Tube	606-2.01								CRSP	
Galvanizing	716-2.07									
Galvanizing Repair	606-2.01								CRSP	
Paint	708-2.01/2.02									
Bollard Post	713-2.01									
Preservatives for Timber	714.2.01									
Retroreflective Bands	606-2.01								CRSP	
608 SIDEWALKS										
Concrete Sidewalk										
Concrete Mix Design	550-2.02									
Joint Fillers	705-2.01									
Joint Sealer	705-2.02									
Asphalt Sidewalk										
Asphalt (HMA) Mix Design	608-2.01.2								CRSP	
Asphalt Binder	702-2.01								CRSP	
Detectable Warnings	608-3.04									

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613 MONUMENTS AND MARKERS										
Concrete Mix Design	550-2.02									
Reinforcing Steel										
Reinforcing Steel Bars	709-2.01.1									
Epoxy-Coated Reinforcing Steel Bars	709-2.01									
Headed Reinforcing Steel Bars	709-2.01									
Epoxy-Coating Patch Material	709-2.01									
Bar Supports	709-2.03									
Epoxy for Bonding Dowels	712.2.21									
Paint	613-2.01									
Marker Posts	730-2.05/Plans								CRSP	
615 STANDARD SIGNS										
Sheet Aluminum	730-2.01/Plans									
High Density Overlaid Plywood	730-2.02									
Sign Framing Members	Plans								CR Detail	
Retroreflective Sheeting	730-2.03									
Orange Background Signs	615-2.01.2								CRSP	
Railroad Crossbucks & Vertical Crossbuck Support Panels	615-2.01.2								CRSP	
Non-Illuminated Overhead Signs	615-2.01.2								CRSP	
Fluorescent Yellow-Green School Area Signs	615-2.01.2								CRSP	
Reflective Sheeting Warranty	615-2.01.5								CRSP	
Sign Posts										
Metal Pipe Posts	730-2.04.1									
Perforated Steel Posts	730-2.04.2									
Finished Wooden Posts	730-2.04.3									

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Pressure Treatment for Wooden Posts	730-2.04.3.b/714									
Preservative for Field cuts and holes	730-2.04.3.b									
Wide Flange Posts	730-2.04.4									
Flanged Channel Posts	730-2.04.5									
Square Non-Perforated Steel Tubes	730-2.04.6									
Zinc Coating for Repairs	730-2.04.6.b									
Flexible Delineator Posts	730-2.05								CRSP	
Acrylic Prismatic Reflectors	730-2.06									
Structural Tubing and W-Shape Beams.	730-2.04.7									
Sign Bases										
Slip Base	615-2.01.3/Plans								CRSP	
Breakaway Base	615-2.01.3/Plans								CRSP	
Frangible Couplings	615-2.01.3/ASP								CRSP	
Concrete Mix Design	615-2.01.3/ 501-2.02/550-2.02								CRSP	
616 THAW PIPE AND THAW WIRES										
Thaw Pipe										
Pipe	616-2.01									
Fittings	616-2.01									
Pipe Hangers	616-2.01									
Braces for Stand Pipe	616-2.01									
Bolts and Nuts	616-2.01									
Galvanizing for Pipe and Braces for Stand Pipe	616-2.01									
Galvanizing Fittings and Bolts and Nuts	616-2.01									
Thaw Wire										
Materials, devices, fittings and hardware	616-2.02									

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Conduits and Fittings										
Conduit, Couplings, Elbows and Nipples	616-2.02.1.a									
Fittings and Miscellaneous Conduit Hardware	616-2.02.1.b									
Heat Cable	616-2.02.2									
Controls										
Thermostat	616-2.02.3.a									
Contactor	616-2.02.3.b									
Switch	616-2.02.3.c									
Conductors										
Service and Feeder Cables	616-2.02.4.a									
Underground Wire	616-2.02.4.b									
Branch Circuit Wire	616-2.02.4.c									
Control Wire	616-2.02.4.d									
Device, Junction, and Pull Boxes	616-2.02.5									
Receptacles, Remote Power	616-2.02.6									
Circuit Breakers	616-2.02.7/Plans									
Grounding	616-2.02.8									
Terminal Posts	616-2.02.9									
Branch Circuit Panelboard	616-2.02.10									
617 RAILROAD CROSSINGS										
Railroad Ballast, Type 4A	617								Project Special Provision	
Anchor Bolts	617-2.01									
Rigid Metal Conduit, Couplings, and Fittings	617-2.01									
Concrete Mix Design	501-2.02									
Railroad Crossing Pads	617-2.01									

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Galvanized Coating Repair	617-2.01									
618 SEEDING										
Seed	724									
Fertilizer	618-2.01/725								CRSP	
Soil Stabilization Material	727								CRSP	
619 SOIL STABILIZATION										
Mulch	727-2.01								CRSP	
Matting	727-2.02								CRSP	
Sediment Retention Fiber Rolls (SRFRs)	727-2.03								CRSP	
Compost	727-2.04								CRSP	
Tackifier	727-2.05								CRSP	
Polyacrylamide (PAM)	727-2.06								CRSP	
Geotextile-Encased Check Dams and Sediment Barriers	727-2.07								CRSP	
Sandbags	727-2.08								CRSP	
Manufactured Inlet Protection System	727-2.09								CRSP	
Clear Plastic Covering	727-2.10								CRSP	
Staples	727-2.11								CRSP	
High Performance Turf Reinforcement Matt	727-2.02								CR Special Provision	
621 PLANTING TREES AND SHRUBS										
Plant Stock										
Nursery Stock	621-2.01.1									
At least 2 full growing seasons in age	621-2.01.1.a									
At least 1 but less than 2 full growing seasons in age	621-2.01.1.b									
Collected Stock	621-2.01.2									
Balled and Burlapped Plants	621-2.01.3									

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Fertilizer	621-2.02								CRSP	
Limestone	712-2.03									
Mulch	621-2.04								CRSP	
Stakes	621-2.06									
Tree Wound Dressing	621-2.07									
626 SANITARY SEWER SYSTEM										
PVC Pipe										
PVC Pipe, __ inch	706-2.05									
PVC Fittings	706-2.05									
Rubber Gaskets for PVC Pipe	706-2.05									
Joints for PVC Pipe	706-2.05									
HDPE Pipe										
HDPE Pipe 2" or less	706-2.08									
HDPE Pipe over 2"	706-2.08									
Butt Fusion Fittings	706-2.08									
Flanged Joints	706-2.08									
HDPE Pipe in Arctic Applications										
Thaw Wire, control system and power supply	706-2.08.1/616									
Polyurethane Insulation	706-2.08.2									
24 Gauge Galvanized Steel Outer Surfacing	706-2.08.3									
16 Gauge Aluminum Outer Surfacing	706-2.08.3									
Ductile Iron Pipe	707-2.05									
627 WATER SYSTEM										
Concrete Mix Design	550-2.02								Added row	
HDPE Pipe										

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HDPE Pipe 2" or less	706-2.08									
HDPE Pipe over 2"	706-2.08									
Butt Fusion or Flange Fittings	706-2.08									
Flanged Joints	706-2.08									
HDPE Pipe in Arctic Applications										
Thaw Wire, control system and power supply	706-2.08.1/616									
Polyurethane Insulation	706-2.08.2									
24 Gauge Galvanized Steel Outer Surfacing	706-2.08.3									
16 Gauge Aluminum Outer Surfacing	706-2.08.3									
Ductile Iron Pipe	707-2.05									
Service Pipe										
Copper Pipe	707-2.06.1									
Steel Pipe	707-2.06.2									
Corporation Stops and Curb Stops	712-2.09/Plans									
Gate Valves										
Larger Than 3 Inches	712-2.10									
3 Inches and Smaller	712-2.10									
Valve Service Boxes										
For Valves Larger than 3 Inch	712-2.11									
For Valves 3 Inch and Smaller	712-2.11									
Hydrants										
Single Pumper Hydrants	712-2.12									
Double Pumper Hydrants	712-2.12									
630 GEOTEXTILE FOR EMBANKMENT SEPARATION AND STABILIZATION										
Geotextiles and Sewing Thread										

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Separation	729-2.01.2									
Stabilization	729-2.01.3									
Reinforcement, Type __	729-2.01.5									
631 GEOTEXTILE FOR SUBSURFACE DRAINAGE AND EROSION CONTROL										
Geotextiles and Sewing Thread										
Subsurface Drainage	729-2.01.1									
Erosion Control	729-2.01.4									
633 SILT FENCE										
Geotextile, Erosion Control	729-2.01.4									
Silt Fence	729-2.02									
634 GEOGRID SOIL REINFORCEMENT										
Geogrid, Stablization, Class _	729-2.04.1									
641 EROSION, SEDIMENT AND POLLUTION CONTROL										
Materials	641-2.05								CR Special Provision - 641 Control and Stabilization Materials identified and documented in SWPPP and approved on project.	
642 CONSTRUCTION SURVEYING AND MONUMENTS										
Monument Cases	642-2.01								CRSP	
Primary Monument	642-2.01								CRSP	
Secondary Monument	642-2.01								CRSP	
643 TRAFFIC MAINTENANCE										
Traffic Control Devices	643-3.04								CR Special Provision - 643 Materials approved on project with TCP conforming to Alaska Traffic Manual (ATM).	

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670 TRAFFIC MARKINGS										
Traffic Paint, Glass Beads	708-2.03, 712-2.08									
Methyl Methacrylate Pavement Markings, Beads, Anti-Skid Combined Cert.	712-2.17, 712-2.18								CRSP	
Raised and Recessed Pavement Markers	712-2.15/Plans									
Additional Materials										

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Project Name Seward Highway: MP 25.5 to MP 36.6 Trail River to Sterling Wye Rehabilitation

Project Number 0311(031) / Z546590000

Project Engineer Signature

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SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
660 SIGNALS AND LIGHTING											
TRAFFIC SIGNAL SYSTEMS											
PCC SIGNAL POLE FOUNDATIONS: Cast In Place											
Concrete Mix Design	660-3.02	N									
Reinforcing Steel Bars	Std. Plans 709-2.01	N									
Anchor Rods	Std. Plans 709-2.01	N									
Corrugated Metal Pipe	Std. Plans 660-3.02	N									
JUNCTION BOXES:											
Type I / IA, II, III	See Detail in Plans 660-2.01 660-3.04	N									
Electronic Ball Marker	660-3.04	N									
Concrete Mix Design	660-2.01 501-2.02	N									
Curing Materials	711-2.01	N									
Reinforcing Steel	709-2.01	N									
Junction Box Cover	See Detail in Plans 660-3.04	N									
STEEL POLES AND POSTS:											
Galvanizing	Std. Plans 740-2.02	N									
Shop Drawings	Std. Plans 660-3.01 740-2.02	N									
Calculations	Std. Plans 740-2.02	N									

SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
Welding Plan	Std. Plans 660-3.01 740-2.02	N									
Mill Certifications	Std. Plans 740-2.02	N									
CONDUIT / LOOPS:											
Galvanized Rigid Metal Conduit (RMC)	740-2.06	Y									
High Density Polyethylene Conduit (HDPE)	740-2.06	Y									
High Density Polyethylene Couplings	660-3.03 740-2.06	Y									
Galvanized Couplings	740-2.06	Y									
Galvanized Split Couplings	740-2.06	Y									
Galvanized Elbows	740-2.06	Y									
Bore Casing	660-3.03	N									
Galvanized Nipples	740-2.06	Y									
Underground Marker Tape	660-3.03	N									
Pull Rope	660-3.03	N									
Watertight Caps (for unused conduit)	See Detail in Plans	N									
Watertight sealing bushing (for used conduits above ground)	See Detail in Plans	N									
Duct Sealing Compound (for conduits below grade entry thru Controller Foundation Slab)	660-3.03	Y									
Galvanized Myers Hub (for connection to enclosures)	740-2.06	Y									

SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
Schedule 80 PVC Conduit (for loops)	See Detail in Plans 740-2.06	Y									
PVC Fittings & Adapters (Loops)	See Detail in Plans 740-2.06	Y									
Type "X" Conduit Outlet Bodies with Covers, Gaskets & Plugs (Loops)	See Detail in Plans 740-2.06	Y									
BONDING & GROUNDING:											
Copper Ground Rod	See Detail in Plans 660-3.06	Y									
Grounding Bushings	See Detail in Plans 740-2.06	Y									
Ground Rod Clamps	660-3.01 660-3.06	Y									
Bare Copper Grounding Wire	See Detail in Plans 660-3.06	N									
Braided Copper J-Box Lid Bonding Wire	See Detail in Plans 740-2.06 660-3.06	Y									
Irreversible Compression Type Connectors	See Details in Plans 660-3.02 660-3.06	Y									
CONDUCTORS / CABLES:											
Control Cables	740-2.05	Y									
Power Cable	740-2.05	Y									
Detector Loops	See Details in Plans 740-2.05	Y									
Loop Lead-in (Snyder) Cable a. Power & Control Tray Cable b. Used on all new construction, and on rehabilitation work with sufficient conduit capacity.	740-2.05	Y									

SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
Loop Lead-in (Shielded Data) Cable a. Polyethylene or polypro insulation b. Used on Rehab jobs where Snyder Cable creates fill problems.	740-2.05	Y									
Interconnect Cable (Copper)	740-2.05	N									
Interconnect Cable (Fiber)	662-2.03	N									
Illumination Cable - PE Jacket	740-2.05	Y									
Luminaire Tap Conductors	740-2.05	Y									
Identification Tags	660-3.05	N									
SPLICES and TERMINALS:											
Terminal Blocks	660-3.05 740-2.11 740-2.14	Y									
Spade type crimp-on terminals	660-3.05	Y									
Loop Lead In Splice Kit (for Loops)	See Detail in Plans 660-3.05	N									
Heat Shrink Tubing	660-3.05	Y									
Power Cable Splice Kit (Lighting)	See Details in Plans 660-3.05	Y									
Splice Connectors	See Details in Plans 660-3.05	Y									
Electrical Tape	See Details in Plans 660-3.05	Y									
Double Fuse Connector Kits (Lighting)	See Detail in Plans 740-2.07	Y									
Fuses for Double Fuse Connector Kit	See Detail in Plans 740-2.07	Y									
Interconnect Splice Kits (fiber)	662-3.09	N									
Interconnect Closures and Splice Trays	662-3.10	N									

SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
CONTROLLER CABINET:											
Flashing Beacon Control Cabinet	See Detail in Plans. 740-2.17	N									
OTHER CABINET COMPONENTS:											
NEMA TS2 Plug N Go	740-2.11	Y									
Malfunction Management Unit (MMU)	740-2.12	N									
Inductive Loop Detector Unit	740-2.13	N									
Traffic Logging System	740-2.13	N									
Solid State Flasher	740-2.12	N									
Three-Circuit Solid State Load Switch	740-2.12	N									
Flash Transfer Relay	740-2.12	N									
Bus Interface Unit (BIU)	740-2.13	N									
Time Switch	740-2.17	Y									
Bypass Switch	740-2.17	N									
Patch Panel (interconnect)	662-2.04	N									
Ethernet Switch (interconnect)	See Detail in Plans 740-2.13	N									
Cabinet interface device (radar)	See Detail in Plans 740-2.13	N									
CABINET VENTILATION SYSTEM:											
Heater	See Detail in Plans 740-2.11	Y									
Thermostat	See Detail in Plans 740-2.11	Y									
Fan	See Detail in Plans 740-2.11	Y									

SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
COMMUNICATION SYSTEMS:											
System Modem	740-2.13	N									
Radio	740-2.23	Y									
Antenna	See Detail in Plans 740-2.23	N									
Antenna Cable	See Detail in Plans	N									
HIGHWAY LIGHTING SYSTEMS											
PCC STREET LIGHT POLE FOUNDATION: Cast in Place											
Concrete Mix Design	660-2.01	N									
Reinforcing Steel Bars	Std. Plans 709-2.01	N									
Anchor	Std. Plans	N									
Corrugated Metal Pipe	Std. Plans 660-3.02	N									
Frangible Couplings	Std. Plans	N									
PRECAST FOUNDATIONS	See Detail in Plans	N									
PIPE PILE ELECTROLIER FOUNDATION:											
Pipe Pile	See Detail in Plans 660-2.01 660-3.02	N									
Pile Adapter, Steel Plate	See Detail in Plans 740-2.02	N									
JUNCTION BOXES:											
Type I / IA, II, III	See Detail in Plans 660-2.01 709-2.01 711-2.01	N									
Concrete Mix Design	501-2.02 660-2.01	N									

SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
Curing Materials	711-2.01	N									
Reinforcing Steel	709-2.01	N									
Electronic ball marker	See Detail in Plans 660-3.04	N									
Junction Box Cover	See Detail in Plans 660-3.04	N									
LIGHTING STRUCTURES:											
Steel Poles	See Detail in Plans 740-2.02	N									
Galvanizing	740-2.02	N									
Shop Drawings	660-3.01 740-2.02	N									
Calculations	740-2.02	N									
Welding Plan	660-3.01 740-2.02	N									
Mill Certifications	740-2.02	N									
CONDUIT:											
Galvanized Rigid Metal Conduit (RMC)	740-2.06	Y									
High Density Polyethylene Conduit (HDPE)	740-2.06	Y									
High Density Polyethylene Couplings	660-3.03	Y									
Galvanized Couplings	740-2.06	Y									
Galvanized Split Couplings	740-2.06	Y									
Galvanized Elbows	740-2.06	Y									
Galvanized Nipples	740-2.06	Y									
Bore Casing	660-3.03	N									

SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
Underground Marker Tape	660-3.03	N									
Pull Rope	660-3.03	N									
Type "C" and "LB" Conduit Outlet Bodies with Covers, Gaskets & Plugs	See Detail in Plans 740-2.06	Y									
BONDING & GROUNDING:											
Grounding Bushings	See Detail in Plans 740-2.06 660-3.01 660-3.06	Y									
Bare Copper Ground Wire	See Detail in Plans 660-3.06	N									
Braided Copper J-Box Lid Bonding Wire	See Detail in Plans 740-2.06 660-3.06	Y									
Irreversible Compression Type Connectors	See Details in Plans 660-3.02 660-3.06	Y									
CONDUCTORS / CABLES:											
Illumination Cable - PE Jacket	740-2.05	Y									
Power Cable - PE Jacket	740-2.05	Y									
Luminaire Tap Conductors	740-2.05	Y									
Identification Labels	660-3.05	N									
SPLICES:											
Heat Shrink Tubing	See Detail in Plans 660-3.05	Y									
Electrical Tape	See Detail in Plans 660-3.05	Y									
Power Cable Splice Kit (Lighting)	See Detail in Plans 660-3.05	Y									

SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
Double Fuse Connector Kits (Lighting)	See Detail in Plans 740-2.07	Y									
Fuses for Double Fuse Connector Kits	See Detail in Plans 740-2.07	Y									
LIGHTING FIXTURES:											
LED Luminaire (include all additional requirements)	See Detail in Plans 740-2.18	Y									
HPS Luminaire, Lamp, Ballast	See Detail in Plans 740-2.18 740-2.21	Y									
Sign Lighting, Lamp, Ballast	See Detail in Plans 740-2.19	Y									
Underpass Luminaire, Lamp, Ballast	See Detail in Plans 740-2.23	Y									
ILLUMINATION CONTROL:											
Node	See Detail in Plans 740-2.20	N									
Gateway	See Detail in Plans 740-2.20	N									
Modem	See Detail in Plans 740-2.20	N									
661 ELECTRICAL LOAD CENTERS											
TYPE 1 & TYPE 1A FOUNDATIONS	Std. Plans 661-2.01	N									
Wood Posts (TYPE 2 & 3 FOUNDATIONS)	Std. Plans 661-2.01	N									
Treatment	Std. Plans 714-2.01	N									
BONDING & GROUNDING:											
Copper Ground Rod	Std. Plans 661-2.01	Y									
Ground Rod Clamps	661-2.01	Y									
Bare Copper Grounding Wire	Std. Plans 661-3.01	N									

SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
COMPONENTS IN COMMON:											
Photoelectric Control	Std. Plans 740-2.20 661-2.01	Y									
Photocell Cable	Std. Plans 740-2.05	Y									
Contactor	Std. Plans 661-2.01	Y									
Load Panel	Std. Plans 661-2.01	Y									
Neutral Bus Bar System	Std. Plans 661-2.01	Y									
Ground Bus Bar System	Std. Plans 661-2.01	Y									
Terminals	661-2.01	Y									
Control Switch (selector switch)	Std. Plans 661-3.01	Y									
Uninterruptible Power Supply Cabinet	See Detail in Plans 661-2.01	Y									
Uninterruptible Power Supply Controller	See Detail in Plans 661-2.01	Y									
Uninterruptible Power Supply Batteries	See Detail in Plans 661-2.01	Y									
Power Transfer Switch	Std. Plans 661-2.01	Y									
Meter Socket	Std. Plans 661-2.01	Y									
Manual Circuit Closing Device	661-2.01	Y									
Circuit Breakers	Std. Plans 661-2.01	Y									
Galvanized Rigid Metal Conduit	Std. Plans 661-2.01	Y									
LOAD CENTER ASSEMBLIES:											
Type 1	Std. Plans 661-2.01	Y									
Type 1A	Std. Plans 661-2.01	Y									
Type 1A with UPS	See Details in Plans 661-2.01	Y									
Type 2	Std. Plans 661-2.01	Y									
Type 3	Std. Plans 661-2.01	Y									
TRANSFORMERS	661-2.01	Y									

SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
669 AUTOMATED TRAFFIC RECORDERS											
JUNCTION BOXES:											
Type II	See Detail in Plans 660-2.01 709-2.01 711-2.01	N									
Concrete Mix Design	660-2.01	N									
Curing Materials	711-2.01	N									
Reinforcing Steel	709-2.01	N									
Junction Box Cover	See Detail in Plans 660-3.04	N									
Ground Wire from Bushing to Cover	See Detail in Plans 660-3.04	N									
CONDUIT / LOOPS:											
Galvanized Rigid Metal Conduit	740-2.06	Y									
Galvanized Couplings	740-2.06	N									
Galvanized Split Couplings	740-2.06	Y									
Galvanized Elbows	740-2.06	Y									
Galvanized Nipples	740-2.06	Y									
Bore Casing	660-3.03	N									
Underground Marker Tape	660-3.03	N									
Pull Rope	660-3.03	N									
Schedule 80 PVC Conduit (Loops)	740-2.06	Y									
PVC Fittings & Adapters (Loops)	740-2.06	Y									
Type "X" Conduit Bodies with Covers, Gaskets & Plugs (Loops)	See Detail in Plans	Y									

SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
BONDING & GROUNDING:											
Copper Ground Rod	See Detail in Plans 660-3.06	Y									
Grounding Bushings	660-3.06	Y									
Ground Rod Clamps	660-3.06	Y									
#6 & 8 Bare Copper Ground Wire	660-3.06	N									
Braided Copper J-Box Lid Bonding Wire	660-3.06	Y									
CONDUCTORS / CABLES:											
1C#14 Detector Loops	669-2.01	Y									
6pr#18 Loop Lead-in Cable	669-2.01	Y									
CONTROLLER CABINET:											
Style CBA2 Cabinet	740-2.11 669-2.01	Y									
Terminal Blocks:	669-2.01	Y									
Circuit Breaker Panel	669-2.01	Y									
Transient Voltage Surge Protection	669-2.01	Y									
Interior Light	669-2.01	Y									
Cooling Fan	669-2.01	Y									
Thermostatically Controlled Outlet	669-2.01	Y									
110-volt Recepticals	669-2.01	Y									
Heater	669-2.01	Y									
Thermostat	669-2.01	N									

SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
SPLICES:											
Overlap Type Crimp Connector	660-3.05	Y									
Heat Shrink Tubing	660-3.05	Y									
Electrical Tape	660-3.05	Y									
DATA LOGGERS AND TEMPERATURE SENSORS:											
Data Logger	669-2.01	N									
External Interface	669-2.01	N									
Serial Interface	669-2.01	N									
Termocouple Referance Termistor	669-2.01	N									
Road Temperature Thermocouple	669-2.01	N									
Air Temperature Thermocouple	669-2.01	N									
Radiation Shield	669-2.01	N									
Telemetry Software	669-2.01	N									
Vertical Temperature probe	669-2.01	N									
ADDITIONAL COMPONENTS:											
Piezoelectric Sensor	669-2.01	N									
AS475 methyl grout for sensor	669-2.01	N									
PSTN Modem	669-2.01	N									
Remotely Controllable Code Operated Switch	669-2.01	N									
Automated Vehicle Classification (AVC) Counter	669-2.01	N									
ADDITIONAL MATERIALS:											

SECTION 660/661/669/740 MATERIALS CERTIFICATION LIST (Updated 3/28/2024)

Materials Item	Specification	Third Party Listing or Labeling Required? (Y/N)	Acceptance By:							Manufacturer/ Remarks	Certificate Location e.g. Binder #
			Construction		Design			Statewide Materials			
			Project Engineer	Regional Materials or QA Engineer	State Electrical Engineer	Regional Highway Data Manager	Regional Traffic Design Engineer	Qualified Products List (QPL)	State Materials or QA Engineer		
ADDITIONAL MATERIALS:											

APPENDIX D

SIGN SHOP DRAWINGS

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SIGN DETAIL
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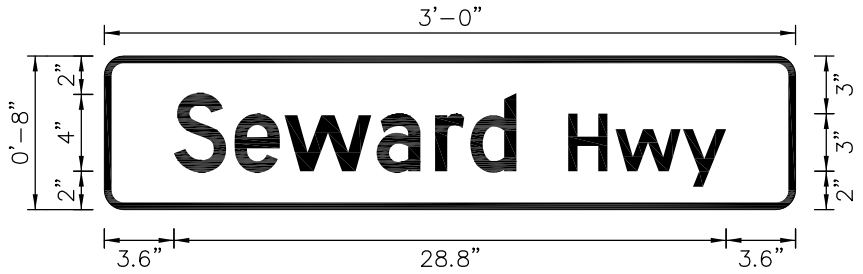

SIGN NUMBER	name
WIDTH x HGHT.	3'–0" x 0'–8"
BORDER WIDTH	0.38"
CORNER RADIUS	1"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–4in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																				LENGTH	SERIES/SIZE
S	e	w	a	r	d																D 2000
3.6	6.8	9.4	14.2	17.2	19.1															17.8	4/3
H	w	y																			D 2000
24.2	26.6	30.1																		8.2	3/2.3

SIGN DETAIL
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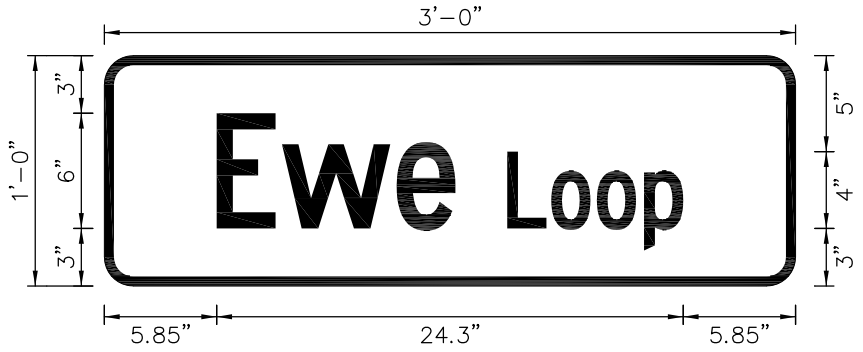

SIGN NUMBER	name
WIDTH x HGHT.	3'–0" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																			LENGTH	SERIES/SIZE
E	w	e																		C 2000
5.9	9.2	15.2																	12.4	6/4.5
L	o	o	p																	C 2000
21	23.3	25.6	28.1																9.2	4/3

SIGN DETAIL
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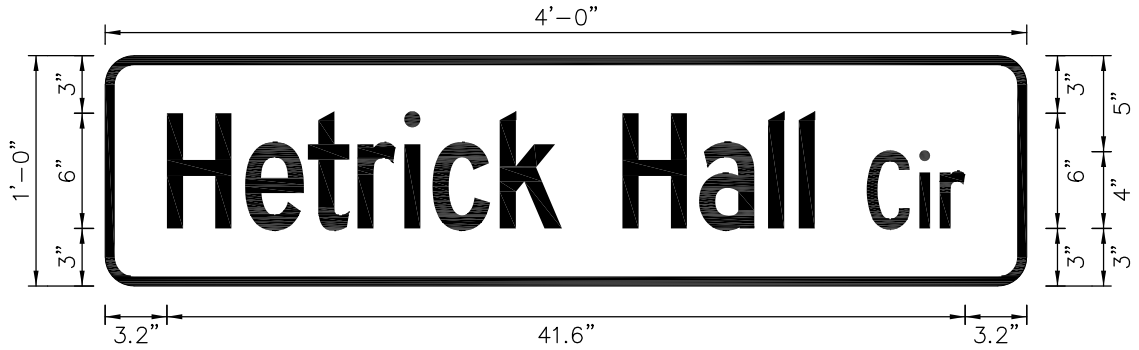

SIGN NUMBER	name
WIDTH x HGHT.	4'–0" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																				LENGTH	SERIES/SIZE
H	e	t	r	i	c	k	H	a	l	l											C 2000
3.2	7.3	10.6	13.1	15.6	17	20.6	26.9	30.9	34.5	36.1										33.7	6/4.5
C	i	r																			C 2000
39.7	42.4	43.5																		5.1	4/3

SIGN DETAIL
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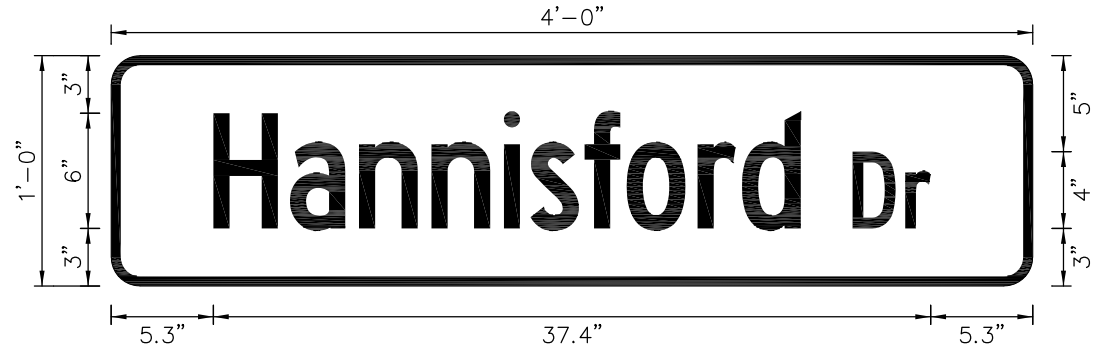

SIGN NUMBER	name
WIDTH x HGHT.	4'–0" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																			LENGTH	SERIES/SIZE
H	a	n	n	i	s	f	o	r	d											C 2000
5.3	9.3	12.9	16.7	20.5	21.8	24.7	26.8	30.5	32.9										30.6	6/4.5
D	r																			C 2000
38.6	41.4																		4.1	4/3

SIGN DETAIL
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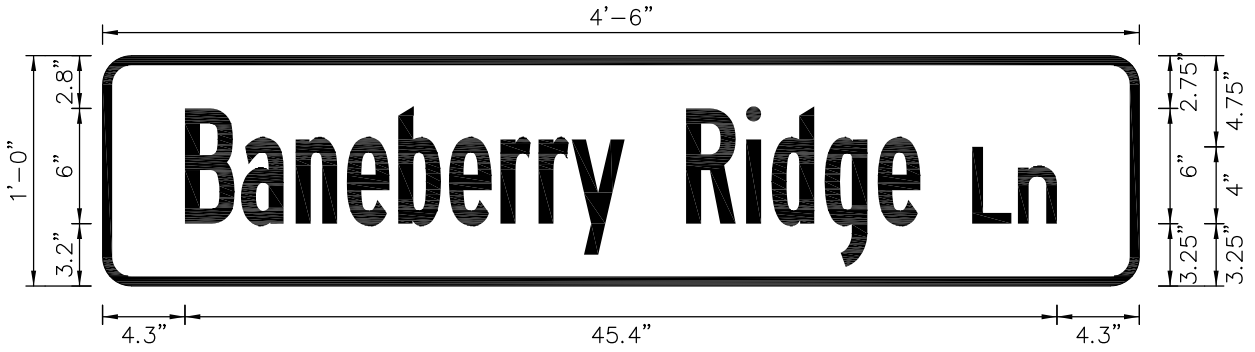

SIGN NUMBER	name
WIDTH x HGHT.	4'–6" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																				LENGTH	SERIES/SIZE
B	a	n	e	b	e	r	r	y	R	i	d	g	e								B 2000
4.3	7.2	10.1	12.7	15.4	18	20.7	22.7	24.4	30.4	33.5	34.8	37.6	40.4							38.3	6/4.5
L	n																				C 2000
45.3	47.7																			4.4	4/3

SIGN DETAIL
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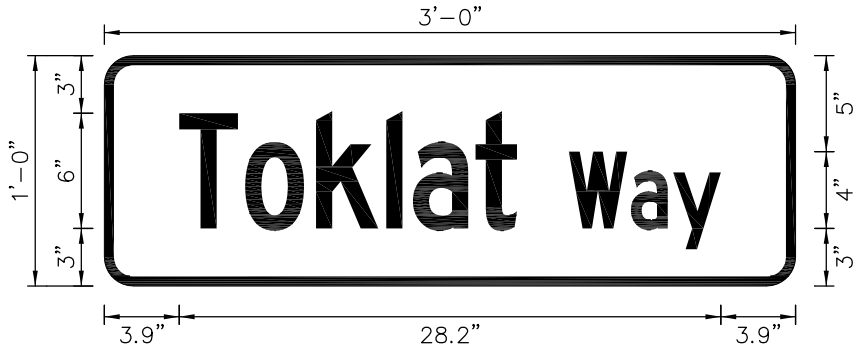


SIGN NUMBER	name
WIDTH x HGHT.	3'–0" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

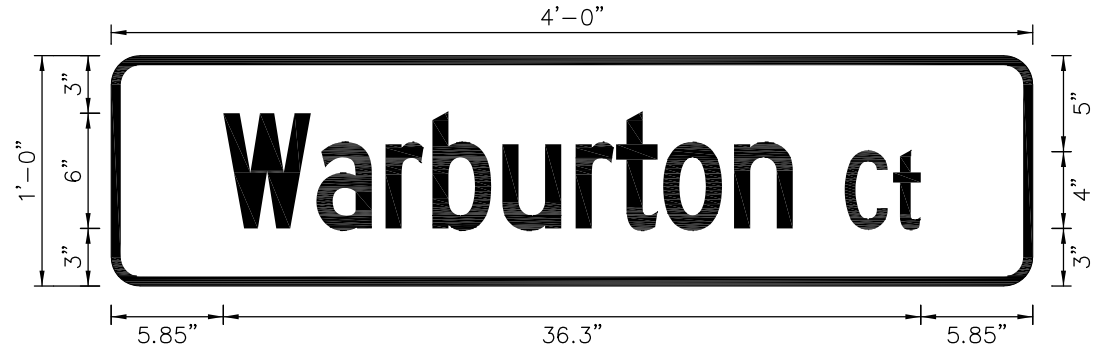
SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																				LENGTH	SERIES/SIZE
T	o	k	l	a	t																C 2000
3.9	7.3	11	14.7	16.1	19.3															17.6	6/4.5
W	a	y																			C 2000
24.2	27.4	29.6																		7.9	4/3

SIGN DETAIL
1:10



SIGN NUMBER	name
WIDTH x HGHT.	4'–0" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

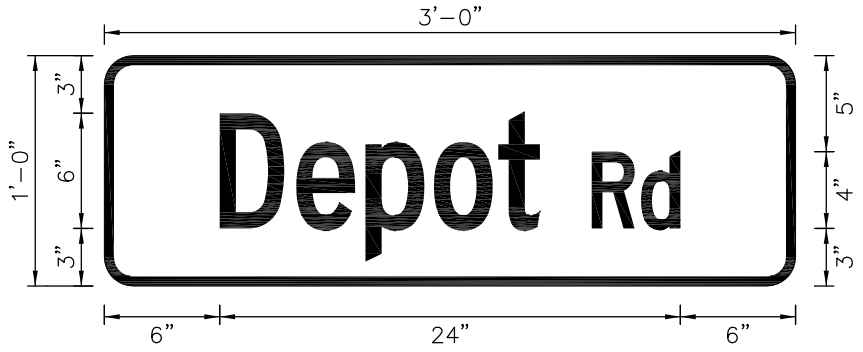
SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																			LENGTH	SERIES/SIZE
W	a	r	b	u	r	t	o	n												C 2000
5.8	10.7	14.3	16.7	20.4	24.2	26.3	28.8	32.4											29.7	6/4.5
C	t																			C 2000
38.2	40.7																		4	4/3

SIGN DETAIL
1:10



SIGN NUMBER	name
WIDTH x HGHT.	3'–0" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

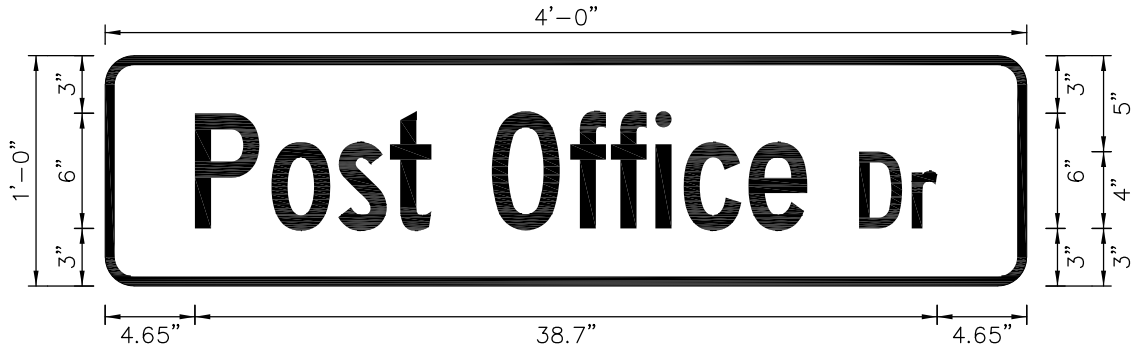
SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																			LENGTH	SERIES/SIZE
D	e	p	o	t																C 2000
6	10	13.6	17.2	20.5															16.7	6/4.5
R	d																			C 2000
25.4	28																		4.6	4/3

SIGN DETAIL
1:10



SIGN NUMBER	name
WIDTH x HGHT.	4'–0" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

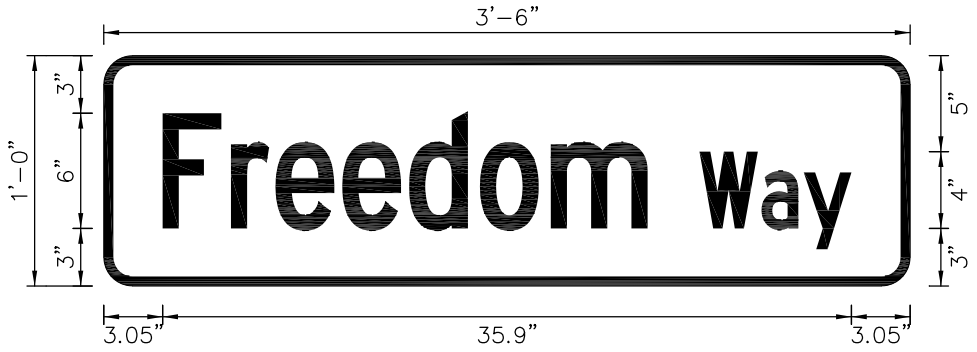
SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																				LENGTH	SERIES/SIZE
P	o	s	t	O	f	f	i	c	e												C 2000
4.7	8.7	12.1	14.8	20.1	24.2	26.3	28.7	30.1	33.5											31.9	6/4.5
D	r																				C 2000
39.3	42																			4.1	4/3

SIGN DETAIL
1:10



SIGN NUMBER	name
WIDTH x HGHT.	3'–6" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

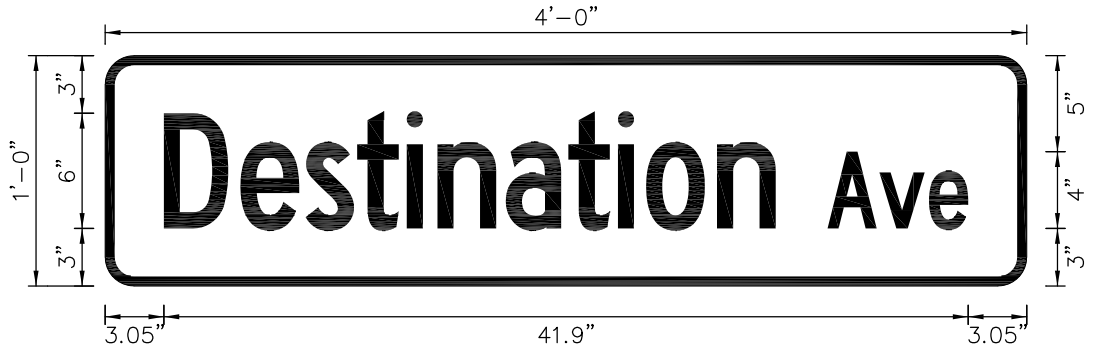
SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																			LENGTH	SERIES/SIZE
F	r	e	e	d	o	m														C 2000
3.1	6.6	8.9	12.4	15.9	19.6	23.3													25.3	6/4.5
W	a	y																		C 2000
31	34.3	36.5																	7.9	4/3

SIGN DETAIL
1:10



SIGN NUMBER	name
WIDTH x HGHT.	4'–0" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

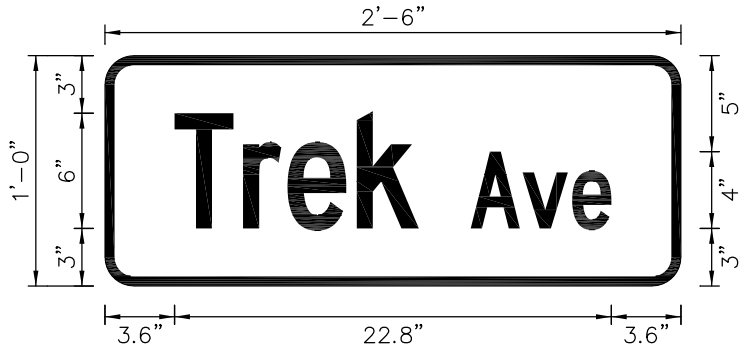
SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																				LENGTH	SERIES/SIZE
D	e	s	t	i	n	a	t	i	o	n											C 2000
3.1	7	10.4	13.1	15.7	17.3	20.9	24.1	26.7	28.2	31.9										31.9	6/4.5
A	v	e																			C 2000
37.6	40.3	42.9																		7.3	4/3

SIGN DETAIL
1:10



SIGN NUMBER	name
WIDTH x HGHT.	2'–6" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

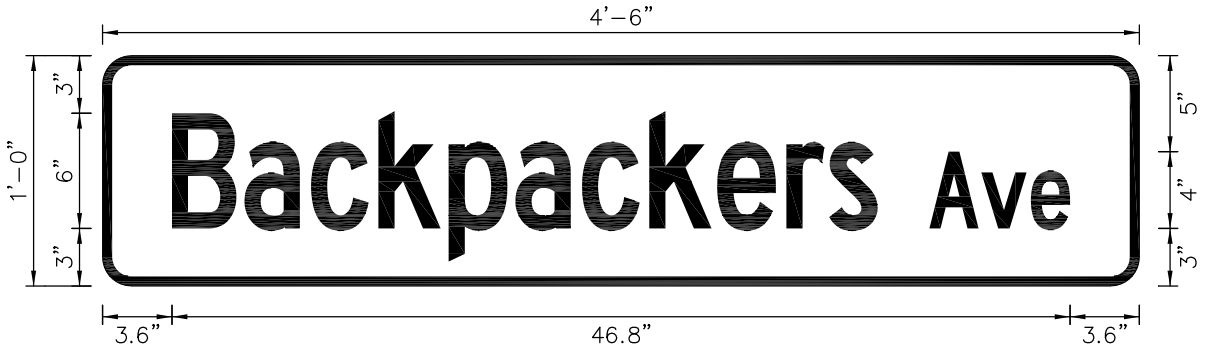
SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																			LENGTH	SERIES/SIZE
T	r	e	k																	C 2000
3.6	7.2	9.5	13.1																12.7	6/4.5
A	v	e																		C 2000
19.1	21.8	24.3																	7.3	4/3

SIGN DETAIL
1:10



SIGN NUMBER	name
WIDTH x HGHT.	4'–6" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

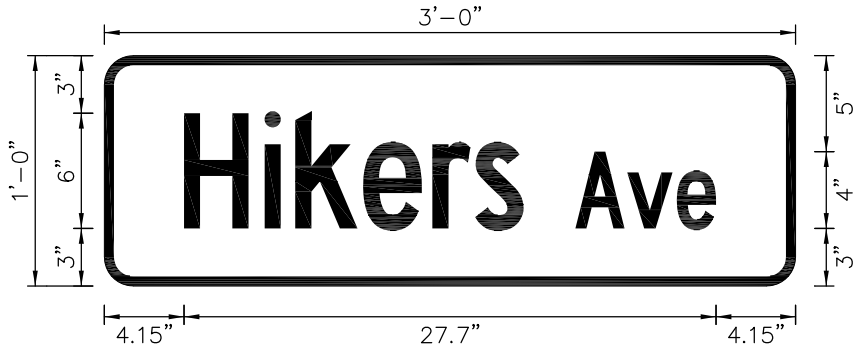
SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																				LENGTH	SERIES/SIZE
B	a	c	k	p	a	c	k	e	r	s											C 2000
3.6	7.4	10.9	14.4	18	21.5	25	28.5	32	35.6	37.8										36.8	6/4.5
A	v	e																			C 2000
43.1	45.8	48.4																		7.3	4/3

SIGN DETAIL
1:10



SIGN NUMBER	name
WIDTH x HGHT.	3'–0" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

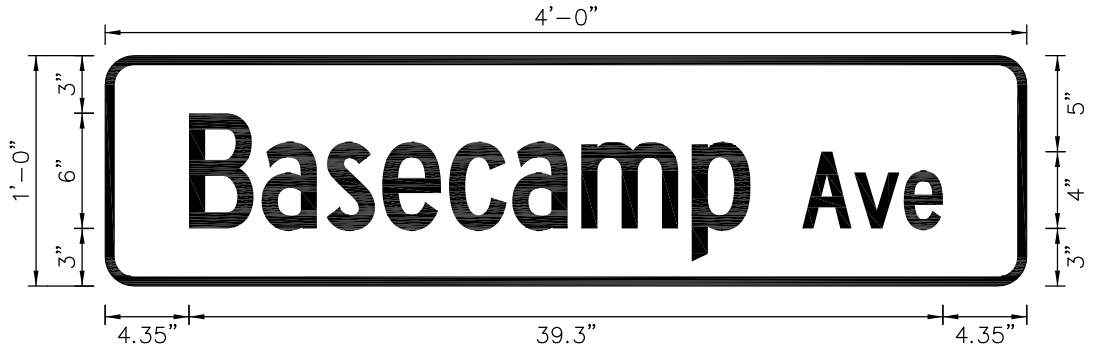
SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																				LENGTH	SERIES/SIZE
H	i	k	e	r	s																C 2000
4.1	8.3	9.9	13.5	17.1	19.3															17.7	6/4.5
A	v	e																			C 2000
24.5	27.2	29.8																		7.3	4/3

SIGN DETAIL
1:10



SIGN NUMBER	name
WIDTH x HGHT.	4'–0" x 1'–0"
BORDER WIDTH	0.5"
CORNER RADIUS	1.5"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

SYMBOL	ROT	X	Y	WID	HT

Panel Style: D3–1–6in
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																				LENGTH	SERIES/SIZE
B	a	s	e	c	a	m	p														C 2000
4.4	8.1	11.5	14.4	17.9	21.2	24.8	30.5													29.2	6/4.5
A	v	e																			C 2000
36.3	39	41.6																		7.3	4/3

APPENDIX E

TEMPORARY CONSTRUCTION EASEMENTS

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APPENDIX F

DRAFT PERMITS

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